The Implications of the Formation of Local Networks

in the Global Online Knowledge Network: Case Study of South Korea

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This study, conceptualizing a search engine as an online knowledge network, examines how a local network is formed in the presence of a global online knowledge network. The network literature has explained how a larger network gets larger and becomes dominant, but fails to explain the prevalence of small, local networks over the global network, which is found in some countries. This is especially true in South Korea, where the market share of the global online knowledge network is the lowest in the world. Conducting a case study of Korea, the present research attempts to explore the chasm between the network literature and the reality from the perspective of network and content.

Key words: knowledge, network, global, local, content, creation, presentation, first-mover advantage, Google, NHN

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I. Introduction

In our time, one of the most common ways to obtain knowledge is to access online databases through search engines. Search engines can be defined as online knowledge networks where nodes such as individuals, organizations, information and data are linked together. Except for a few countries, such as China and South Korea, the world is now dominated by a single knowledge network, Google.

The worldwide dominance of Google within a short period of time became possible because of the innate characteristics of the network that allow large networks to get larger. With its superior search technology, Google possesses the largest number of links to Web pages and can update online content far more easily than smaller search engines in the face of the exponential growth of the Web. Moreover, economies of scale and network externalities encourage Google to incur less cost and generate more benefits for users. Propelled by the richer-get-richer effect of the network, Google has became the global knowledge network.

However, the network literature fails to explain how a local knowledge network can survive and even prevail over the global knowledge network which has strong advantages due to its large network size. Based on this question, the present research attempts to explain the dominance of a local search engine through a case study of South Korea, where Google's share of search queries is the lowest in the world.

This study starts by conceptualizing a knowledge network and defining a search engine as a knowledge network. Then, the worldwide dominance of Google is explained in line with the

network literature. Next, the case of South Korea is introduced and the success of NHN, the most popular search engine in Korea, is examined from the perspectives of network and content.

II. The Conceptualization of a Knowledge Network and a Search Engine as a Knowledge Network

The definition of knowledge differs as each discipline attempts to address different research questions and is highly contentious to define directly and definitely. The present research follows Spender's (1996) conceptualization of knowledge from the standpoint of organizational perspectives in order to focus on the dynamics of the individual's institutional context. Though Spender developed his definition of knowledge based on knowledge management within a firm, his matrix of knowledge is useful to explain how knowledge is situated and interacted on the Web, a virtual organization. Spender classified knowledge according to individual/social and explicit/implicit categories into four types: conscious, objectified, automatic, and collective knowledge (see Table 1). Conscious knowledge is "facts, concepts, and frameworks that can be stored and retrieved from memory or personal records" and automatic knowledge is "theoretical and practical knowledge of people and the performance of different kinds of artistic, athletic, or technical skills" (Nahapiet & Ghoshal, 1998). Objectified knowledge is "the shared corpus of knowledge" (Nahapiet & Ghoshal, 1998) and is regarded as "the most advanced form of knowledge" (Boisot, 1995; citing in Nahapiet &

Ghoshal, 1998) which can be science or established standards and practices such as patents and registered designs (Spender, 1996). Collective knowledge is "embedded in the forms of social and institutional practice" (Nahapiet & Ghoshal, 1998) and is "relatively hidden from individuals but accessible and sustained through their interaction" (Spender, 1994; citing in Nahapiet & Ghoshal, 1998). Knowledge as defined in this study, includes all four types of knowledge whether individual or social and explicit or tacit.

<Table 1> Different Types of Knowledge in Organizational Analysis (Spender, 1996)

	Individual	Social
Explicit	Conscious	Objectified
Tacit	Automatic	Collective

This study conceptualizes a knowledge network as the linkage through which knowledge circulates from nodes to other nodes that create, distribute, and/or apply knowledge. Nodes include individuals, organizations, and non-human agents such as knowledge repositories, Web sites, and content (Contractor & Monge, 2002). Knowledge networks have to perform an optimized rate of knowledge creation and sharing in order to lessen the gap between information haves and have-nots (Clark, 1998; citing in Cukor & McKnight, 2001). They should be cost effective and efficient in providing benefits to all actors and should involve several sectors of the economy to integrate diverse viewpoints (Clark, 1998; citing in Cukor & McKnight, 2001).

Based on this conceptualization of a knowledge network, the present research defines 'search engine' as a knowledge network on the World Wide Web. Several studies (Cole, Suman, Schramm, Lunn, & Aquino, 2003; Fox, 2002; citing in Jansen & Spink, 2006) found that the

Web has become "an integral part of knowledge networks by serving as the primary tool of knowledge acquisition, sharing, and application" (Cukor & McKnight, 2001). Since the online transaction cost of information is minimal[2] and the barriers to participate in creating and sharing knowledge are low, the Web can function as a knowledge network. A study (Ntoulas et al., 2004), through an examination of 154 Web sites every week over a period of a year, shows that new web pages are created at the rate of 8 percent per week and that about 25 percent more new links are established every week. This relatively low cost as well as "the rapid turnover rate of Web pages and hyperlinks" (Ntoulas et al., 2004) have contributed to discovering and diffusing individual or tacit knowledge which was once set aside in the traditional or formal knowledge networks (Cukor & McKnight, 2001).

At the heart of the Web as a knowledge network, lie the search engines such as Google. Search engines crawl Web pages in advance to make indexes of the pages, which are used later to identify relevant pages and provide adequate answers to users' queries (Ntoulas et al., 2004). They function as hubs, "nodes with an extraordinarily large number of links," which hold together myriads of unpopular or seldom noticed websites that have only a few links (Barabasi, 2003). Facilitating finding online information or services, Google had the largest number of worldwide unique visitors in May 2007 according to comScore's[3] recent report. In line with this global trend, search engines are the second most commonly used online application next to e-mail service in the U.S. The Pew Internet & American Life Project (Fox, 2008) data show that, on a typical day, 90 percent of Web users used search engines and 49 percent of Web users had

[2] According to Von Hippel (1994) and Szulanski (2003), when transfer costs are low, knowledge stickiness is low and when it is high, knowledge stickiness is high (Van Baalen et al., 2005).

[3] ComScore is an Internet marketing research company providing data and analysis in online audience measurement, e-commerce, advertising, search, video and mobile.

visited search engines, which is not far from the 60 percent who sent or received e-mail in August 2008. Not only in the U.S., but also in Korea, usage of search engines is the primary online activity, next to checking news. Fifty percent of Web users use search engines, which is close to the 58 percent who visited news websites in September 2006 (Choi et al., 2006). Along with the frequent usage of search engines, they have become the main source of information when people need to address problems. Fifty eight percent of people went online to get help, exceeding 53 percent of respondents who consulted professionals and the 45 percent who turned to friends and family members in the U.S. (Estabrook et al., 2007). Also in Korea, the Web was the second most frequently used resource to find information, next to asking professionals, and it was the most popular medium used for gathering information, surpassing television and newspapers (Choi et al., 2006).

Search engines as knowledge networks connecting information have thus made heavy contribution to synthesizing, sharing, and creating information which once were limited to offline human networks (Kim, 2006).

III. The Worldwide Dominance in the Search Engine Market

Across the world, the most popular search engine is Google whose share of search queries was over 60 percent in 2007, far above the 12 percent share of Yahoo, the second runner up. Its share of searches even approaches 80 percent in Europe (see Table 2). In contrast to the

European market, Google only occupies a third of the total search queries in the Asia-Pacific market because of the overwhelming popularity of local search engines in two countries: China and South Korea. In addition to these, Google has yet to take a lead in Japan, Russia, and Czech Republic (Ellis, 2008). Except for these five 'known' countries, Google ranks as the first search engine around the world, which suggests that it deserves the title 'Planet Google[4].'

<Table 2> Share of Searches of the Top Five Search Engines (%)

	World-wide (Dec 2007)		**U.S.** (Jun 2009)		**Europe** (Mar 2008)		**Asia-Pacific** (July 2008)
Google	62.4	Google	65.0	Google	79.2	Google	33.5
Yahoo	12.8	Yahoo	19.6	eBay	3.1	Baidu.com	27.4
Baidu.com	5.2	Microsoft	8.4	Yandex	2.2	Yahoo	19.7
Microsoft	2.9	Ask	3.9	Yahoo	2.0	NHN	4.6
NHN	2.4	AOL LLC	3.1	Microsoft	1.9	Alibaba.com	3.0
Others	14.3	-	-	Others	4.7	Others	6.2
Total Internet	100.0	Total Core Search*	100.0	Total Internet	100.0	Total Internet	100.0

* Based on the five major search engines including partner searches and cross-channel searches. Searches for mapping, local directory, and user-generated video sites that are not on the core domain of the five search engines are not included in the core search numbers.

Note: Age 15+, Home & Work Locations (Excludes searches from public computers such as Internet cafes or access from mobile phones or PDAs)

Source: comScore qSearch

[4] The phrase 'Planet Google' was used in the article of the New York Times (Williams, A. (Oct. 15, 2006) Planet Google Wants You) and the book, 'Planet Google: One Company's Audacious Plan To Organize Everything We Know' (Stross, R., 2008).

The worldwide dominance of young Google, an eleven-year old company[5], results from the characteristics of the network and network economy. Google's superior search technology has enabled it to have the largest number of Web pages indexed[6] and to provide the most relevant search results based on the PageRank algorithm[7]. A study (Vaughan & Thelwall, 2004) of the coverage of the top three search engines by size – Google, AlltheWeb, and AltaVista – found that Google covers the most sites, an average of 72 percent throughout the U.S., China, Taiwan and Singapore. Since "each node attracts new links at a rate proportional to the number of its current links" (Barabasi, 2003), the search engine with the larger number of indexed pages needs far less effort to update itself compared to the one with a small search database. Consequently, the rich get richer and the poor become poorer.

In addition to the effect of the network structure itself, the network economy, represented by network externalities in consumption and economies of scale in production, propelled Google to become a global company within a short period of time. Network externalities are "positive external consumption benefits" (Katz & Shapiro, 1986) that a user derives from the consumption of goods and the benefits increase with the number of other people consuming the goods (Katz & Shapiro, 1985). That is, the size of the network in terms of the number of users determines the amount of utility produced from using that network. Search engines, as 'multi-sided platforms'

[5] Google is officially launched in September 1998.

[6] According to the most recent estimation of SearchEngineShowdown.com (http://searchengineshowdown.com/ statistics/sizeest.shtml), Google, indexing three billion Web pages, has the largest size of the search database in 2002, followed by AlltheWeb (2.1 billions) and AltaVista (1.7 billions). SearchEngineWatch.com (http://blog. searchenginewatch.com/041111-084221) also reported that Google's size is the biggest quoting the claimed size of search engines in 2003.

[7] Google's PageRank algorithm accesses the importance of the Web page by the number of the pages citing that particular page. Through capturing the Web link structure, Google estimates the importance and popularity of Web pages (Ntoulas et al., 2004) and enhances the relevance of search results.

or ‘two-sided markets’ providing services to searchers, advertisers, and other Web businesses, are affected by indirect network effects across these platforms (Evans, 2008). The indirect externalities mean that “the value that a customer on one side realizes from the platform increases with the number of customers on the other side (Evans, 2008)”. When a search engine has a larger number of searchers, more Web publishers who want to run advertising or offer services and information rally to that search engine. The more the searchers, the greater the benefits that are created, which, in turn, attracts more searchers. As a result, the larger search engine gets bigger. Economies of scale also provide advantages to larger search engines. Larger search engines have lower average costs because they can easily amortize fixed costs over a larger customer base (Evans, 2008). Moreover, the low marginal production costs and high fixed costs of network industries strengthen the effect of scale economies (Evans & Schmalensee, 2002). Consequently, the larger search engine dominates the market.

Possessing a larger base of searchers with superior search technologies and high search quality, Google has become a worldwide search engine fueled by network structure, network effects, and economies of scale which contribute to expanding the market at a faster pace generating the rapid S-curve than non-network industries (Economides, 2004; DiMaggio & Cohen, 2004). Considering the wide discrepancy in the share of searches between Google and its nearest competitor, the search engine market seems to have passed the tipping point which means that the size of the network tips expectations sharply towards one player (McGee & Bonnici, 2002), Google, and away from its rival. When one network reaches the critical mass, that network becomes the winner who takes all and Google is the winner at present. However, if the winner takes all, why is this not true in some countries? The characteristics of network and network economy explain the worldwide dominance of Google, but not its defeat by some local

search engines which have a far smaller number of searchers than Google. The present research attempts to find the answer to this through conducting a case study of South Korea.

IV. Case Study of South Korea: NHN

1. Introduction to NHN

NHN Corporation, whose brand name is 'Naver', is a search portal which has the characteristics of both a search engine and a Web portal, but which concentrates more on the former. Among the weekly unique visitors to the NHN Web site (www.naver.com), 88 percent did online searches at NHN in 2005 (Kwon et al., 2007). According to NHN, search advertising sales accounted for 50 percent of its total sales in 2008. Considering that the total search advertising sales in Korea in 2008 was estimated to be 823 billion Won by Hwang (2008), the share of NHN was 74 percent, indicating the overwhelming lead of NHN in the search engine market of Korea.

NHN is the most engaging site in the world according to comScore's measure of average visits per visitor[8]. NHN, as a local network, was ranked 47th in terms of the number of unique visitors, but it took first place in the world in terms of the average visits per visitor, leaving the global network, Google, in fourth place (see Table 3). These statistics show the relatively strong

[8] According to comScore World Metrix (Feb. 2007), a 'visit' is a frequency measure and indicator of user engagement defined as an individual's set of interactions with a specific Web site.

loyalty of Web users to NHN compared to other Web sites all around the world. According to the research of Choi et al. (2006), 47.8 percent of Korean Web users designated the NHN Web site (www.naver.com) as their personal home page on the Web, showing a sharp contrast with Google whose Web site (www.google.com) was only chosen by 0.5 percent of users as their home page (see Figure 1). When people had something to ask, 81 percent of total Web users visited the Web site of NHN, while 2.8 percent went to the Web site of Google (Choi et al., 2006) (see Figure 2). The Economist (2009) reported that the share of searches of NHN was 76 percent and that of Google three percent in Korea. This is the lowest market share of Google among the 48 countries studied (Chitu, 2009). Based on the statistics above, Korea can be called 'Naverland,' even though the world is 'Planet Google.'

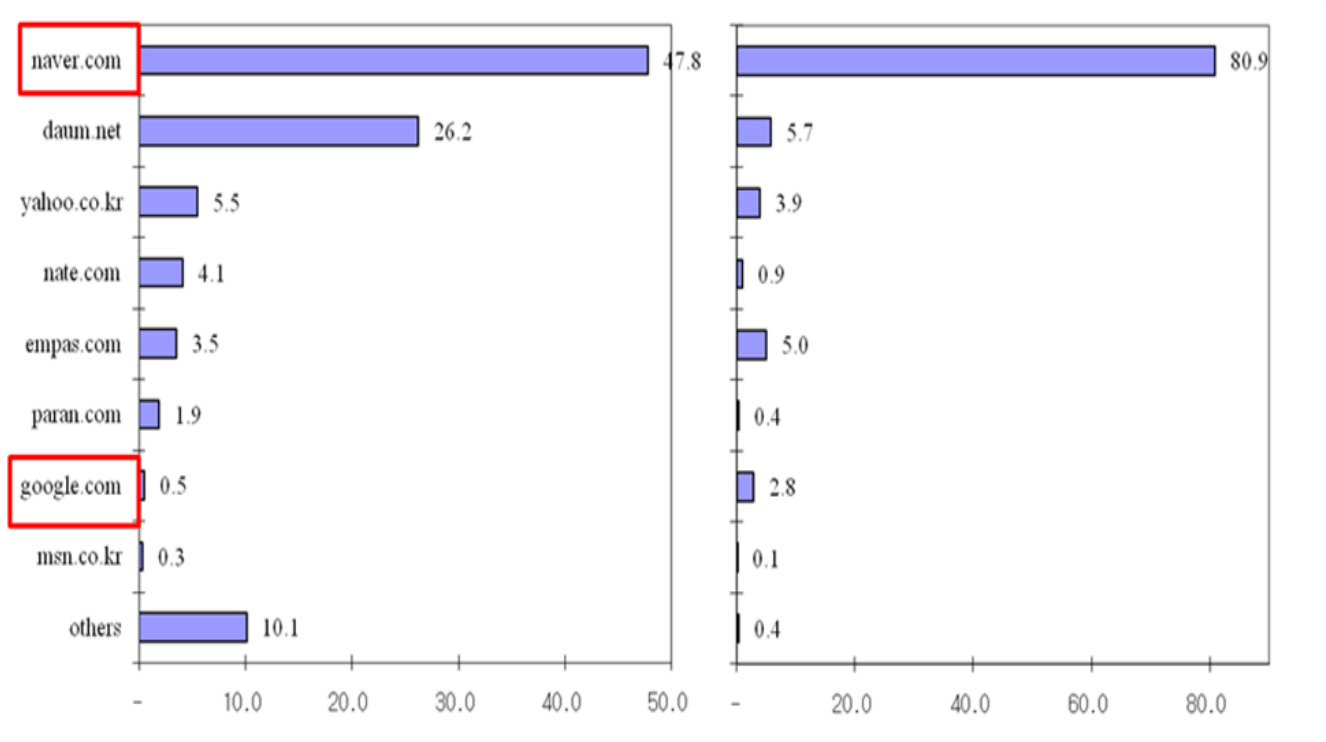
<Table 3> Top 5 Global Properties by average visits per visitor in 2007

Property	Average Visits / Visitor	Total Unique Visitors (000)	Rank in Top 100 by UV
NHN Corporation	33	30,077	47
TENCENT Inc.	31	53,175	21
RISING.COM.CN	29	22,254	89
Google Sites	24	503,033	2
Microsoft Sites	22	507,317	1

Source: Choi et al. (2006)

<Figure 1> The Web site registered as the First Page (%)

<Figure 2> The Web site visited to ask questions (%)



Source: comScore World Metrix (Feb. 2007)

The present research analyzes NHN's victory over Google from the perspective of network and content. It also attempts to explain what factors enable a small player to survive despite the strong advantage of a global search engine that has the benefits of network and network economy, based on technological innovation and a large base of customers.

2. Analysis of NHN

Previous studies (Bradlow & Schmittlein, 2000; Evans & Schmalensee, 2001; Sheu & Carley, 2001; Economides, 2004; Gideon, 2004; Vaughan & Thelwall, 2004; Evans, 2008) focusing on the growth of the Web or search engines have focused on the features of the network itself or the network economy, such as the coverage of the network, network externalities, and

monopolistic market structure. Based on the technological and economic literature on how a certain search engine has become a global knowledge network, the present research instead seeks to throw light on other aspects, such as the content issue, to explain how a local network has survived against the global network. Content and network perspectives are useful to analyze the development of a knowledge network which is composed of network as a structure and knowledge as content on the Web.

i) Network Perspective

From the perspective of a network, the first-mover advantage enabled NHN to take the lead in Korea instead of Google, unlike in most countries. The first-mover advantage refers to the phenomenon that "the potential demand for a second mover's product lies far below that of the first-mover" once a first-mover has obtained a critical mass of customers with positive network externalities (Mueller, 1997). NHN entered the search engine market in June 1999, while Google Korea launched in 2001. Korean Web users had already got accustomed to using the NHN and enjoyed the network externalities created by a greater number of NHN searchers. Launching its 'Unified Search' service the first in the world in August, 2000 (Park & Lee, 2008), NHN became distinguished in the Korean search engine market and positioned itself as the third most visited Web site in 2001, jumping from eighth place in 2000 (see Table 4). Stepping one rank upward in 2003 driven by the 'Knowledge iN' service, NHN overtook Yahoo, the then leader. Its gains in 2002 seem to have led NHN to the tipping point, which resulted in its place as champion in terms of search traffic since then and as the most popular Website in Korea since 2005 (see Figure 3). A study (Sheu & Carley, 2001) supported the first-mover advantage that

"the earlier the setup date of a search engine, the higher the audience reach" through simple regression between audience reach and years of setup of the top 19 search engines in the U.S. Without Google's critical innovations in technology, service, or promotion in the Korean search engine market, seniority was an important factor for the success of NHN.

<Table 4> The Trend of the Top Five Most Visited Websites in Korea

in terms of the number of visitors

	June 2000	June 2001	June 2002	June 2003	June 2004	June 2005
1	Yahoo	Daum	Daum	Daum	Daum	Naver
2	Lycos	Yahoo	Yahoo	Naver	Naver	Daum
3	Daum	Naver	Naver	Yahoo	Yahoo	Nate
4	Netian	Lycos	Dreamwiz	Nate	Nate	Yahoo
5	Interpia 98	Netian	Hanmir	Dreamwiz	Bugs	Auction

Source: Metrix Corporation, Internet Index (2000. 6. -2005. 6.)

<Figure 3> Search Traffic Market Share in Korea

Second, the low visibility of Korean websites played a critical role in the formation of a local search engine. Vaughan and Thelwall (2004) examined the language factor and site visibility in order to find the technical causes of the search engine coverage bias through comparing the English sites (US and Singapore) against the Chinese sites (China and Taiwan). They found that not the language itself but the visibility of websites affected the coverage of the top three search engines worldwide. Since the U.S. websites were established earlier than those based in other countries and sites tend to connect more with sites of their own country than those outside, the U.S. sites had higher coverage by search engines than did other countries' sites (Vaughan and Thelwall, 2004). The national differences in coverage will grow because the Web increases exponentially and this is why national search engines which cover more of their own chosen region are needed and used (Vaughan and Thelwall, 2004). Korea, having little digitized content, had not much information to search online in mid-1990s (KDPC Knowledge Standard Team, 2006) when the search engine market was germinating (Choi et al., 2007). According to the Korea Internet and Security Agency, there were only 159,252 Korean domains[9] in October, 1999 and the number of sites containing useful information was even smaller. Little online content led to the low visibility of Korean Web sites and made Google's superior search technology in finding relevant Web sites based on the number of citations not as useful as in other countries. What was needed in Korean search engine competition in the early 2000s was not the innovative search technology but the online content to search, and it was NHN which targeted the creation of its own online knowledge database.

[9] According to NetNames (1999; citing in Korea Internet & Security Agency, 2000), the number of domains registered all around the world was 11,187,830 in October 1999. Considering that the number of Korean domains was 159,252 at the same period, the share of Korean domains accounts for only 1.4 percent.

Third, NHN's refusal to interconnect its knowledge database with Google contributed to the maintenance of its dominant position in Korea. For the purpose of creating Korean online content, NHN introduced a knowledge-sharing service, 'Knowledge iN[10]' (KDPC Knowledge Standard Team, 2006), and provided search results from the knowledge database which was accumulated from the questions and answers of its searchers. NHN has continued to decline to open its knowledge database to other domestic or foreign search engines including Google[11]. While Google concentrated on finding 'Web pages' based on an open-access and open-source philosophy, NHN focused on providing 'information' and 'knowledge' via establishing an online knowledge database and headed for a closed policy (Kang & Ryu, 2009). NHN's closed strategy was found to be useful in protecting itself against the attack from the global search engine. Kim and Tse (2009) studied a differential game model based on the competition between a high-technology search engine without a knowledge search service[12], such as Google, and a low-technology search engine with a knowledge search service, such as NHN. This research found that "an inferior search engine can always increase its market share by closing the database of answers" (Kim & Tse, 2009). Especially, when online content is limited, the impact of the closed database was far more significant than when content is copious. The simulation demonstrated that the closure of the database increased the market share of the inferior search engine by 10 to

[10] While "Yahoo! Answers" service ─ launched in 2006, four years later than "Knowledge iN" service ─ aims at matching questioners with answerers, "Knowledge iN" service focuses on giving answer through searching knowledge database (Choi et al., 2007).

[11] Failing to interconnect with NHN's knowledge database, Google Korea made an OpenSocial contract with four Korean Web portals within the top five, excluding NHN, in May 2009 (Kim, 2009a). However, the gathering of the four portals with Google, so-called anti-NHN group, might not be influential enough to sway NHN's overwhelming dominance in Korea (Kim, 2009b).

[12] Knowledge search service is defined as a service which provides search results based on users' questions and answers.

15 percent in the case of limited online content, but only one to two percent in the case of abundant online content (Kim & Tse, 2009). This result implies that NHN's closure of its online knowledge database against Google contributed to keeping its leading position in Korea where online content was limited. Moreover, NHN's knowledge database has the characteristic of self-referential closure, doing self-production and reproduction through the autonomous participation of users. Therefore, NHN does not feel any need to open up its database (Kang & Ryu, 2009). Its closed policy, which seems like a natural choice, is found to be an effective strategy to confront the attack of a global search engine.

ii) Content Perspective

NHN aimed at providing 'knowledge' and 'information' rather than 'web pages' per se. This strategy originated from the scarcity of online content which resulted in the limitation of offering relevant information through searching web pages. It also stemmed from the philosophy that what searchers want is not the web page but the information. Based on this thought, NHN concentrated on 'creating' the knowledge database, providing 'highly demanded knowledge,' and 'presenting' that knowledge in an organized way, instead of developing search technologies.

For the creation, accumulation, distribution, usage and evaluation of knowledge on the Web, the 'Knowledge iN' service was implemented. The knowledge created through the 'Knowledge iN' service is mostly practical knowledge and advice related to our daily life, based on the knowledge and experiences of the majority of people, and it is relatively changeable, fluid, and subjective (Kim, 2006). The online knowledge database includes all of the types of knowledge ― conscious, objectified, automatic, and collective ― that Spender defined. Knowledge providers have diverse backgrounds, not restricted to people around us, but extended

to people such as experts and professionals (Kim, 2006). Knowledge creation is encouraged by mileage service. Mileage service allows users to use mileage in consuming charged online content, gives reputations to the users who have high levels of mileage as a knowledge sponsor or directory editor in the 'Knowledge iN' service. Through accumulating the questions and answers disclosed, knowledge is distributed and sometimes promoted on the main Web page of NHN. When the knowledge turns out to be useful to many people, it is managed separately by an 'Open Encyclopedia' service like 'Wikipedia.' After the process of questioning and answering is over, knowledge is evaluated and reproduced by users through conducting polls, giving opinions, adding comments, or raising objections (see Table 5). NHN participates in the process through getting rid of unanswered questions, harmful information, or answers for commercial promotion.

<Table 5> Knowledge Management Process of "Knowledge iN" service

Knowledge Management Process	"Knowledge iN" service
Knowledge Creation	Upload questions and answers Endow mileage for knowledge activity to users
Knowledge Accumulation	Choose category of questions by questioners Select relevant answers Accumulate selected answers into the knowledge database
Knowledge Distribution / Sharing	Open / disclose knowledge Develop promotion for new knowledge
Knowledge Usage	Classify knowledge which turns out to be useful to many people (for example, the service of NHN's "Open Encyclopedia")
Knowledge Evaluation	Evaluate knowledge through participating in poll, giving opinion, adding comments, or raising objection Endow mileage based on knowledge evaluation to users

Source: Lee & Kang (2003)

Most Korean Web users, around 97 percent (Kim, 2006), have had the experience of using a knowledge search service which has been adopted by several Korean Web portals after NHN's 'Knowledge iN' service. According to Rankey.com (2006), 79.9 percent of those who used a knowledge search service visited the "Knowledge iN" service in June 2006. The 'Knowledge iN' service accounted for 66.6 percent of unique visitors who went to the NHN site in 2005 (Choi, 2005; citing in Kwon et al., 2007); 49.5 percent of respondents have experience in answering other's questions (Choi et al., 2006); 69.0 percent answered that they have found correct information through the knowledge search service; and 65.3 percent thought that knowledge obtained by the service is reliable because it is based on the opinions of a majority ─ including experts and professionals ─ which are regarded as more useful than theoretical knowledge (Choi et al., 2006). After using a knowledge search service, about 50 percent of users replied that they consult family, friends and professionals less than before and also depend less on information from television or newspapers. Considering the statistics above, the degree of trust in a knowledge search service, represented by the 'Knowledge iN' service, is found to be high. This service offers additional benefits to users by updating the frequently searched keywords in real-time and showing information related to those search queries. Through providing highly demanded knowledge during a certain period of time, NHN satisfied the need of a majority of users. Moreover, popularly searched terms were about education, society, culture and entertainment (Kim, 2006) which are based on localized context. As a local network, NHN had a comparative advantage against Google in offering local information which is highly desired. Though the 'Knowledge iN' service has been criticized for becoming tarnished by gossips, commercials, and useless disputes (KDPC Knowledge Standard Team, 2006), it has a more positive function in that it creates, shares, distributes and reproduces knowledge which was

once individual and tacit and provides relevant information which is in high demand at any given time.

The 'Unified Search' service, as well as the 'Knowledge iN' service, distinguished NHN from Google. The 'Unified Search' service provides relevant collections of information, i.e. types of knowledge sources, on the first page of search results. It appeals to users because of its intuitive categorization of knowledge which fits with the typical knowledge sources that people usually refer to. Moreover, since this service suggests search results by knowledge source on the first page, it enhances users' convenience and search efficiency (Lee et al., 2008). NHN has 24 collections, types of knowledge sources, such as image, photo, dictionary, local information, video, book, web page, shopping, expert knowledge, online community, news, and so on (Park & Lee, 2008). These collections are presented in the different order by 'Collection Ranking' which is based on the most searched type of knowledge sources by keyword (Choi et al., 2007). The order of the content within the collection is designated by 'Multi-ranking' which has different rules of ordering by each collection (NHN). For example, 'freshness' decides the order of the news collection, while 'confidence' as well as 'freshness' and 'relevance' is considered in the ranking of 'Knowledge iN' collection. In this way, NHN presents the most relevant collection on top of the Web page and the most relevant information on top of each collection. Eye tracking experiment clearly shows the difference between Google which just listed search results from the most relevant to the least relevant and NHN which classified information into several sections (see Figure 4). Considering that the red color indicates the time of attention paid to a certain spot, NHN has more evenly distributed red spots than Google. This is because NHN users find relevant information in each type of knowledge sources while Google users search information only at the top of the Web page (Lee et al., 2007).

<Figure 4> Eye Tracking Experiment: Google (left) and NHN (right) compared

Source: http://www.enquiroresearch.com/eyetracking-report.aspx (Google, 2006)

http://story.nhncorp.com/story.nhn?story_id=12 (NHN, 2007)

The ‘Unified Search’ service, which was introduced to overcome the scarcity of online content through providing information in an organized and well-presented format, was found to have more merits than intended. Since it provides various types of information sources on the first page of the search results, it sometimes suggests relevant results that the searcher missed (Lee et al., 2008). Moreover, if a certain type of information sought has a low ‘Page Rank,’ Google fails to show that on the first page, while NHN provides a higher possibility to discover it on the front page (Kang & Ryu, 2009). For example, when a user searches for the music of ‘Wonder Girls,’ one of the most popular Korean dance groups, NHN shows the collection of music on the first page, along with other collections such as information on person, video clips, news, blogs, ‘Knowledge iN,’ open encyclopedia, Web sites, community, image, professional information, books, and Web pages. However, Google presents the music of ‘Wonder Girls’ on

the 23rd page[13]. Since it is not always true that the most cited Web page contains the most relevant information, the 'Unified Search' service, which suggests diverse aspects of related information, explains the superiority of NHN to Google in part. Adding to this, the 'Unified Search' service prevents searchers from 'multi-homing[14].' Most users search only the first page of the search results (Park & Lee, 2008) and searchers move to other Web sites if they fail to find the right information, rather than searching for it again on the same site (Lee et al., 2008). Considering the users' volatile searching behavior, the 'Unified Search' service[15] is more than a refined way to present knowledge. It is an effective strategy to satisfy and hold searchers.

V. Conclusion

Regarding a search engine as a knowledge network, the present research questioned how a local search engine exists and prevails at some places in the presence of a global search engine. It is natural in the network industry that a larger network takes all because of the characteristics of the network itself and the network economy. The larger the knowledge network, the easier it is to link Web pages and update online content, which, in turn, makes the gap between the winner

[13] Information about 'Wonder Girls' is searched by the author at the Web sites of Google and NHN on August 10th, 2009.

[14] 'Multi-homing' means that users visit multiple search engines (Kim & Tse, 2009).

[15] Google Korea announced in March 2009 that it is opening "Universal Search" service ─ similar to NHN's "Unified Search" service ─ which categorizes news, blog, and other search results by section instead of listing Web pages (Lim, 2009).

and others greater, considering the exponential growth in the number of Web pages. Moreover, economies of scale and network externalities allow the richer to get richer in the network economy. As a result, the worldwide dominance of Google is in line with network literature. However, this fails to explain the prevalence of local networks in some countries. Facing the chasm between the network theory and the reality, this study attempts to explain the formation of a local network in the presence of the global online knowledge network through the case study of South Korea.

In Korea, a local search engine, NHN, takes the overwhelming lead against Google whose share of search queries is less than three percent. The unexpected victory of NHN over Google, which has a far larger size of network in terms of the number of indexed Web pages and searchers, can be explained in the context of network and content.

From the viewpoint of network, NHN had the first-mover advantage against Google in Korea. When Google entered the market, NHN had already reached the critical mass, which made it hard for Google to overtake it. Moreover, Google's superior search technology was not useful in Korea because of the scarcity of online content and therefore, the relatively low visibility of Korean Web sites. In order to function as a search engine in Korea, not developing search technology but creating online content was what was needed. As a result, NHN concentrated on establishing its own online knowledge database and this strategy turned out to be effective in Korea. Moreover, through closing its knowledge database, NHN maintained its dominant position against Google, in spite of the latter's superior search technology.

From the content perspective, NHN's strategy of creating and presenting knowledge and providing knowledge in high demand at a certain point in time enabled it to be the winner. The

‘Knowledge iN’ and ‘Unified Search’ services, which were first intended to overcome the scarcity of Korean online content, turned out to be the strong points of NHN and the weakness of Google. The ‘Knowledge iN’ service helped to discover individual and tacit knowledge as well as objectified knowledge and satisfied local users’ needs by giving relevant information about issues in high demand. As a result, this service contributed to the creation, distribution, accumulation, and reproduction of knowledge on the Web. The ‘Unified Search’ service, with its categorized presentation of knowledge by knowledge source, attracted users because of its correspondence to the knowledge source that we traditionally and intuitively refer to. In addition, by presenting diverse types of knowledge sources on the first page of search results, it enhanced both user’s convenience and search efficiency.

Not only the network factor but also the content factor contributed to the survival of NHN despite the strong advantage of Google whose market dominance was propelled by the richer-get-richer phenomenon of network. While Google focused on finding the most relevant Web pages already existing on the Web, NHN concentrated on creating a knowledge database and on providing information in a well-organized and well-presented way. In this sense, NHN appears to be more devoted to function as a knowledge network than Google. Though NHN’s knowledge creation and presentation strategy was an inevitable choice to cope with the scarcity of online content, it turns out to have been the main factor in its success in surpassing a global knowledge network which mainly depended on the development of search technology.

The present research has limitations to generalize its findings through studying a single case, but it provides some implications to explain what makes certain countries exceptional from the worldwide dominance of Google. Who was the first mover in that particular knowledge network industry and what was the circumstance of the search engine market from the beginning

are to be considered in explaining the success of local networks. The initial circumstance of Korean search engine market ─ lack of online content and invisibility of Web pages to a global network ─ developed the function of the network in a different way from other countries which focused on finding relevant Web pages that already exist. In addition to these, how well the knowledge network serves the demand of locality in terms of content and time allows the survival of local networks. Local knowledge networks have relative advantage in providing information that people want to know in a local context at a certain period of time. Moreover, offering differentiated services from the global network, such as the 'Knowledge iN' and the 'Unified Search' services, widen the probability of success of the local networks. Overall, the perspective of content as well as that of network contributes to explaining the formation of local networks in the global knowledge network.

6,028 Words in total August 31st, 2009

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Appendix

1. The main Web page of NHN (http://www.naver.com)

2. The “Knowledge iN” service of NHN

3. The “Unified Search” service of NHN

(to be continued in the next page)


수도세 :: 네이버 통합검색 - Windows Internet Explorer
http://search.naver.com/search.naver?where=nexearch&query=%BC%F6%B5%B5%BC%BC&sm=top_hty&fbm=1
Bing
파일(F) 편집(E) 보기(V) 즐겨찾기(A) 도구(T) 도움말(H)
즐겨찾기 추천 사이트 무료 Hotmail 연결 사용자 정의 다른 추가 기능 가져...
수도세 :: 네이버 통합검색
페이지(P) 안전(S) 도구(O)
http://dgsong84.egloos.com/4920193 블로그명 : 디지의 아스트랄 라이프
블로그 더보기
카페 Community
역삼동 원룸(500/45)-관리비 없음, 수도세 없음 2009.07.30
갑니다. 장점과 단점 알려드릴게요 1. 장점- 원룸 치고 방이 직사각형이라 넓다(넓어 보이기도 하다^^)- 관리비, 수도세 없음- 집주인이 좋다(주인이 5층에 살고 계심-건물청소를 직접 하셔서 관리비가 없음)- 교통이 좋다...
http://cafe.naver.com/kig/650771 카페명 : ◆피터팬의 좋은방구하기◆원룸/투룸/룸메이트/부동산직거래/방
(계약완료)역삼1동조건좋은옥탑(전기세x수도세x 관리비x) 2009.07.18
원룸옥탑2. 매물크기 : 약 6~7평3. 거래금액 : 500/46 (이외 수도세 가스비 전기세 모두 무료)4. 난방방식 :... 월세안에 모든게 다 포함된가격이고요 가스비, 전기세, 수도세등등..지로로납부하는건 전혀없습니다....
http://cafe.naver.com/kig/636363 카페명 : ◆피터팬의 좋은방구하기◆원룸/투룸/룸메이트/부동산직거래/방
중랑구 묵동 먹골역1번출구 도보 2분,최고의 역세권, 500-60 (월세에 모든 관리비,공과금 전기세 수도세,다포함된...
2009.07.19
13평3. 거래금액 : 500-60(월세에 모든 공과금, 전기세 수도세,냉.난방비.관리비 다 포함)4. 난방방식 :... 사진정보 먹골역 최고의 역세권, 월세에 모든 관리비 포함(수도세,전기세.냉난방비.관리비)다 포함된거라 정말 집도...
http://cafe.naver.com/kig/636551 카페명 : ◆피터팬의 좋은방구하기◆원룸/투룸/룸메이트/부동산직거래/방
카페 더보기
이미지 Image
실내 간이 화장실
포토앨범
수도세 6만원이 ...
카페
동작구, 전기 수...
포토뉴스
수도세
블로그
미안마식 돈세기
블로그
이미지 더보기
동영상 Video
물은 어디서? 수도세 걱정 없겠네~!! 2007.11.19
물은 어디로? 수도세 걱정 없겠네~!! (설악산 입구에 한 식당에 달려있는 물건입니다. 눈치 빠르신 분은 원리를 알 수 있으실 듯. ^^)
출처: 판도라TV | 50초 | 관련동영상 보기
50 현대증권 HTS 수수료 질문 드립니다.
40 프라임상호저축은행의 국민은행 연계계좌에서 ...
검색결과 만족도 설문 참여
인터넷
100%