



Big data analysis of local government 3.0: Focusing on Gyeongsangbuk-do in Korea



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ABSTRACT

In the era of Government 3.0, local governments focus on establishing, maintaining, and strengthening relationships with citizens to fulfill “service government”; they thus engage in administration customization. This research aims to provide a structural understanding of local Government 3.0 through network and semantic analyses of Big Data gathered from the homepage of Gyeongsangbuk-do, North Gyeongsang Province in Korea, and Naver and Daum, major Korean portals. Results show that information and opinions about future policies, issues, and plans, and about the vision of provincial government, are dominant on the portals, while the Gyeongsangbuk-do homepage mainly plays a role for communicating public grievances and requests. The portal sites are more suitable places for giving information about and discussing technologies and urban policies than the homepage is. This study contributes to the analysis of Government 3.0 on a local level. In addition, it can be used as a reference and comparison by other countries or local governments and scholars interested in the issue.

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1. Introduction

The impact of new technology on information access, government service delivery, and public attitudes about government has long been debated by observers, researchers, and policymakers. Each technological innovation has sparked speculation in regards to its longer-term social and political impact (Carter & Belanger, 2005; Dombrowki et al., 2014; King & Cotterill, 2007; West, 2004). However, the Internet has brought more than a technological breakthrough. It has stimulated a transformation in the philosophy and organization of government.

The arrival of the Internet and the World Wide Web marked a watershed in information technology use by shifting the focus of governance to its external relationship with citizens (Seneviratne, 1999). Technology has certainly played an important role in fostering this change. From the newsgroup and commercial email technology that appeared in the mid-1980s, to the development of the World Wide Web and Web browser technology in the early 1990s, to the expansion of portal and online services in the 2000s, the Internet has gradually matured into a cost-effective and user-friendly platform for citizens and officials to communicate directly with each other and for the delivery of information to the public.

Information and communications technology (ICT) enhances interaction by overcoming geographical distance, promoting ideological variety, opening citizens to more diverse viewpoints, and encouraging

deliberation (Codagnone & Wimmer, 2007; Sneed & Wright, 2014). The interactive nature and ability to speed communications have the potential to make governance function better than it currently does. Technological innovation is leading to the proliferation of “e-government” and thus the delivery of government information and services online through the Internet or other digital means.

In the 2010s, revolutionary changes led to the creation of the Korean government's Government 3.0 initiative, a nonhierarchical, nonlinear, and multi-channel ecology that can be accessed at any time and place according to citizens' needs, uses, and satisfaction at the individual level. The term “Government 3.0” has gained much attention from the public since the 2012 presidential election in the nation (Nam, 2013). Geun-hye Park, the Korean president, announced Government 3.0 as a new paradigm for the government's tasks in her inaugural ceremony in 2013 and decided to invest \$45 million in the Big Data for Government 3.0 project over the next 5 years (Park, 2013).

Driven by ICT and data evolution, the Government 3.0 initiative transforms existing administration from typical bureaucracy-based mechanisms to task-centered and program-centered mechanisms for collaborative administration. The recent orientation of local government portals in Korea provides evidence that the paradigm shift is taking place as well. Local governments are using information and user-oriented portal designs, which in each case requires a dismantling of departmental thinking and a reorganization of information according to citizens' perspectives and interests.

The Government 3.0 drive may offer far more than the promise of the technological potentials of Web 3.0, of which the main features

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are personalization and a Semantic Web, providing customized and intelligent services according to the demands, characteristics, and preferences of individuals by storing and analyzing the records of individual lifestyles via information devices and sensors connected onto networks (NIA, 2008). While Government 3.0 citizens have convenient and efficient access to required information and services, they also enjoy flexible management, interdepartmental services, formal and informal feedback through multiple channels, virtual but direct interaction, and user customization and personalization.

Government 3.0 environment may enhance local democracy through greater and more direct citizen input into policy making, an expansion in the scope of policy deliberation, and reduction in the intermediate barriers to information dissemination, thus giving citizens new access to the levers of power in government. Local government is actively promoting the openness of public data and has expanded the use of social media. As more information reaches citizens, the greater their potential to influence and make informed choices about how government touches their lives (O'Neill, 2001). In addition, technology-driven local Government 3.0 increases transparency, which will bring governments and citizens closer, reduce corruption or power abuse, and lead information to be correctly interpreted and processed. Thus, the local government and citizen-generated content and communication found on city portals give new meaning to “government of the people, by the people, and for the people” in the era of Government 3.0.

Although the benefits of local government portals are numerous, there are significant challenges associated with developing and implementing them in many countries. A high percentage of e-government portal efforts has been failing at an alarming rate (United Nations, 2011; Venkatesh et al., 2014). As Belanger & Carter (2012) argued, while research on e-governments and their online platforms, such as homepages and portals, began in or around 2000, it is only recently that researchers have increasingly begun to examine them in their own right, apart from other commonly researched technologies. A majority of research describes specific governmental initiatives, the status of the portals, or the rate of success or failure of such initiatives (Saxena, 2005).

There is not much research, however, that specifically focuses on Asian countries and provides a richer understanding of what drives e-government portal adoption and the extent of use of such portals (Venkatesh et al., 2014; Vicente & Novo, 2014). Moreover, the role of Internet-related resources in Asia and the online discourse of local public administrations remain little explored, while local governments still rely significantly on the direction and support of higher authority such as President and Prime Minister (Valero, 2015).

Future governments are expected to advance toward Government 3.0, preferring Semantic Web-based government in which the services are personal, intelligent, and appropriate to the conditions and preferences of each individual (NIA, 2013). Government 3.0 is also intended to make information sharing more equitable and transparent among the central government, local governments, government agencies, and the public (Nam, 2013) through various channels, data evolution, and ubiquitous services provided and processed online. On the basis of these arguments, through semantic analyses of Big Data and online interviews, this exploratory research aims to provide a structural understanding of local Government 3.0 in Korea where Government 3.0 is employed as a symbol of the superior national policy overarch and directs many public programs and initiatives.

2. Literature review

2.1. E-government

E-government is a generic term for Web-based services from agencies of local, state, and federal governments. E-government uses information communication technology and particularly the Internet (Gartner Group, 2000; Liikanen, 2003; United Nations Department of

Economic and Social Affairs, 2004; World Bank, 2011), to support government operations, engage citizens, and provide government services.

ICT is improving the efficiency of government and increasing information and service ease of use for citizens. The development of the Internet and Web technology makes it possible to combine the administration process with electronic elements to improve the work of public officials and the methods of dealing with civil affairs, as well as helping citizens to extend their means to access government with ease.

Government innovation driven by ICT is leading to an interest in the characteristics of e-government from various fields. The United Nations Department of Economic and Social Affairs (2004) defines e-government as the “use of ICT and its application by the government for the provision of information and basic public services to the people.” More broadly, e-government can be referred to as the use and application of information technologies in public administration to streamline and integrate workflows and processes. It effectively manages data and information, enhances public service delivery, and expands communication channels for the engagement and empowerment of people (United Nations Department of Economic and Social Affairs, 2014). According to the World Bank (2011), government agencies driven by information technology have the ability to transform relations with citizens, businesses, and other arms of government. The resulting benefits can be reduced corruption, increased transparency, greater convenience, revenue growth, and cost reductions.

Liikanen (2003) identified e-government as the “use of information and communication technology in public administrations,” combined with organizational changes and new skills in order to improve public services or democratic processes and strengthen support for public policies. According to the Gartner Group (2000), in the private sector, e-government is the continuous optimization of service delivery, constituency participation, and governance by transforming internal and external relationships through technology, mostly the Internet and new media.

To sum up, e-government is a form of government services system that supports administrative tasks and induces citizen participation by using ICT. Improvement in government services can raise efficiency and transparency, while citizen participation can promote participatory democracy through mutual interaction. This interaction may be in the form of obtaining information, filing of returns, making of payments, or a host of other activities via the World Wide Web (Sharma, 2004; Sharma & Gupta, 2003).

This study assumes that e-government enhances trust in and satisfaction with the government administration by providing governmental innovations based on ICT. Government innovation using ICT not only enhances administrative efficiency and transparency but also induces citizen participation and collaboration through information sharing and interactions among citizens, enterprises, and the branches of the government.

2.2. From Government 2.0 to 3.0

E-government based on ICT raises administrative service satisfaction along with government innovation and the development of democracy. The development of ICT in Government 1.0 changed the task style of public officials, improving the type of government. Government 1.0 established the computerization of the internal administration serving government-centered services.

Government 2.0, based on Web 2.0 (Maio, 2009; Mintz, 2007), provides computerized administration in a citizen-centered two-way service system, using social media, key technologies even in times of crises (Kim et al., 2015). According to Shannon (2006), Web 2.0 refers to an Internet that is even more interactive, customized, social, and media-intensive—not to mention more profitable—than that of a decade ago. Web 2.0 refers to the interactive Web. It focuses on data sharing among users and the use of social networking services. Tim O'Reilly

(2005) noted that Web 2.0 is the Web as a platform, harnessing collective intelligence.

Government 2.0 is derived from the more general term Web 2.0, which represents a second generation of Web usage. This second-generation access differs greatly from the first in at least three ways: it is participatory, pervasive, and integrated (Mintz, 2007). According to Maio (2009), Government 2.0 uses Web 2.0 technologies, leads collaboration internally and externally, increases transparency, and potentially transforms the relationships between government agencies and citizens. Government 2.0 is the “hyped” form of the use of social media (in government and by its diverse stakeholders) that transforms how government interacts with citizens in a participatory, transparent, and collaborative way (Mergel, 2010). Practically, portal sites of government agencies are linked to social media such as Facebook, Twitter, YouTube, and blogs.

Government 2.0 combines Web 2.0 fundamentals with e-government and increases citizen participation by using open-source platforms, which allow for the development of innovative applications, websites, and widgets. The government’s role is to provide open data, Web services, and platforms as an infrastructure (Howard, 2012). Government 2.0 is about putting government in the hands of citizens (Harper, 2013). To sum up, government 2.0 realizes citizen-centered administration that enhances government efficiency and transparency through collaboration, encouraging citizen participation by using open-source platforms.

The transition from 2.0 to 3.0 begins when government agencies initiate steps toward government 3.0, taking on its complete form and driving its evolution. Just as Government 2.0 is founded on Web 2.0, Government 3.0 establishes Web 3.0. It is understandable that Government 3.0 should offer the new technological potentials of Web 3.0 to governments and societies (Nam, 2013). Web 3.0 is a phrase coined by Markoff (2006) of the *New York Times* in 2006. It refers to a third generation of Internet-based services.

Web 3.0 is the ability to make connections and infer meaning. Web 2.0 was all about interaction and collaboration, but Web 3.0 is the concept of enhancing the “intelligent Web,” which makes searches more effective because the platform understands and makes connections between pieces of data. Web 3.0 is more connected, open, and intelligent; it is going to become more intelligent. According to Williams (2012), Web 3.0 deals with a Web of data that often interfaces with itself, such as Web applications not necessarily designed for users at all but sometimes designed simply to feed data to other Web applications being used by people around the Internet. This could be done via the communication of common semantic meanings as data is being shared (Williams, 2012).

Web 3.0 is the Semantic Web, the next generation. The Semantic Web provides customized information by interpreting meaningful data on the Web. It is described as “a smart Web that thinks for itself.” It is a next-generation artificial-intelligence Web technology that enables computers to define, understand, and logically deduce the meaning of information to improve further the search for requested information (Nam, 2013).

Government 3.0 can refer to a Semantic Web-based government that personalizes all government services according to the conditions and preferences of each individual (NIA, 2013). Korea is pursuing this new model of government strongly. Korea emphasizes openness, sharing, communication, and collaboration in order to improve government service and to achieve economic success. In this country, Government 3.0 is also a new paradigm for government operations. It aims to provide customized services for individual citizens and support for job creation and a creative economy by opening and sharing public information (Korea IT Times, 2013). Government 3.0 takes a step further. The paradigm provides high-quality information and services customized to serve the unique needs of individuals on a wide array of topics, including employment opportunities, weather, traffic, education, welfare, and finance (Korea Government, 2013).

Government 3.0 seeks transparent, competent, and user-centered government. Government 3.0 leads to a transparent government keen

on communication with the public by allowing wider public access to government data (Korea IT Times, 2013). It also results in a more complete and efficient government by removing communication barriers among different government agencies and provides a user-oriented government by providing the public with services tailored to their needs.

Government 3.0 is a smart government platform sharing open data with citizens, government, and enterprises. It also leads to collaboration through active communication and the voluntary participation of citizens in government and builds trust by enhancing government transparency and efficiency. Government 3.0 is an advanced version of Government 2.0 achieved through Intelligent ICT.

To conclude, Government 3.0 is a new type of government that provides citizen individuals with customized government services irrespective of device, time, or place using the intelligent ICT of the Semantic Web, Big Data, SNS, and smart technology. Smart technology raises the standard of communication and cooperation among departments. In these circumstances, Big Data analysis enables government to examine current issues more extensively for better and precise prediction. Scientific administration, which enhances the efficiency of policymaking and management, is realized through Big Data analysis.

The current research assumes that Government 3.0 uses intelligent ICT to socialize and innovate government services and processes. Government 3.0 is a smart government platform that re-designs the style and processes of administrative work based on highly intelligent ICT; it seeks partner roles by serving the public platform that shares knowledge and information among government, enterprises, citizens, and the global community. Although the geographical area of local Government 3.0 is smaller, it is more closely connected with the practice of citizen-centered and life-friendly administration than Government 3.0 is. In other words, local Government 3.0 is actual implementation of Government 3.0 at the actual spot.

On the basis of the literature review, this research presents two research questions.

RQ1. What are the characteristics of issues that appeal to citizens concerning Gyeongsangbuk-do provincial government on its homepage and portals?

RQ2. What are the semantic structures of issues that appeal to citizens concerning Gyeongsangbuk-do provincial government on its homepage and portals?

3. Methods

3.1. Data

Research on Big Data is intended to identify trends, reveal issues, predict future behavioral patterns, and propose solutions (Rhee, 2012). Using Big Data analysis methods, this study collected data from the homepage of Gyeongsangbuk-do (North Gyeongsang Province) and atypical data concerning the Province from Naver and Daum, two Korean portals.

Basic data mining was conducted to analyze the semantic network from data that was extracted according to its relevance and accuracy. The semantic network analysis method is a collection of research techniques that treat a word as a node in a network and a semantic relationship (in terms of the concurrence) between words as a social relationship connecting those words (Chung & Park, 2010). For example, the keywords government and 3.0 produce “government 3.0” when used together in the same sentence. Both scholars and practitioners in the policy information domain can employ this technique to identify the main thematic frames in government documents (e.g., policy programs) because semantic networks of salient terms explicitly generate relevant issues and trends facing the government (Diesner & Carley, 2011). In total, 120,745 words from Gyeongsangbuk-do Province homepages and Korean portals were analyzed after data mining and

cleaning. More than 60% of the words (73,588) were from Korean portals.

Gyeongsangbuk-do is one of the local Government 3.0 initiators in Korea and is leading the Government 3.0 initiative after deciding to invest nearly \$500 million into the Government 3.0 project over 5 years from 2013 (Gyeongsangbuk-do Province, 2015). This research obtained recent available Gyeongsangbuk-do Province homepage data from 2011 to 2013. The inside data for archiving, categorized into *policy suggestion*, *civil affairs counseling*, *free bulletin board*, and *dialogue with the Governor*, were endorsed from the province directly for the current research.

Through Textom using the key words of *Gyeongsangbuk-do* and *Province*, this study also gathered Gyeongsangbuk-do Province data for news, documents, photos, and SNS postings for a 3-year period up to 2013 on two Korean portals, Naver and Daum, which held around 95% of the domestic market share in portals for several years, including 2015 (Nielsen, 2015).

Textom is a Big Data management solution developed for its Big Data-related information consulting and R&D cultivation (Jun & Seo, 2013; Kim & Jun, 2014). Textom is a consistent process that includes Web and social media data collection, text mining, and matrix data creation, which are the core technologies of Big Data utilization. To overcome the difficulties in collecting data from surveys, it collects text data automatically, refines them via morpheme analyzer, counts the frequency of words, and makes a matrix of the chosen words. The process has an advantage with respect to data mining because it collects large amounts of data from various channels, such as portal sites and social media, and analyzes networks through a computerized refining process.

The window size of Textom is the same as that for Naver and Daum's search results. In the current research, window size is used for the distance measuring of co-occurrence. Distant concepts can still be in a relationship with one another, but only concepts in same window can form statements (Carley et al., 2010). As window size is the span of making connections, the bigger the window size, the more co-occurrence words are obtained.

3.2. Semantic network analysis

Semantic network analysis is a collection of research techniques treating a word as a node in a network and a semantic relationship in terms of co-occurrence between words as a social relationship connecting those words (Jung et al., 2014; Jung & Park, 2015). This research analyzes semantic networks of the Province's homepages, websites, online texts, and social media postings. As a result, the research examines a current phenomenon with respect to local Government 3.0 of Gyeongsangbuk-do Province in Korea.

By focusing on the relational structures of the shared meaning in texts, semantic network analysis improves on traditional content analysis by analyzing network content (Jang, 2001). Semantic analysis represents a type of social network analysis because it uses responses to a set of answers to identify the structures of the concepts and symbols (Chung & Park, 2010).

A message is an independent social system acting as a symbolic or cognitive system (Leydesdorff, 2001). From a social network perspective, an important element of content analysis is the semantic association between prominent words because the prominent words of a message create specific meaning when incorporated into a specific form.

Based on network algorithms, KrKwic classifies large-scale texts through meaningful conceptual grouping to find prominent words in various forms of message (Biddix et al., 2015). Prominent words are operationally defined as words that appear frequently in the selected message. KrKwic analyzes the frequency of all words used in the message (Park & Leydesdorff, 2004). Word frequency can reveal the level of saliency of a linguistic symbol used in a given message. Frequency can be a useful primary datum. Past studies support the utility of KrKwic

(Biddix et al., 2015; Chung, 2014; Chung & Park, 2010; Hsu et al., 2013; Park & Leydesdorff, 2004).

This study estimates degree and eigenvector centrality through various methods. These classifications are determined by centrality estimation, depending on the focus of the relationships among the nodes (words or texts) of the semantic network (Son, 2002). A node is seen as occupying an important position if it falls on the geodesic path between other pairs of nodes in the semantic network. Degree centrality is most effective in identifying nodes that humans judge to be important using a graph representing summarized information about vocabularies used in the Semantic Web (Erkan & Radev, 2004; Zhang et al., 2011; Zhang et al., 2007). Eigenvector centrality indicates the extent to which a node is connected to others that are central. The higher the eigenvalue centrality, the more central the link of the keywords is and the more influential it is in agenda setting in the semantic network (Cha & Kweon, 2015; Hanneman & Riddle, 2005).

Convergence of iterated correlations (CONCOR) was used to analyze text in the structure of meaning through a word \times word co-occurrence matrix obtained from KrKwic. Subjects are grouped using the CONCOR matrix so that each cell shows the likelihood of a word occurring, which indicates the occurrence of another word (Chung & Park, 2010; Wasserman & Faust, 1994). CONCOR analysis was conducted to identify semantic clustering, discover hidden subgroups, and explore relationships among each group (Cho et al., 2011).

For network visualization, NetDraw packaged with UCINET was utilized. UCINET is a commonly used software program for network analysis (Borgatti et al., 2002). Ego network analysis of key words and the connections between them was then conducted using NodeXL, which can be downloaded from <http://nodexl.codeplex.com>.

3.3. Online interviews

To conduct an in-depth analysis of Big Data and its applications on Government 3.0, this study recruited ten public administrators who are currently working with Government 3.0 projects in Gyeongsangbuk-do Province. Survey questions addressed the definition, activity, implications, and applications of Government 3.0 for administrative purposes.

4. Results

Fig. 1 shows that the frequency of comments has continuously improved on the Gyeongsangbuk-do Province homepage, while the frequency of Gyeongsangbuk-do Province on Naver and Daum has increased sharply since 2011.

The frequency of civil complaints and events on the Gyeongsangbuk-do Province site appears to be high. Civil complaint words include Resident (frequency: 1552), Construction (830), Inquiry (570), Extreme Opposition (544), and Industrial Waste (539). Gyeongsangbuk-do Province event words include Guide (988), Event (642), Gyeongju City (634), Festival (631), and Concert (590). The frequency of provincial governance-related words also appears to be high; these include Gyeongsangbuk-do (2400), Resident (1552), Kim Kwan-yong

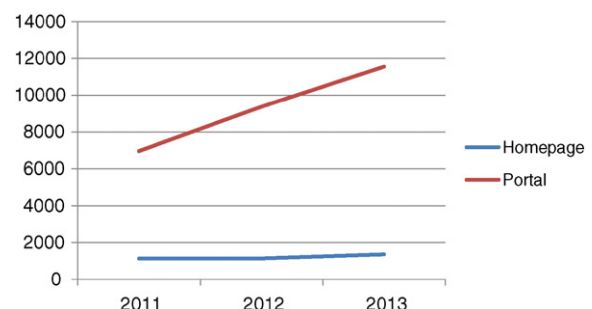


Fig. 1. Data frequency change on the Gyeongsangbuk-do Province homepage and portals.

Provincial Governor (617), Public Official (555), Administration (485), Gyeongsangbuk-do Province (474), Participation (434), and Answer (417) (see Table 1).

The frequency of provincial government relocation and infrastructure issues was high on Naver and Daum; these include Gyeongsangbuk-do Province, Relocation of Provincial Office, New City, Region, Construction, Build, Development, Science Business Belt, New Government Office Building, and New Airport. Innovation and diffusion-related words were also visible on these portals. They included such terms as Cluster, Convergence, Smart, Diffusion, Change, Robot, and Software (see Table 2).

Table 1 shows the centrality of terms relevant to Gyeongsangbuk-do Province on its homepage. The unpleasant facilities-related words, such as Industrial Waste (degree-eigenvector centrality/frequency ranking: 10–2/18), Waste (8–4/70), and Landfill (33–7/47), have high centrality compared to frequency. The words indicative of strong resident resistance, such as Opposition (6–1/48) and Extreme Opposition (11–3/17), rank top in eigenvector centrality. The frequency of

Table 1

The relative term frequency and centrality on the Gyeongsangbuk-do Province homepage.

Word	Frequency	Rank	Degree	Rank	Eigenvector	Rank
Gyeongsangbuk-do	2400	1	10.21	1	15.1	10
Civil complaint	2000	2	7.571	5	11.51	16
Resident	1552	3	8.773	3	23.58	9
Guide	988	4	3.184	55	4.822	52
Construction	850	5	3.749	44	6.496	36
Support	722	6	5.349	18	7.319	31
Culture	680	7	6.561	12	9.289	21
Region	680	8	7.534	7	11.8	13
Event	642	9	4.951	23	6.528	35
Gyeongju City	634	10	5.913	13	23.63	8
Festival	631	11	4.26	36	5.255	47
Kim Kwan-yong	617	12	5.792	14	11.68	15
Provincial Governor						
Concert	590	13	2.762	65	3.512	67
Complex	588	14	7.868	4	46.67	6
Inquiry	570	15	5.57	15	7.485	28
Public Official	555	16	3.304	52	5.512	44
Extreme Opposition	544	17	6.894	11	49.92	3
Industrial Waste	539	18	7.079	10	50.23	2
Administration	485	19	5.5	16	13.04	12
Dokdo Island	484	20	1.768	81	2.205	82
Gyeongsangbuk-do	474	21	4.749	25	8.296	23
Province						
Participation	434	22	5.296	19	6.439	38
Disabled Person	431	23	2.947	60	3.623	65
Answer	417	24	4.364	34	7.88	26
Sightseeing	398	25	4.63	27	7.1	32
University	363	26	4.237	37	5.701	42
Welfare	362	27	3.607	47	4.64	58
Business	362	28	7.127	9	11.73	14
Industry	344	29	9.331	2	49.02	5
Policy	305	30	4.494	31	7.365	30
Economy	276	31	4.457	32	6.837	34
Senior Citizen	272	32	2.067	79	2.798	79
Job	263	33	2.943	61	3.306	72
Child	260	34	3.538	49	10.49	18
Inconvenience	251	35	2.807	64	4.405	60
Damage	250	36	2.872	63	4.797	53
Host	248	37	3.68	45	4.797	54
Information	242	38	3.875	41	5.268	46
Enterprise	226	39	5.294	20	8.049	25
Government	216	40	4.982	22	7.074	33
Budget	197	41	4.292	35	6.135	40
Experience	192	42	3.825	42	4.886	51
Tradition	191	43	3.036	59	3.913	63
Education	188	44	5.005	21	6.462	37
Technology	186	45	3.676	46	4.774	55
Female	183	46	2.512	68	3.299	73
Landfill	181	47	4.447	33	28.66	7
Opposition	178	48	7.559	6	50.61	1
Progress	176	49	4.667	26	7.83	27
Invite	169	50	4.856	24	13.91	11

Table 2

The relative term frequency and centrality of Gyeongsangbuk-do Province on portals.

Word	Frequency	Rank	Degree	Rank	Eigenvector	Rank
Gyeongsangbuk-do	28,657	1	12.5	2	38.587	2
Province						
Gyeongsangbuk-do	20,310	2	15.086	1	48.333	1
Relocation of Provincial	7337	3	8.212	4	34.026	4
Office						
Resident	4494	4	4.232	21	15.268	20
New City	4293	5	7.208	7	33.335	5
Region	3169	6	7.079	8	24.87	10
Kim Kwan-yong	2939	7	3.772	26	12.233	28
Provincial Governor						
Culture	2563	8	5.286	16	15.211	21
Public Official	2550	9	3.647	28	11.344	31
Construction	2281	10	4.743	18	20.486	17
Business	2250	11	7.722	5	29.995	7
Civil Complaint	2165	12	4.101	23	16.402	18
University	2156	13	2.078	58	7.568	52
Dokdo Island	2073	14	2.517	53	5.612	62
Host	2058	15	4.732	19	14.295	23
Administration	1952	16	3.61	30	13.232	26
Volunteer Work	1942	17	2.419	54	6.413	57
Build	1611	18	6.22	11	26.979	8
Development	1491	19	7.53	6	30.139	6
Female	1466	20	1.686	68	5.601	63
Event	1455	21	3.071	42	9.184	45
Sightseeing	1217	22	2.87	45	11.011	34
Economy	1184	23	3.916	24	12.529	27
Visit	1168	24	3.347	36	11.183	32
Election	1159	25	1.327	72	4.533	69
Policy	1015	26	3.813	25	11.733	30
Information	989	27	3.103	40	10.313	40
Enterprise	969	28	3.419	34	10.489	36
Industry	878	29	6.874	9	24.23	11
Progress	877	30	4.508	20	16.028	19
Guide	836	31	2.643	48	10.256	41
Budget	819	32	2.683	47	10.346	39
City	816	33	8.275	3	35.685	3
Environment	808	34	3.41	35	9.964	42
Deployment	803	35	6.479	10	24.975	9
Invite	721	36	3.312	37	10.628	35
Technology	689	37	2.585	49	8.802	47
Science Business Belt	653	38	0.909	83	3.244	81
Global	638	39	2.941	43	6.032	61
Welfare	620	40	2.041	59	6.167	60
Cooperation	568	41	3.139	39	9.756	43
Job	563	42	3.201	38	7.636	51
Participation	541	43	2.365	55	7.681	50
Pledge	515	44	5.351	15	21.28	15
Government	515	45	3.539	31	11.864	29
Content	509	46	1.047	82	3.121	82
Honorary Ambassador	487	47	2.565	50	3.858	73
Investment	460	48	2.872	44	9.731	44
Education	457	49	3.459	33	10.368	38
Future	437	50	2.525	52	8.82	46

disadvantaged groups, such as Disabled Person, Senior Citizen, and Female, appears high, but both centralities are low, which means those group issues were not linked relatively to other issues including important ones unlike their frequent appearance on the homepage.

Table 2 displays the centrality of terms relevant to Gyeongsangbuk-do Province on portals. The high-tech-related words, such as Cutting Edge (degree-eigenvector centrality/frequency ranking: 13–13/59), Cluster (14–14/62), Convergence (12–12/76), and Software (17–16/82), have relatively high centrality compared to frequency of occurrence. Urban-regeneration-related words, such as Industry (9–11/29), City (3–3/33), Deployment (10–9/35), and Pledge (15–15/44), have relatively high centrality compared to that of occurrence. The frequency of local governance, such as Resident (21–20/4), Kim Kwan-yong Provincial Governor (26–28/7), Public Official (28–31/9), Election (72–69/25), and Administration (30–26/16), appears high, but both centralities are low.

Fig. 2 presents the semantic network results that are related to issues on the Gyeongsangbuk-do Province homepage. After hierarchical clustering based on a semantic matrix of similarities, the implications extracted from the semantic network analysis results concerning Gyeongsangbuk-do Province on its homepage are as follows:

- (1) Local government listening to public opinion
 - Public opinion on clear government, policy effectiveness, and city progress
 - Requests on business fostering and Science Business Belt
- (2) Providing solutions to residents' complaints, inconvenience, and damage
 - Direct questions to and answers from Provincial Governor or other public official
 - Provincial government data and information
- (3) Disposal of waste matter and industry
 - Opposing industrial waste and landfill
 - Extreme opposition from residents
- (4) Promoting tourism through various events
 - Participating in sightseeing program
 - Experiencing festival, concert
 - Hosting event
- (5) Openings, job creation, and growth
 - Creating jobs
 - Economic growth
 - Enterprise cooperation
- (6) Social stratum and related service
 - Smart technology and the young
 - Sharing opportunities and information with females
 - Welfare, guiding senior citizens and supporting disabled persons
- (7) Diffusion of history and cultural assets
 - Disseminating local history and cultural assets
- (8) Child happiness and education
 - Child education balancing happiness in school

Fig. 3 shows the semantic network results for the Gyeongsangbuk-do Province on the portals Naver and Daum. The implications that are extracted from the semantic network results of Gyeongsangbuk-do Province on portals are as follows:

- (1) City development is the first priority task of local government
 - Growth of Gyeongsangbuk-do through new city development
 - Administration for settling civil complaints, leading cooperation, and working for market revival
- (2) Governance and elections
 - Pressure on provincial governor and public officials
 - Job creation and business
- (3) Investment for the future through relocation of Provincial Office and PR
 - PR, construction, and re-building of local government
 - Volunteer worker and honorary ambassador of Dokdo Island, historic and cultural asset in Korea
- (4) Planning the center for convergence
 - Robots/software information/new airport/Science Business Belt
 - Pledge issues for local budget and economy
- (5) Leading open innovation
 - Local government embodied with cutting-edge technology and environment
- (6) Dreaming of change, improvement, and progress
 - Smart education
 - Customized welfare and effective service
 - Environmentally friendly enterprise and sharing economy
- (7) Promoting globalization
 - Diffusion of bio and clear city
 - Global activity of VANK, the Voluntary Agency Network of Korea
- (8) Concern for the future of younger generation
 - Real estate and environment issues.

Fig. 4 compares the ego networks of local Government 3.0 on the Gyeongsangbuk-do Province homepage and Korean portals using the

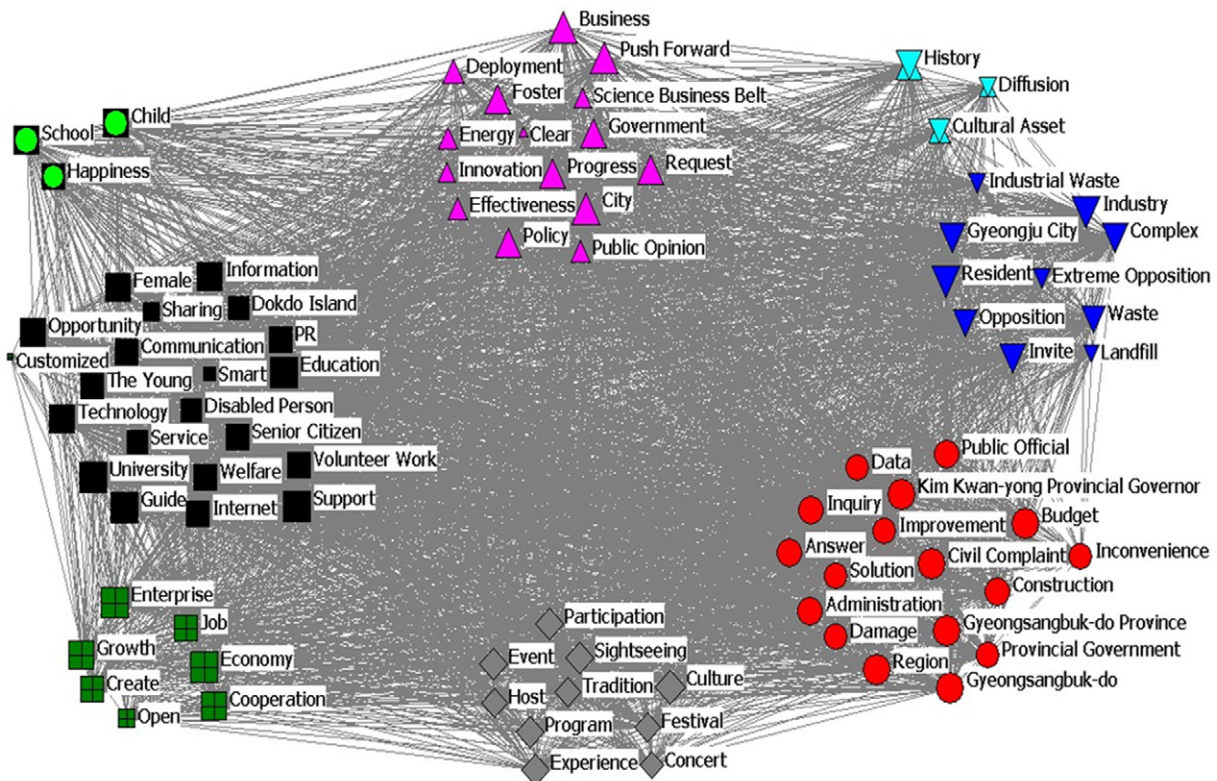


Fig. 2. The semantic network on the Gyeongsangbuk-do Province homepage.

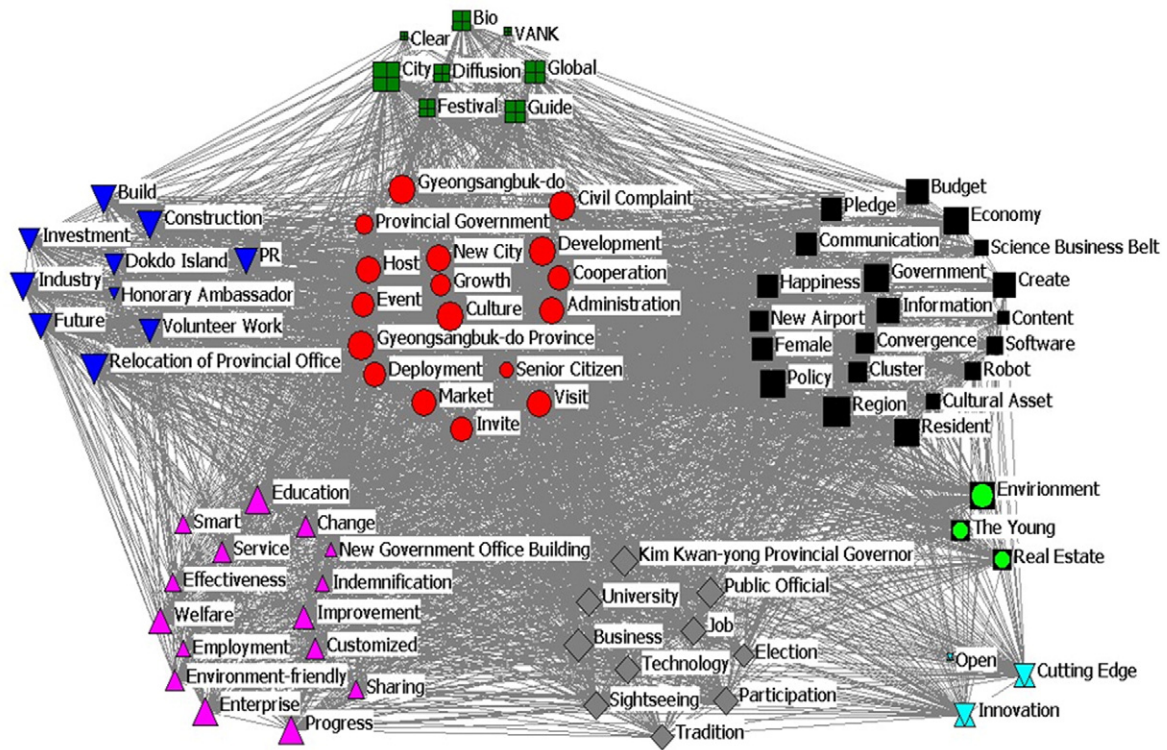


Fig. 3. The semantic network for Gyeongsangbuk-do Province on portals.

keywords, Gyeongsangbuk-do Province, Administration, Collaboration, and Innovation.

On the Gyeongsangbuk-do Province homepage, the ego network map of Gyeongsangbuk-do Province shows close links to local government-related words, including Gyeongsangbuk-do, Provincial Government, City, and Administration. There are also links to negative issues such as Inconvenience, Civil Complaints, and Damages. On the portals, Gyeongsangbuk-do Province is associated with traditional methods of governance through key words such as Built, Host, and Construct. On the homepage, the ego network map of Administration reveals links to NIMBY (Not In My Back Yard) issues, such as Landfill, Waste, Complex, and Civil Complaint. However, on the portals and the homepage, Administration is associated not only with local governance and civil complaints, but with new business and industry keywords, such as New City, Build, Market, and Service. On the homepage, the ego of Collaboration is linked to local governance by both residents with civil complaints and public officials, with customized answers and solutions at the level of Government 1.0 and 2.0. The collaboration issues job creation, sharing business, and provincial progress are the most frequently discussed. By contrast, local collaboration is apparent on the portals in fields such as education, industry, policy, industry, business, and culture. Innovation on the Gyeongsangbuk-do Province homepage is closely related to powerful initiatives at the level of local government policy and plans, while technology and new urban development are primary issues on the World Wide Web.

According to interviews with public administrators who currently work in Gyeongsangbuk-do Province, Government 3.0 is defined as a people-centered government innovation, offering citizens a customized service as a new paradigm of government operations. Government 3.0 is designed to serve the public. Its services construct a transparent and competent version of government by representing and complementing existing projects.

Big Data analysis is acknowledged to have both advantages and disadvantages. One of its advantages is the ability to grasp or infer the overall flow of people's unspoken thoughts. It also helps to detect the

opinions of uncategorized people, not identified with particular groups. At the same time, Big Data analysis has interpretive shortcomings; its complexity, inclusiveness, and ambiguity make results difficult to generalize due to a lack of statistical verification. The managers and developers of Government 3.0 in Gyeongsangbuk-do Province emphasize the need for research using visualization, which enables them to better interpret results, and to understand intuitively the results of Big Data analyses.

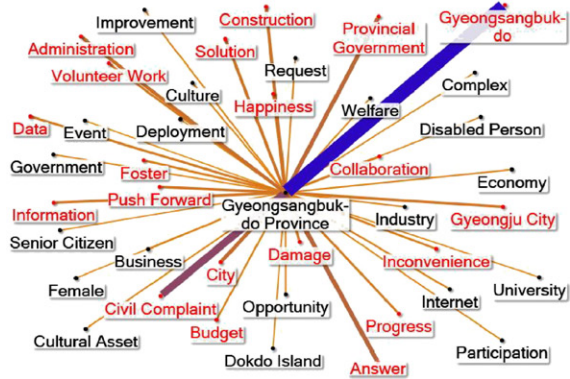
5. Discussion

This study aims to provide a structural understanding of local Government 3.0 through semantic network analyses of Big Data gathered from the homepage of Gyeongsangbuk-do Province and major Korean portals such as Naver and Daum, where the Korean government is actively promoting the implementation of Government 3.0. Gyeongsangbuk-do homepage data and Gyeongsangbuk-do Province-related data from the portals have been extracted to examine the smart government platform and Gyeongsangbuk-do-related issues and discourses through a series of semantic network analyses. Online interviews have been carried out to provide an auxiliary analysis of Big Data and its applications on Government 3.0.

An exploration of data from the period between 2011 and 2013 demonstrates that the quantity of data gradually increased on the Gyeongsangbuk-do Province homepage, while dramatically increasing on Naver and Daum. It seems that interest in the province grew rapidly on major Korean portals providing news, documents, online communities, and blog content, after a PR campaign that began in 2010 highlighted the name of the province.

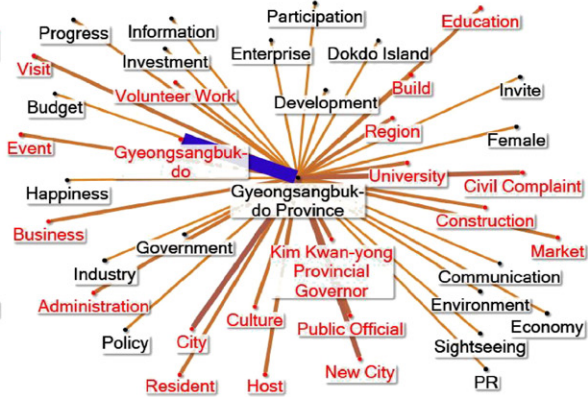
This study has identified issues and interests that are relevant to Gyeongsangbuk-do Province on the basis of word frequency and centrality analyses. Participation by and requests from citizens whose areas of interest relate to the local government's current administration and projects dominate on the homepage. At the same time, information and opinions about future government policies, issues, plans, and vision

Gyeongsangbuk-do homepage

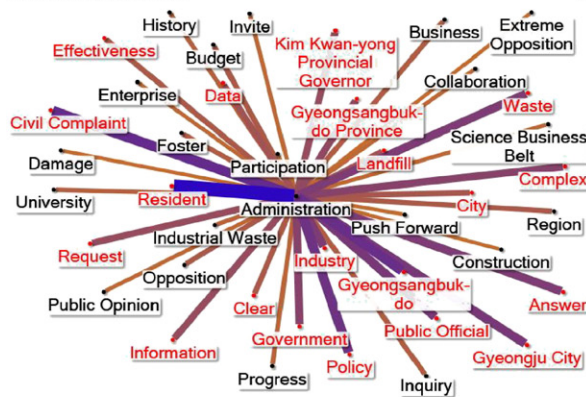


Created with NodeXL (<http://nodexl.codeplex.com>)

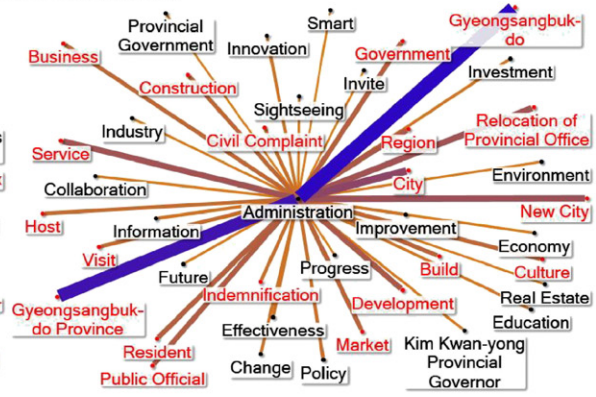
Naver and Daum



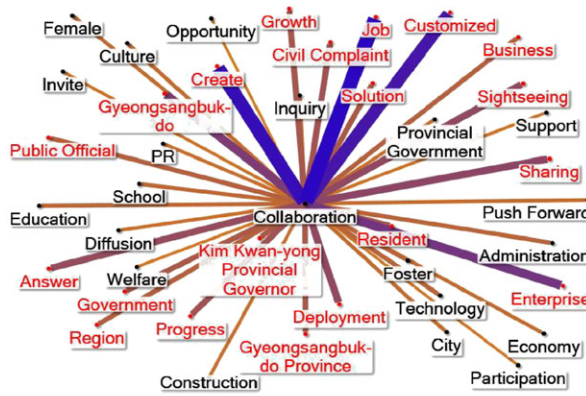
Created with NodeXL (<http://nodexl.codeplex.com>)



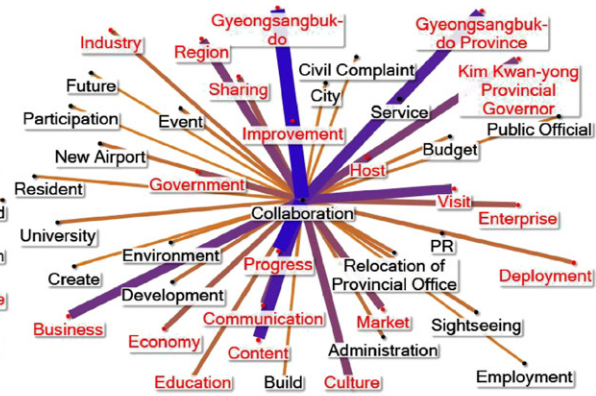
Created with NodeXL (<http://nodexl.codeplex.com>)



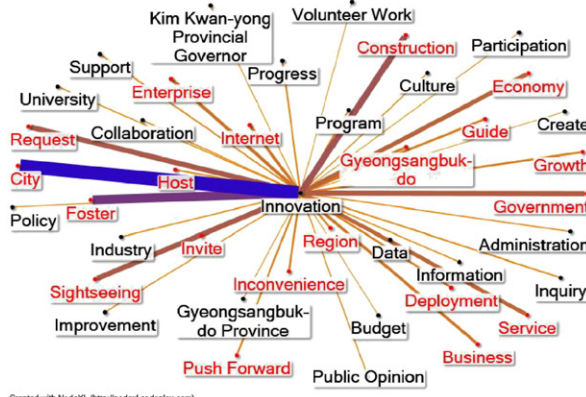
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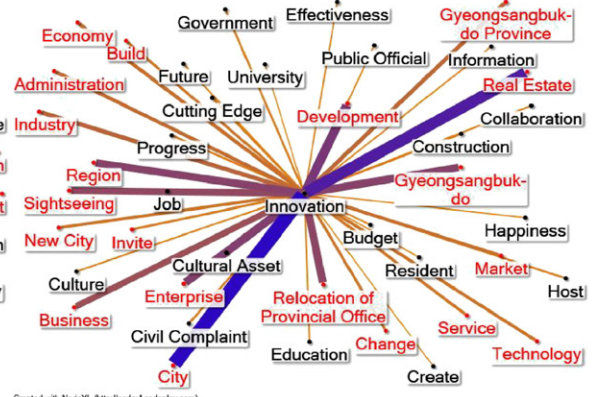
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Fig. 4. Ego network comparison of local Government 3.0 on the Gyeongsangbuk-do Province homepage and portals.

dominate the portals. This demonstrates that the Gyeongsangbuk-do homepage is mainly used to communicate public grievances and requests, which is consistent with its primary purpose. The portal sites

differ from the local government's homepage in part because they are more suitable places for providing information and discussing technologies or urban policies.

The CONCOR analysis results identified the main discourses appearing online. The Government 3.0 discourses on the Gyeongsangbuk-do homepage were related to local government projects, public grievances, and social welfare. While discourses on the provincial homepage dealt with current conditions and quality-of-life issues, those on the portals reflected public opinion and concerns about the future, citing the younger generation, sustainable development of the local economy, and the relocation of the Provincial Office. The provincial homepage appears to offer a space for civil complaints and petitions, while portals are dominated by issues in the public sphere.

On both the homepage and the portals, “Administration” refers to primary forms of Government 3.0 that offer a customized service to residents of Gyeongsangbuk-do. Interestingly, the ego network of “diffusion” on the homepage is closely related to subjects such as “young people” and “provincial governor.” On the portals, “Gyeongsangbuk-do Province” and “diffusion” also show a strong association, with subjects such as “government” and “public official,” but also with “education,” which can be considered a means of diffusion.

Most interviewees have considered Big Data analysis as a means to realize the service-customized government. While they used to have meetings, public hearings, direct communication, and surveys to understand the demand of citizens as Government 1.0 and 2.0 practices, they seem to agree Big Data analysis appears a new survey method helping notice the opinion of public majority who seldom have expressed themselves directly.

This investigation of the local government's current Government 3.0 practices using Big Data analysis aims to explore how data-based scientific methods of administration can be used to achieve the following goal of Government 3.0: establishing a competent government, while emphasizing customized services for citizens and cooperation between participants. Using intelligent ICT, such as the Semantic Web, Big Data, and social media, this study focuses on ways to build a smart government platform. It also explores the needs and participation of citizens in relation to information on portal sites, the management of Government 3.0, and the local government's homepage.

The academic approach has several implications. It reveals the need to build a smart government platform to ensure openness, sharing, communication, and cooperation. Government 3.0 procedures can help to uncover major policy issues and to establish the strategies of a future government. The strategic application of Government 3.0 is an integrated process that involves analyzing social networks through an active use of social media and the gathering of Big Data. To carry out the process efficiently, this smart government platform should promote openness, sharing, communication, and cooperation by making use of social media, while keeping the homepage as its center. Government 3.0 is based on smart government, an advanced type of electronic government achieved through the development of intelligent ICT; it has the capacity to provide customized services for citizens, while encouraging cooperation in various areas.

This study shows that opening up information and policy processes to the public is not an end, but a means—an effective vehicle that can improve the status of government. Government 3.0 can develop customized policies for citizens and establish effective future strategies through social network analyses of various data, by identifying a semantic network of policies drawn from citizens' homepages and portal sites. This study could also provide a theoretical basis for Government 3.0 research at an early stage and become a stepping-stone for future studies by linking theoretical and practical fields.

The new media-driven Government 3.0 does not have an automatically democratic character. However, idealized visions of the emergence of ICT and enhanced modes of government can be said to encourage transparency, participation, and innovation, bringing governments and citizens closer. These examples demonstrate the critical importance of a better understanding of the complex, dynamic, and nonlinear aspects of Government 3.0 phenomena; they enable the mutual shaping of ICT

use in the public sector and shape its external relationship with individual citizens.

6. Conclusion

This study has several features. First, it analyzed data gathered from the local government's website and portal sites. Second, it explored the role of Government 3.0, which has recently been introduced as a new type of electronic government. Third, it conducted Big Data analysis to achieve a structural understanding of Government 3.0. Fourth, it provided comparative results for the local government's website and portal sites, providing a comprehensive evaluation of Government 3.0. Fifth, it aimed to identify the major issues and discourses of local government through various network and semantic analyses.

Despite these contributions, this study also has some limitations. First, although the Gyeongsangbuk-do homepage demonstrates active citizen participation, separated from the aggregated data drawn from Gyeongsangbuk-do portal sites, the homepage data mainly comes from the board and includes many messages requesting improvements. Second, broad generalizations cannot be drawn from this study of local Government 3.0 because the gathered and analyzed data come only from Gyeongsangbuk-do. Third, there is a difference between the website and the portal sites; while the website is a space used by residents of North Gyeongsang Province to flag up problems and request improvements, portal sites provide information on topics such as lifestyle, news, and opinions. This means that the sources of data have different purposes and characteristics. Fourth, this exploratory study has not confirmed the effects of or the relationship between diverse variables related to the launch effect of Government 3.0.

This research can therefore be used as a reference by other local governments and scholars interested in semantic network analysis using Big Data. It provides a relative, objective evaluation of keywords related to Government 3.0, which can be compared with studies of other local governments within and outside Korea. Moreover, this study can serve as a reference for essential research into Government 3.0 in the age of local governance, smart administration, civil collaboration, and technology-driven innovation.

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References

- Belanger, F., Carter, L., 2012. Digitizing government interactions with constituents: an historical review of e-government research in information systems. *J. Assoc. Inf. Syst.* 13, 363–394.
- Biddix, J.P., Chung, C., Park, H.W., 2015. The hybrid shift: evidencing a student-driven restructuring of the college classroom. *Comput. Educ.* 80, 162–175.
- Borgatti, S.P., Everett, M.G., Freeman, L.C., 2002. *Ucinet for Windows: Software for Social Network Analysis*. Analytic Technologies, Harvard, MA.
- Carley, K.M., Columbus, D., Biggins, M., Kunkell, F., 2010. *AutoMap User's Guide 2010*. Institute for Software Research School of Computer Science, Carnegie Mellon University. (Retrieved from <http://www.casos.cs.cmu.edu/publications/papers/CMU-ISR-10-121.pdf>).
- Carter, L., Belanger, F., 2005. The utilization of e-government services: citizen trust, innovation and acceptance factors. *Inf. Syst. J.* 15, 5–25.
- Cha, M., Kweon, S., 2015. A semantic network analysis of “creative economics” in news frame. *Korean J. J. Commun. Stud.* 59 (2), 88–120.
- Cho, S.E., Choi, M., Park, H.W., 2011. Government-civic group conflicts and communication strategy: a text analysis of TV debates on Korea's import of U.S. beef. *J. Contemp. East. Asia* 11 (1), 1–20.
- Chung, C., 2014. An analysis of the status of the triple helix and university–industry–government relationships in Asia. *Scientometrics* 99 (1), 139–149.
- Chung, C., Park, H.W., 2010. Textual analysis of a political message: the inaugural addresses of two Korean presidents. *Soc. Sci. Inf.* 49, 215–239.
- Codagnone, C., Wimmer, M.A., 2007. Roadmapping Egovernment Research: Visions and Measures Towards Innovative Governments in 2020. Retrieved from <http://www.egovrd2020.org>.

- Diesner, J., Carley, K.M., 2011. Semantic networks. *Encyclopedia of Social Networking*, 766–769.
- Dombrowski, L., Hayes, G.R., Mazmanian, M., 2014. E-government intermediaries and the challenges of access and trust. *ACM Trans. Comput. Hum. Interact.* 21 (2) (Article 13).
- Erkan, G., Radev, D.R., 2004. LexRank: graph-based centrality as salience in text summarization. *J. Artif. Intell. Res.* 22 (1), 457–479.
- Gartner Group, 2000. Key issues in e-government strategy and management. *Research Notes, Key Issues*, p. 23.
- Gyeongsangbuk-do Province, 2015. Gyeongsangbuk-do Government 3.0. Retrieved from http://www.gb.go.kr/open_content/open_info/index.jsp?LARGE_CODE=860&MEDIUM_CODE=5&SMALL_CODE=60&SMALL_CODE2=&SMALL_CODE3=&menu_code=02947&target=main&URL=/open_content/executive/info_government/gb30_budget.jsp.
- Hanneman, R.A., Riddle, M., 2005. Introduction to Social Network Methods. University of California, Riverside, Riverside, CA (Retrieved from <http://faculty.ucr.edu/~hanneman/>).
- Harper, L., 2013. Gov 2.0 Rises to the Next Level: Open Data in Action. Retrieved from <http://opensource.com/government/13/3/future-gov-20>.
- Howard, A., 2012. Making Dollars and Sense of the Open Data Economy. O'Reilly Radar (Retrieved from <http://radar.oreilly.com/2012/12/making-dollars-and-sense-of-the-open-data-economy.html>).
- Hsu, C., Park, S.J., Park, H.W., 2013. Political discourse among key twitter users: the case of Sejong City in South Korea. *J. Contemp. East. Asia* 12 (1), 65–79.
- Jang, H.Y., 2001. Exploring the structure of media criticism: a network analysis of the problems in Korean newspaper reporting. *Korean J. Commun. Inf.* 16, 108–134.
- Jun, C.N., Seo, I.W., 2013. Analyzing the big data for practical using into technology marketing: focusing on the potential buyer extraction. *J. Mark. Stud.* 21 (2), 181–203.
- Jung, K., Park, H.W., 2015. A semantic (TRIZ) network analysis of South Korea's "open public data" policy. *Gov. Inf. Q.* 32, 353–358.
- Jung, K., No, W., Kim, J.W., 2014. Who leads nonprofit advocacy through social media?: some evidence from the Australian Marine Conservation Society's twitter networks. *J. Contemp. East. Asia* 13 (1), 69–81.
- Kim, H.W., Jun, C.N., 2014. An exploratory study on content creation methods utilizing Big Data: linguistic and story resources for effective creation of TV home shopping content. *J. Cybercommunication Acad. Soc.* 31 (3), 5–51.
- Kim, J.W., Kim, Y., Suran, M., 2015. Emergency-response organization utilization of social media during a disaster: a case study of the 2013 Seoul floods. *J. Contemp. East. Asia* 14 (2), 5–15.
- King, S., Cotterill, S., 2007. Transformational government? The role of information technology in delivering citizen-centric local public services. *Local Gov. Stud.* 33 (3), 333–354.
- Korea IT Times, 2013. Korea Unveils Its Gov 3.0 to Move Korea's E-gov to the Next Level. GeGF, 2013. Retrieved from <http://www.koreaitimes.com/story/32579/gegf-2013-korea-unveils-its-gov-30-move-korea%E2%8099s-e-gov-next-level>.
- Korean Government, 2013. Government 3.0 Plan. Retrieved from <http://www.gov30.kr>.
- Leydesdorff, L.A., 2001. *Sociological Theory of Communication: The Self-Organization of the Knowledge-Based Society*. Universal Publishers, Parkland, FL.
- Liikanen, E., 2003. *E-Government for Europe's Public Services of the Future*. Retrieved from <http://www.uoc.edu/inaugural03/eng/article/20336.pdf>.
- Maio, A.D., 2009. *Government 2.0: Gartner Definition*. Retrieved from <http://www.gartner.com/doc/1224639/government-gartner-definition>.
- Markoff, J., 2006. Entrepreneurs: see a web guided by commonsense. *The New York Times*, Business, November 12, 2006.
- Mergel, I., 2010. Government 2.0 revisited: social media strategies in the public sector. *PA Times* 33 (3), 7–10.
- Mintz, D., 2007. Government 2.0—fact or fiction? *Public Manag.* 36 (4), 21–24.
- Nam, T., 2013. Government 3.0 in Korea Fad or fashion? *ICEGOV'13 Proceedings of the 7th International Conference on Theory and Practice of Electronic Governance*, pp. 46–55.
- NIA, 2013. *Government 3.0: Dreaming new Korea*. Retrieved from <http://www.gov30.kr>.
- NIA, 2008. Concepts and features of Government 2.0 and 3.0. Retrieved from http://www.nia.or.kr/english/BBS/board_view.asp?BoardID=201112221611231975&id=9270&Order=303&search_target=&keyword=&Flag=.
- Nielsen, 2015. Data query top 10. Retrieved from <http://www.nielsen.com/kr/ko.html>.
- O'Neill Jr., R.J., 2001. The Levers of Power: In 21st Century Governance. Supplement to *Government Technology*, January.
- O'Reilly, T., 2005. *What is Web 2.0: Design patterns and business models for the next generation of software*. Retrieved from <http://www.oreillynet.com/pub/a/oreilly/tim/news/2005/09/30/what-is-web-20.html>.
- Park, H.W., Leydesdorff, L., 2004. Understanding the KrKwic: a computer program for the analysis of Korean text. *J. Korean Data Anal. Soc.* 6, 1377–1387.
- Park, S., 2013. *Opening Big Data analysis and application centers*. ZDNet, October 24, 2013. Retrieved from http://www.zdnet.co.kr/news/news_view.asp?artice_id=20131024134751.
- Rhee, Y., 2012. Potential and limitations of social media in nation branding. *Proceeding from the International Symposium on nation branding and e-government (Presidential Council on Nation Branding)*, pp. 41–67.
- Saxena, K.B.C., 2005. Towards excellence in e-governance. *Int. J. Public Sect. Manag.* 18, 498–513.
- Seneviratne, S.J., 1999. Information technology and organizational change in the public sector. In: Garson, G.D. (Ed.), *Information Technology and Computer Applications in Public Administration: Issues and Trends*. Idea Group Publishing, Hershey, PA, pp. 41–61.
- Shannon, V., 2006. A more revolutionary web. *The New York Times* (May 23, 2006, Retrieved from <http://www.iht.com/articles/2006/05/23/business/web.php>).
- Sharma, S.K., 2004. Assessing e-government implementations. *Electron. Gov. J.* 1 (2), 198–212.
- Sharma, S.K., Gupta, J.N.D., 2003. Building blocks of an e-government: a framework. *J. Electron. Commer. Organ.* 1 (4), 34–48.
- Snead, J.T., Wright, E., 2014. E-government research in the United States. *Gov. Inf. Q.* 31, 129–136.
- Son, D., 2002. *Social Network Analysis*. Kyungmoon, Seoul, Korea.
- United Nations, 2011. Human development report 2011. Retrieved from <http://hdr.undp.org/en/reports/global/hdr2011>.
- United Nations Department of Economic and Social Affairs, 2004. *Global e-Government Readiness Report 2004: Toward Access for Opportunity*. Division for Public Economics and Public Administration, New York.
- United Nations Department of Economic and Social Affairs, 2014. *United Nations E-government Survey 2014: E-government for the Future we Want*. Division for Public Economics and Public Administration, New York.
- Valero, J.N., 2015. Effective leadership in public organizations: the impact of organizational structure in Asian countries. *J. Contemp. East. Asia* 14 (2), 69–79.
- Venkatesh, V., Sykes, T.A., Venkatraman, S., 2014. Understanding e-government portal use in rural India: role of demographic and personality characteristics. *Inf. Syst. J.* 24, 249–269.
- Vicente, M.R., Novo, A., 2014. An empirical analysis of e-participation: the role of social networks and e-government over citizens' online engagement. *Gov. Inf. Q.* 31, 379–387.
- Wasserman, S., Faust, K., 1994. *Social Network Analysis: Methods and Applications*. Cambridge University Press, New York.
- West, D.M., 2004. E-government and the transformation of service delivery and citizen attitudes. *Public Adm. Rev.* 64 (1), 15–27.
- Williams, J., 2012. Introducing the Concept of Web 3.0. Retrieved from <http://www.tweakandtrick.com/2012/05/web-30.html>.
- World Bank, 2011. Definition of E-government. Retrieved from <http://web.worldbank.org>.
- Zhang, H., Fiszman, M., Shin, D., Miller, C.M., Roseblat, G., Rindflesch, T.C., 2011. Degree centrality for semantic abstraction summarization of therapeutic studies. *J. Biomed. Inform.* 44 (5), 830–838.
- Zhang, X., Cheng, G., Qu, Y., 2007. Ontology summarization based on RDF sentence graph. *Proceedings of the 16th International Conference on World Wide Web.*, pp. 707–716.

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