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A new methodological quest to evaluate South Korean digital diplomacy in US government web domains

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This study employs a novel methodological approach to evaluate the effectiveness of South Korea's digital diplomacy within U.S. government web spaces. Given the United States' experience with modern digital public diplomacy, its foreign policy has a significant impact on both Korea and Japan. We examine how key issues in the Korea-Japan territorial dispute are perceived and preserved on U.S. government web spaces, as well as their effects on the public. The study used web archives for data collection, as well as a composite analysis combining web impact studies and semantic network analysis. The analysis revealed that Japan's digital public diplomacy is more prominent, primarily through online media operated by the U.S. Embassy in Japan. This suggests that Korea needs strategies similar to Japan's, leveraging digital technology and media.

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Introduction

The emergence of the Internet has deeply penetrated all facets of society, including international relations, and has consequently influenced diplomacy. Within the realm of public diplomacy, digital public diplomacy using digital technologies and platforms has also become an important element of modern international relations. Pamment (2012) contends that throughout the majority of the 20th century, the phrase "public diplomacy" was closely associated with the notion of "propaganda." In the context of countries in conflict with each other, aggressive public diplomacy has emerged to create favorable public opinion in their countries against the backdrop of a newly emerging media environment (Manor and Bjola, 2020; Wiseman, 2019).

An illustrative instance of digital public diplomacy in progress is the continuing territorial dispute between South Korea and Japan concerning the Dokdo/Takeshima islands. The two countries assert their sovereignty based on historical, geographical, and legal grounds through the Dokdo/Takeshima website of the MFA (Ministry of Foreign Affairs) (Cho et al., 2009; Schrijver and Prislan, 2015; Huth et al., 2021). Related issues, such as the "Takeshima Day" event in Shimane Prefecture and politicians' remarks on Dokdo/Takeshima, occur periodically, and the conflict between the two countries persists. Consequently, the success of their arguments will depend on the extent of international support they receive.

This study employs the Dokdo/Takeshima territorial dispute as a case study to suggest a novel methodological framework for assessing South Korea and Japan's digital diplomacy within the web domain of the U.S. government. Because each country's MFA has its own digitalization process (Manor, 2019), comparative studies between Korea and Japan can demonstrate the efficacy of digital public diplomacy. However, the majority of existing research is qualitative in nature, employing case studies as a methodology. The search for quantitative methodologies that can utilize the vast amount of data available on digital platforms is limited (Manor, 2019). Relatively few public diplomacy studies have examined digitized web materials about diplomatic issues, and even fewer have applied big data analytics, despite being a topic worthy of investigation.

This study seeks to fill this void by utilizing a blend of web impact studies and semantic network analysis to investigate how content connected to Dokdo is stored and portrayed in the web domain of the United States government. The U.S. has been selected as a benchmark because modern public diplomacy has its historical roots in the American experience. (Melissen, 2005). Additionally, U.S. foreign policy is likely to impact both Korea and Japan, given that both nations have a strong alliance with the United States. The government domain is also targeted to help establish government information intervention technologies for public foreign policy management and to understand how influential non-state actors are on public foreign policy management (Park and Yoon, 2023). By examining the representation of this issue on U.S. government web domains, the study aims to elucidate the challenges and opportunities facing South Korea in its digital public diplomacy initiatives. The primary research questions guiding this study are as follows:

RQ1. What is a methodological innovation that uses web archiving to objectively measure the impact of digital diplomacy?

RQ2. What are the networked structures of U.S.-mediated archived web materials on Dokdo, and how do these reflect South Korea's digital diplomacy strategies?

RQ3. What improvements do the analysis results of archived web materials suggest in Korea's digital diplomatic strategy?

Literature review

Digitalization of public diplomacy. The term "public diplomacy" is defined as "an instrument used by states, associations of states, and sub-state and non-state actors to understand cultures, attitudes, and behaviors; to build and manage relationships; and to influence thoughts and mobilize actions to advance their interests and values." (Gregory, 2011, p. 353). The digital evolution of public diplomacy is inextricably linked to the evolution of the Internet, as represented by Web 2.0 (Cull, 2013). The term "Web 2.0" first appeared in 1999 and was first used in 2004 as a convenient way to describe new online resources such as blogs, Wikipedia, Facebook, and YouTube (Park and Park, 2024). The communication revolution has spurred the emergence of "new" public diplomacy, increasingly significant as public opinion's influence on foreign policy has grown. The global adoption of digital technologies by MFAs, embassies, and other foreign affairs actors has been a key factor in the emergence of "new" public diplomacy (Manor, 2019).

Digital diplomacy encompasses the impact or alteration of diplomacy due to the Internet, digital media, tools, and technological sectors (Hedling and Bremberg, 2021). Conceptually, it is regarded as both a catalyst and an outcome of digitalization, involving diverse interactions with diplomacy (Bjola and Holmes 2015). Various scholars have proposed multiple conceptualizations about the use of digital technology in public diplomacy. Among these are "Public Diplomacy 2.0" (Hallams, 2010), "Virtual Diplomacy," "Net Diplomacy" (Wehrenfennig, 2012), and "Digital Diplomacy" (Bjola and Holmes, 2015). However, Manor (2019) argues that "digitalized public diplomacy" is a more accurate expression, although the term "digitalized public diplomacy" is often used as a synonym for digital diplomacy. This is because digital technology is affecting changes in diplomatic norms, values, practices, and the structure of diplomats and diplomatic organizations.

Current research on digital diplomacy has primarily concentrated on the conversion of public diplomacy into digital form. This has resulted in an understanding of the most effective ways to project and evaluate these influences, employing concepts such as "soft power," "strategic communication," and "national branding" (Hedling and Bremberg, 2021). In this regard, digital diplomacy is commonly seen as a means of exerting soft power by showcasing a nation's cultural traits and values to attract and convince global audiences (Nye, 2004). It is also described as a framework for utilizing social media in diplomatic activities (Barnett et al., 2017; Bjola and Holmes, 2015; Ittefaq, 2019). However, digital diplomacy cannot simply be seen as a framework that uses social media in diplomacy (Manor, 2016). This study focuses on digital public diplomacy activities in web-based spaces, interpreting Mazumdar's (2021) public diplomacy activities as a novel practice utilizing Internet-based amplification or participatory communication technology.

The implications of "digital" in public diplomacy. Castells and Cardoso (2006) described a digital society's organizational structure as a network, making it a network society where individuals, countries, and companies coordinate actions globally. The network structure has created a society in which people are constantly striving to destroy time and space (Castells, 2013). Scholars like Bauman and Lyon (2013) contend that the digital society operates remotely. Historically, diplomacy has relied on proximity (Roberts, 2017), but the integration of digital society's values and norms into MFAs is apparent (Manor, 2019). Digital diplomacy is evolving through an interactive process of

adaptation and adoption of digital technologies, which has been demonstrated through several examples (Bjola and Manor, 2022).

However, a careful approach to the implications of the term "digital" in digital diplomacy is required. This is because the term digital encompasses both virtual space and specific technological enterprises, as well as physical objects or conditions related to communication (Hedling and Bremberg, 2021). In order to fully understand the effects of digitization on diplomatic practice, it is imperative to carefully differentiate and do further research, given the complex nature of these aspects. Manor and Segev (2015) suggest that digital diplomacy exists at two levels: MFAs and embassies around the world. Their goals are to customize and enhance foreign policy and national brand messages by considering the unique characteristics of local audiences, including their history, culture, values, and customs. This approach can be used as a benchmark for the comparative evaluation of digital diplomacy between Korea and Japan. Both countries take a similar approach to public diplomacy, such as promoting a positive image of the country through a government-run digital platform.

Consequently, research on the digital public diplomacy of the two countries is gradually being conducted (Park and Lim, 2014; Park et al., 2019). Because each country's MFA has its own digitalization process (Manor, 2019), comparative studies between Korea and Japan can demonstrate the efficacy of digital public diplomacy.

Digital diplomacy in South Korea
State actor policy intervention. South Korea possesses the essential infrastructure and hardware required for the utilization of digital technology and has been verified for its digital advantage internationally. The Korean government has employed digital tools in the realm of foreign policy since the mid-1980s as a means of diplomacy (Oh and Larson, 2011), and comprehensive digitalization, which has gone through in a unique historical context, is working in many aspects of foreign policy. In 2012, the Korean government produced and distributed its own guidebook with examples of how domestic and foreign ministries use SNS to practice digital diplomacy.

Research on digital diplomacy in Korea has been gradually conducted in recent years. Their studies primarily focus on the Korean government's digital infrastructure and organizational capacity for digital diplomacy (Kim, 2022; Melissen and De Keulenaar, 2017; Park and Lim, 2014; Robertson, 2018), as well as the use of social media for public diplomacy (Indraswari and Joo, 2022; Lee and Shahin, 2023; Park et al., 2019). The former study assessed that Korea has excellent digital infrastructure and hardware but has not presented a strategic plan for digital diplomacy and has not fully realized its potential. The latter also recognized Korea's excellent digital environment, but there were differences in the interaction with digital diplomacy on specific issues.

Park et al. (2019) conducted a social network analysis of active accounts on Facebook fan pages opened by government-affiliated organizations leading cultural diplomacy between Korea and Japan. The findings indicated that Korea systematically manages reciprocal communication with influencers and activists at the institutional level, and the foreign public's perception of soft power was observed in the manifestation of various cultural assets and political values. Conversely, Indraswari and Joo (2022) scrutinized the Twitter messages of both state and non-state actors regarding the Korean government's New Southern Policy (NSP) and discovered that they employed digital diplomacy to engage domestic audiences for political objectives, not the foreign public in ASEAN.

This is also consistent with the analysis of Kim (2022). He analyzed more than 3,000 public diplomacy projects conducted by Korea's central administrative agencies and local governments from 2018 to 2022 and found that one-way information distribution-oriented projects about Korea, such as introducing Korea, promoting overseas Korean and Korean studies, tourism promotion, exhibition projects to improve the country's image, and policy briefing sessions, were mainly carried out. These projects primarily focus on foreigners, international students, and multicultural families residing in Korea, with a rare presence of digital technology-based public diplomacy activities. The same is true for global social media communication. These findings suggest that Korea's digital diplomacy is specialized in Web 2.0, rather than Web 1.0.

Non-state actor policy intervention. The government's digital diplomacy is having a discernible impact on the perspectives of Koreans about political matters, encompassing contentious subjects in global politics such as the territorial dispute between South Korea and Japan over Dokdo/Takeshima (Melissen and De Keulenaar, 2017). Castells (2008) interprets the public as a social actor practicing public diplomacy in the global public sphere, and a representative example of the public practicing public diplomacy as a social actor in Korea is "VANK."

VANK's main activities include building relationships between members and foreigners through social networking sites, correcting misinformation about Korea in foreign websites and books, and raising awareness of global issues and foreign history and culture among middle and high school students. The most representative activities are Dokdo-related activities, including petitioning Google and Apple to revise Dokdo notation, running Dokdo Academy to train global ambassadors for Dokdo, building a Japanese-language Korean history website, and establishing a metaverse Dokdo exhibition hall. VANK's public diplomacy activities, which are based on practice rather than theory, have confirmed that public diplomacy and national branding can be practiced regardless of the direction of government agencies (Ayhan, 2018, Varpahovskis, 2017).

Political intervention in the Dokdo/Takeshima dispute by non-state actors varies. In 2005, Yeungnam University (2021) established the "Dokdo Research Institute," Korea's first university-affiliated research institute for Dokdo-related research. Since 2007, the institute has published a total of 50 research books and is continuously conducting research to scientifically prove its sovereignty over Dokdo, including holding annual conferences on related topics. A Korean professor continues his personal "public diplomacy" activities on the Dokdo/Takeshima dispute by publishing a Dokdo advertisement in the New York Times and pointing out the incorrect notation of Dokdo and the East Sea on the world map. (Bak, 2014).

In addition, Pohang MBC (2023), a local broadcaster in Korea, aired a two-part documentary titled "Dokdo, Data War", which examines the global perception of the Dokdo/Takeshima dispute based on data. The documentary, which is currently posted on the station's YouTube channel, also discusses the Korea Communications Commission's program translation support project, which can be viewed as a component of public diplomacy once the subtitled program is broadcast overseas.

Material and methods
Web archive. Offering unparalleled access to information on almost any subject, the web is a constantly expanding resource that evolves as users share knowledge (Dougherty and Meyer, 2014). The web is also temporary. It has transformed from a platform for publication to a means of communication and

currently provides a wide range of historical primary sources. This abundance of diverse information enables web archiving to emerge as an interdisciplinary field, integrating practitioners and scholars from the computer and information sciences, social sciences, humanities, and library and archival sciences (Ogden et al., 2017).

Web archiving involves collecting, storing, and preserving web data, ensuring its availability for future research (Niu, 2012). All web archives select web resources for preservation using one or more criteria. While the Internet Archive aims to archive the entire web, it primarily captures surface web pages (Lecher, 2006). Web archiving can take different forms depending on the scope, method, and qualitative level of the archive (Masanés, 2006). The scope of this collection can be divided into sites, topics, and domains. Site-centric archiving is conducted by institutions or individuals primarily for limited archiving purposes and does not involve building collections. Topic-centered archiving collects accurate and valuable web resources on a specific topic, focusing on web resources that are directly requested by researchers or are expected to be needed in the future. Domain-centered archiving bases its selections on the location of the web resource, (i.e., the domain). For example, national web archiving projects prioritize the government and educational domains .gov and .edu (Masanés, 2006).[1]

Web archiving has been used as a tool in historical research since its introduction. It has expanded to include a variety of uses depending on the field of study and subject matter. For example, the U.S. Library of Congress offers digital archival materials on its Web Archive by topic of interest.[2] Some of these are subject-specific, such as the Digital Archive of Chinese History.[3]

Web resources are collected into web archives by automatic collectors called "web crawlers." Among these, the Wayback Machine, developed as a tool for accessing URLs, has been used for academic research since Internet archives were established (Ben-David and Huurdeman, 2014). The Wayback Machine is based on a web archive of more than 80.8 billion snapshots[4] and can display information on a website (archive.org) using specific keywords. The Internet Archive's crawler, designed to index the web, relies on its hypertextual structure, following links to discover and ingest new pages (Rogers, 2015). The Wayback Machine was established as a means to access the Internet Archive's materials, specifically its Uniform Resource Locators (URLs). When a URL is entered, the contents of the site can be viewed at various times, and snapshots stored in the web archive can also be viewed at various times (vertical surfing) and moved to other archived pages (horizontal surfing). In order to consult the Wayback Machine, the researcher must possess the URL necessary to obtain information from the archive. Using the URL allows a researcher to consult the Internet Archive while browsing the live web (and perhaps find a broken link or URL with interesting past versions) given the temporal proximity between the live and archived objects (Ben-David and Huurdeman, 2014). Table 1 summarizes the key differences between a single URL and web archive search access points.

Table 1 Comparison of URL-based and search-based access to web archives (Ben-David and Huurdeman, 2014).

	Single URL	Search
Unit of analysis	Webpages	Archived web data
Wayback Machine	Primary analytical tool	Viewing/validation tool
Focus (content)	Text	Digital objects (text, hyperlinks, metadata, images)
Collections	Building (manually)	Reassembling/critique

Methods

Robertson (2018) conducted a literature review on assessing the capacity of the MFAs to utilize digital diplomacy with individual attitudes within the MFA on national infrastructure and hardware, management and administrative structure of the MFA, technology, and organizational capabilities, and Park et al. (2019) used social network analysis and topic modeling to comparatively assess digital diplomacy between South Korea and Japan. This study uses webometric big data analytics based on web archiving. This is a methodological innovation for the problem posed in RQ1. A process is illustrated in Fig. 1.

Webometrics (which combines "web" and "metrics") is a methodology for quantitative analysis of web-based biggish data (Thelwall et al., 2005). Björneborn and Ingwersen (2004) defined webometrics as "the study of the quantitative aspects of the construction and use of information resources, structures, and technologies on the web, drawing on bibliometric and informetric approaches." This definition includes an examination of both the web's structure and usage. It focuses on four primary areas of research: (1) analysis of subjects and topics; (2) analysis of link structures, such as hyperlinks, self-links, and external links; (3) analysis of usage patterns, including the utilization of log files to study user searching and browsing behavior; and (4) the development and monitoring of tools, including the evaluation of search engine performance (Björneborn and Ingwersen, 2004).

Since the focus of this study was on the U.S. government web space, all web pages containing the term "Dokdo" were collected on the .gov domain, which is reserved exclusively for U.S. government agencies. This kind of e-search strategy proved to be a straightforward way to cover as many archived materials related to Dokdo as possible using the Wayback Machine. We used Internet Download Manager (IDM) software to collect the HTML files of the webpages that appeared in the search results. We conducted the collection twice, on January 29 and 31, 2023. The Wayback Machine can fetch the original version of a webpage
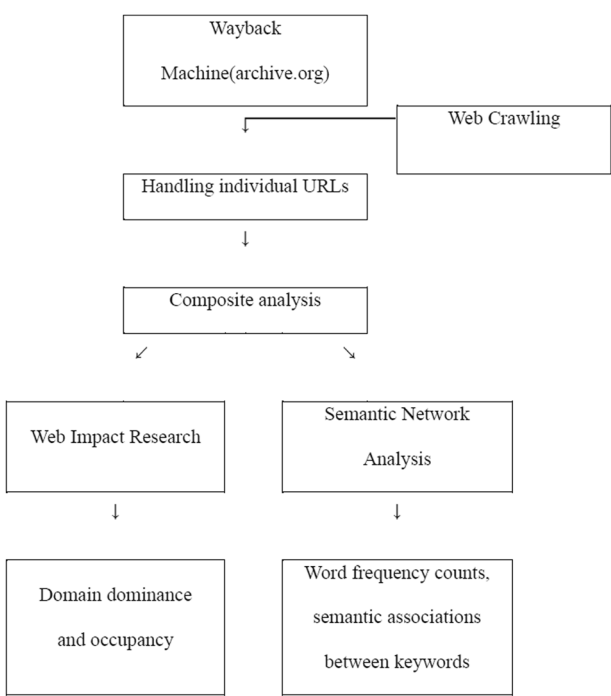
Fig. 1 Expanded webometrics model employed in the study. Brief description of data collection and analysis: we collected individual URLs related to "Dokdo" from the Wayback Machine through web crawling, then conducted Web Impact Research and semantic network analysis on them.

Table 2 List of "Dokdo" domains viewed by URL frequency ($N = 141$).

Domain	Name	URLs	Percentage
jmh.usembassy.gov	Japan Media Highlights	122	86.5%
www.state.gov	U.S. Department of State	7	5.0%
agricola.nal.usda.gov	AGRICOLA | National Agricultural Library	3	2.1%
usinfo.state.gov	U.S. Department of State	2	1.4%
petitions.whitehouse.gov	Petition the White House on the Issues that Matter to You	2	1.4%
korea.usembassy.gov	US Embassy in Seoul	2	1.4%
www.sos.wa.gov	Washington Secretary of State	1	0.7%
uspolicy.belgium.usembassy.gov	U.S. Embassy in Belgium	1	0.7%
www.statelibrary.sc.gov	South Carolina State Library	1	0.7%

and regularly check for updates. If a webpage was crawled multiple times and there was no difference in content, the duplicate webpage was not included in the analysis. These verification procedures were performed in addition to machine check-ups.

We analyzed the webpages in two ways. First, a Web Impact Report for URLs was extracted for each webpage using Webometrics Analyst 2.0, which has the ability to collect a variety of data from underlying services and perform quantitative analysis on them (Thelwall, 2012). As the URL information for the webpages collected by the IDM program was not displayed directly, we used a program coded in Python to extract the URLs. The extracted URLs were analyzed on a per-domain basis. Domains are composed of subdomains from the top-level domain, and the second top-level domain can be used to identify the source of information.

Second, we performed semantic network analysis of text within webpages. Semantic networks are constructed in three ways: (1) based on the relationships between words in a text, (2) based on traditional text content analysis, and (3) based on overlapping perceptions measured with scales. These different methods may be a function of two different definitions of semantic networks (Doerfel, 1998). The first describes the nature of semantic networks via text analysis to measure the relationships between words (Rice and Danowski, 1993), and the second describes the conceptualization of semantic networks as associations based on shared interpretations (Monge and Eisenberg, 1987). These two definitions are central to distinguishing types of semantic network research. (Doerfel, 1998).

The semantic network analysis involved examining keyword occurrence frequency, term frequency-inverse document frequency (TF-IDF), and centrality. TF-IDF, the most commonly used criterion in information retrieval and text mining, is a statistical value that indicates the importance of a particular keyword in a document. It is used to extract keywords from a document or to rank search results in a search engine; the larger the value, the more important the word. To characterize the semantic connectivity network, we performed a CONCOR ("CONvergence of iterated CORrelations") analysis. A CONCOR analysis identifies blocks of nodes according to the correlation of co-occurring words in a matrix and then identifies the relationship between the blocks to form keyword relationships and clusters. This methodology is valuable for uncovering concealed subgroups and the semantic framework of texts (Park et al., 2017). The network was visualized using UCINET.

We used Textom[5] as a tool to analyze semantic networks. We used a text mining technique for the analysis. Text mining is a set of techniques used to extract hidden information and derive patterns from the frequency and distribution of words that are not explicit in written content. We have used Textom for semantic network analysis and the visualization of analysis results.

Results

The keyword "Dokdo" was searched on the Wayback Machine website on January 27, 2023, and 299 results were obtained. We later collected 1,206 web pages for "Dokdo" using IDM. For the collected webpages, the contents were checked individually to exclude webpages that were duplicates or were unrelated to the keywords. We also tried to collect "Takeshima" as a keyword but excluded it due to significant content overlap with "Dokdo" during the collection process.

Consequently, we analyzed 150 webpages. Using a Python coding program for the "Web Impact Report," we extracted 141 URLs. URLs can become difficult to find as the time between the disappearance of a page from the live web and the appearance of its archived version increases (Ben-David and Huurdeman, 2014). Table 2 shows the results of organizing the domains in order of URL frequency.

As shown in Table 2, the jmh.usembassy.gov domain had the highest number of URLs (122), accounting for 86.5% of the total. This site is called "Japan Media Highlights."[6] The site's introduction states that the Media Analysis and Translation Team of the Public Affairs Section of the U.S. Embassy in Tokyo operates it. Second, the www.state.gov domain, a U.S. State Department site, had the most URLs, with seven. The third-ranked domain, usinfo.state.gov, is a subsite of the U.S. Department of State website, so there are actually 11 State Department URLs. Fourth on the list are the White House petition site and the U.S. Embassy in Korea. The stark difference between the U.S. embassies in South Korea and in Japan is worth noticing. On its website, the U.S. Embassy in Japan has far more Dokdo-related pages than the U.S. Embassy in South Korea. Figure 2 shows a visual representation of these results. As the number of URLs increases, the lines become thicker.

Table 3 categorizes the types and contents of the collected web pages. News was the most common source, with 122 pages. The news reports present the reactions of the Korean, Japanese, and foreign media to Dokdo-related issues. It is noteworthy that they not only report news but also include editorials and contributions from experts on Dokdo-related matters. Figure 2 displays the types of webpages by domain, previously extracted as a two-mode matrix. As shown in Fig. 3, the .jmh domain contains all news; briefings belong to the State Department and the embassy, and the rest of the URLs belong to others.

The results show the influence of the .jmh domain, which indicates that the U.S. Embassy is conducting public diplomacy through its own online space. The most prominent example is an editorial titled "South Korea should not bring territorial issues to the Olympics," published on February 7, 2018. The editorial protested the raising of the Korean Peninsula flag with Dokdo during a women's ice hockey tournament between North and South Korea ahead of the Pyeongchang Winter Olympics. It cited an example of a men's soccer match held at the 2012 London Olympics:
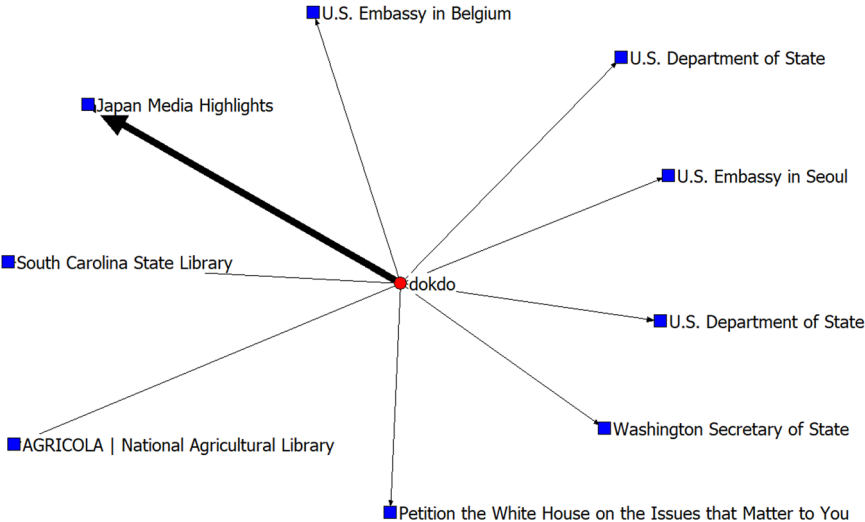
Fig. 2 Visualization of "Dokdo" domains by URL frequency. The greater the number of web page domains collected with the "Dokdo" keyword, the thicker the arrow.

Table 3 Types and content of archived web pages (N = 150).

Type		Numbers	Total
News	General news	96	122
	Editorials	12	
	Features	10	
	Polls	4	
Briefings	Briefing	5	12
	Press conference	5	
	Hearings	2	
Others	Introduction (book, forum)	4	7
	Petition	2	
	Search list	1	

It is incomprehensible that South Korea has not learned a lesson from its past mistake. At the 2012 London Summer Olympics, the Japanese and the South Korean teams competed in the third-place match in men's soccer. A South Korean soccer player, excited about his team's victory over Japan in the game, held up a sign reading "Dokdo is our territory." FIFA, soccer's governing body, considered the player's action as "behavior that goes against the concept of sportsmanship and fair play," and decided to suspend him for two World Cup qualifying matches and imposed a fine.[7]

Table 4 provides a summary of the information sources used to extract the URLs from the webpages. These sources include events in various countries, such as summits, diplomatic meetings, international events such as the Tokyo Olympics, and press conferences on conflicts between South Korea and Japan, such as compensation for the forced labor of Korean comfort women and two Japanese corporations (Mitsubishi and New Nippon Steel Corporation). It also includes overlapping sources of information, such as opinion polls conducted jointly by the Korean and Japanese media. Table 4 shows that Japan has slightly more sources than South Korea. There are five briefings related to Dokdo in South Korea, which occurred when a senior U.S. official visited the country. Figure 4 is visualized in a two-mode matrix. As the line becomes thicker, the number of URLs for each sort of information source increases.

The results of this analysis show that the network structure of the Dokdo archival web materials mediated by the United States

in RQ2 is mainly based on news, and Japan, rather than Korea, is actively producing web materials in the government's online space. This suggests that Korea should not only target domestic and foreign audiences through social media, but also engage in government-level media public diplomacy with foreign governments.

Table 5 shows the top 30 words and TF-IDF numbers resulting from a text mining of the entire text on the collected webpage. We changed plural to singular in the text mining process, ensuring it did not undermine the original meaning of the text, and excluded meaningless words from the analysis. For instance, we changed "United States" to "U.S.," and "Islands" to "Island."

As Table 5 shows, even though "Dokdo" was searched as a keyword, "Takeshima" appeared more often. The TF-IDF levels for Takeshima were also high. This means that "Takeshima" was used more often than "Dokdo" within the archived web pages.

Table 6 summarizes the network overview between the top 30 words. Figures such as Density and Diameter show that the words as a whole are strongly connected.

Figure 5 presents a visualization of the network of the top 30 words. The blue node marked "Dokdo" is from "Korea" and "Korean," and the red node marked "Takeshima" is from "Japan" and "Japanese." Greater line thickness indicates a more robust relationship between the words.

Table 7 shows four groups classified via CONCOR analysis. "Dokdo" is in the first group, along with Korea, Japan, China, and political keywords like "government" and "ministers". The fourth group, to which "Takeshima" belongs, includes the words "U.S.," "world," "think," and "talk." This group classification implies the politicization of the "Dokdo" issue in the online space and the greater influence of "Takeshima" over "Dokdo" in the United States. This is also contradicted by the fact that it is difficult to find the mark "Dokdo" in areas other than Korea on Google and Apple's map services.[8]

Discussion

Public diplomacy primarily aims to support a nation's foreign policy. Thus, examining South Korea's public diplomacy strategy is essential. In 2010, South Korea proclaimed the "first year of public diplomacy" and included it as a pillar of diplomacy alongside political and economic aspects. In 2016, the Korean Public Diplomacy Act was enacted, which defines public diplomacy as diplomatic activities conducted by the state, either
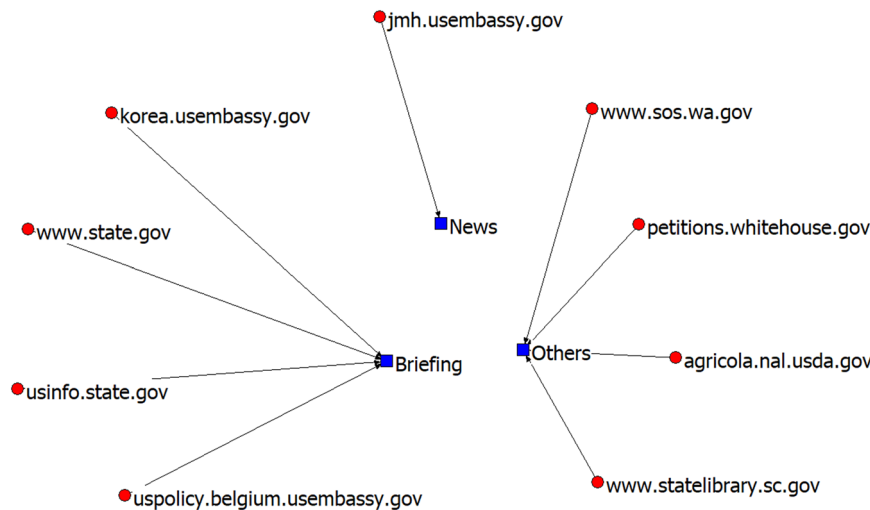
Fig. 3 Visualization of "Dokdo" domains by type and content. We classified the web page domains collected by the "Dokdo" keyword according to their type, including news, briefings, and others.

Table 4 Information source for URL-based archived web pages (n = 152).

	South Korea	Japan	China	U.S.	Russia	Taiwan	Vietnam
News	59	67	3	1	1	1	1
Briefings	5	0	0	7	0	0	0
Others	0	0	0	7	0	0	0

directly or in cooperation with local governments or the private sector, to promote foreign understanding and trust in South Korea. These activities are based on cultural, knowledge, and policy exchanges. Before the law was passed, public diplomacy in Korea was mostly understood as cultural interaction and the promotion of Korean culture (Ayhan, 2020). However, in our earlier literature review we found two problems: state-centered public diplomacy, lack of power, and evaluation systems. These are the issues that have arisen since the first plan was implemented.

This is also evident in the "2nd Basic Plan for Public Diplomacy" announced by the Korean MFA (2022). The second plan presents the creation of a digital and innovative public diplomacy ecosystem as one of its main goals. However, looking at the details of the comprehensive implementation plan: development of a global campaign using the next generation of digital technology, "KOREAZ" operation and content creation, MOFA studio management and operation, building a digital cultural experience zone (using VR, interactive media, etc.), cyber international exchange center, establishment of a metaverse platform to promote international exchange, KF Global e-School (VOD-type online Korean/Korean Studies lecture support), promote Korea's policy stance through the operation of "Korea.net", production of a video introduction to the national image, publication of English web journal on the situation on the Korean peninsula, KOREANA publishes a multilingual webzine, the publication of e-newsletters. There is a lack of plans utilizing digital technology in the fields of strategic policy and public diplomacy. Some studies have also pointed out the lack of government organizational systems and evaluation systems in the promotion of digital diplomacy (Robertson, 2018; Kim, 2022).

Scholars have discussed the social media metrics commonly used in digital diplomacy evaluation (Spry, 2018), which is

evident when compared to Australia. Australia has a webpage that lists all agencies, programs, and personal social media accounts operated by the Department of Foreign Affairs and Trade (DFAT). The accounts are designated by region, which shows that there are strategies to influence the overseas public using local languages and social media characteristics (DFAT, 2024). Conversely, "KOREAZ," a public diplomacy SNS channel in Korea, operates only four accounts on the MFA website: YouTube, Facebook, Instagram, and X.

These issues align with the analysis's findings. First, the Dokdo-related domain that collected the most hits in the web space of U.S. government agencies was the .jmh domain operated by the media analysis and translation team of the U.S. Embassy in Japan. This site primarily provides major political and international news reported in English by Japanese media. As this domain accounted for 86.5% of all collected web pages, the most common web-page type was news, which presented the reactions of the Korean, Japanese, and foreign media to Dokdo-related issues. Additionally, the publication included editorials on Dokdo-related issues and contributions from experts. This means that the U.S. Embassy in Japan is promoting a kind of digital public diplomacy through online media. The fact that "Takeshima" appeared more often than "Dokdo" on web pages collected using "Dokdo" as a keyword and from similar information sources in South Korea and Japan may be a sign that digital public diplomacy at the Japanese government level is paying off. This analysis again confirms the second problem.

The analytical findings of this study point to a critical insight: South Korea's current digital public diplomacy efforts are not sufficiently reflected in the U.S. government's web space. This gap suggests that South Korea's digital diplomacy efforts may be either under-resourced or misaligned with the channels and platforms that have the greatest impact on international discourse. The lack of South Korean-authored materials in these archives suggests a potential disconnect between the South Korean government's diplomatic initiatives and their implementation in the digital realm.

To ascertain the answer to RQ3, it is important to consult the Japanese case presented in the findings of this study. As in Japan, this would require a public diplomacy that utilizes digital technology and media. In other words, it suggests that interactive media public diplomacy is needed to gain international support, not just one-way public diplomacy that promotes its own policies and achievements through social media platforms. It is also worth considering implementing a digital diplomacy campaign that
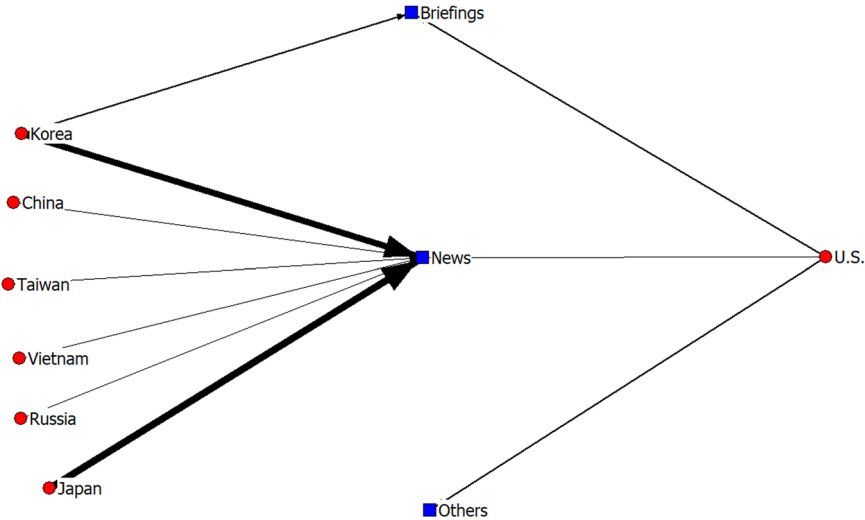
Fig. 4 Two-mode visualization of "Dokdo" contents by information source. This visualization displays the information source (country) of the web page domain type, which is classified using the 2-mode matrix. As the line becomes thicker, the number of URLs for each sort of information source increases.

Table 5 Top 30 words and their TF-IDF values.

Word	Frequency	TF-IDF	Word	Frequency	TF-IDF
Korea (South Korea)	1329	1799.3766274	government	271	742.2989234
Japan	1164	1673.5995138	island	270	768.8119218
U.S. (United States)	701	1360.0496317	Takeshima	255	698.4731567
south	647	1265.7591482	people	252	725.1947418
Korean	565	1142.264037	's	227	702.4539209
say	542	1082.9288864	other	205	602.9604151
issue	496	1083.5664267	foreign	202	603.1660403
north	462	1157.4530226	talk	201	633.8623835
China	443	1108.2895288	relation	197	603.4425466
question	406	916.0795762	minister	194	587.1977432
Japanese	401	939.3882061	Dokdo	192	572.2123152
country	366	870.8294171	sea	190	604.3792024
president	352	874.4840833	security	182	571.5020541
secretary	282	747.1585092	world	173	550.3031685
think	281	770.9473004	Tokyo	167	515.72296

Table 6 Network overview among top 30 words.

Average degree	28.867
Ave. weighted degree	4786.133
Networked diameter	2
Density	0.995
Modularity	0.09
Average clustering coefficient	0.996
Average path length	1.005

draws on transmedia engagement theory to generate international advocacy (Jenkins, 2006; Pamment, 2016).

This study's limitation is that, in the context of big data, the URLs to be analyzed cannot be considered large-scale data. In addition, given that most of the data collected was media, more meaningful results can be obtained by trying to analyze it in relation to one or more social media platforms in the future, or by collecting and comparing data related to other diplomatic issues in the same way.

Conclusion
The study analyzed diplomatic issues on archival websites maintained by U.S. government agencies in order to establish a framework for evaluating South Korea's digital diplomacy. This is also an exploratory study for theory formation and practice evaluation of public diplomacy. These findings are significant for disclosing strategic deficiencies in South Korea's digital public diplomacy. By identifying the limited presence and impact of South Korean content in influential U.S. digital spaces, this study underscores the need for a more robust and targeted approach to digital diplomacy. Addressing these gaps is essential for South Korea to improve its international standing and effectively advocate for its position on contentious issues such as the Dokdo/Takeshima dispute.

The findings suggest that South Korea's diplomatic interventions are not adequately reflected in the U.S. government domain, pointing to a need for more strategic and effective digital engagement. Clearly, the Korean government should continue to produce and disseminate web content (or web resources) and establish medium- to long-term digital public diplomacy strategies to revitalize digital diplomacy based on globally recognized digital infrastructure (Ilijaš, 2023). By addressing these strategic gaps, By addressing these strategic gaps, South Korea can ensure that its perspectives are more prominently represented in influential international digital platforms, thereby advancing its diplomatic goals and strengthening its global influence.
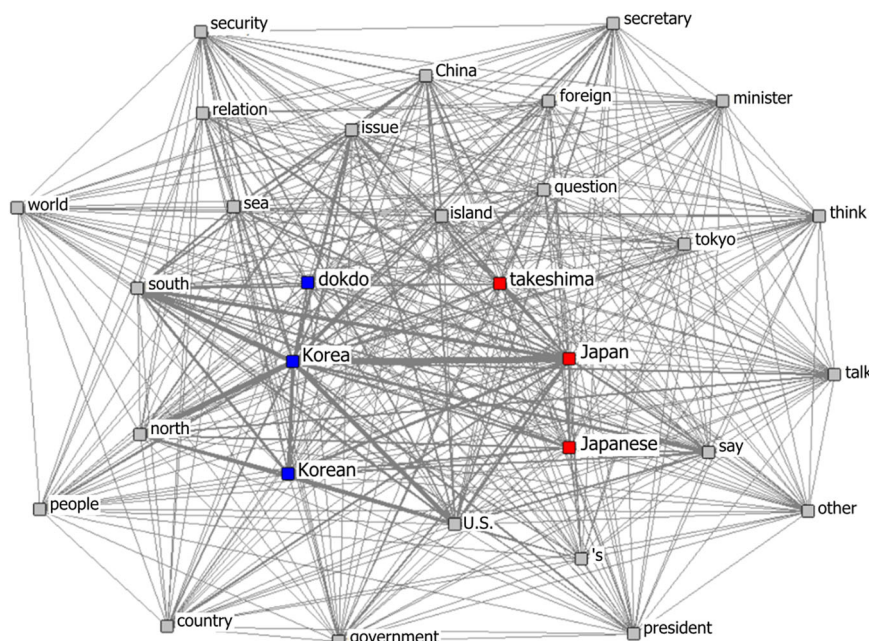
Fig. 5 Semantic networks among the top 30 words. The following visualization depicts the network between the top 30 words with the highest frequency in the collected web page text. Greater line thickness indicates a more robust relationship between the words.

Table 7 Classification of CONCOR analysis results for collected web page text.	
Cluster	**Word**
1	Dokdo, Japan, Korean, north, China, government, minister
2	Korea, Issue, Japanese, country, island, foreign
3	say, question, president, people, other, relation, sea
4	Takeshima, U.S., south, secretary, think, talk, security, world, Tokyo

Data availability

Data generated or analysed during this study are available from the Dataverse repository: https://doi.org/10.7910/DVN/OCJKYI. The analyzed datasets were derived from the following public domain resources: https://web.archive.org/gov/search/dokdo.

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Notes
1 https://www.mofa.go.kr/eng/wpge/m_22841/contents.do.
2 https://www.loc.gov/web-archives/collections/.
3 https://www.zo.uni-heidelberg.de/boa/digital_resources/dachs/.
4 http://archive.org.
5 Textom was developed based on the KrKwic ("Korean Key Words in Context") program, a Korean text analysis software. This is a big data processing solution that automatically gathers data from various Internet channels and performs batchprocessing and matrix creation. (https://www.textom.co.kr).
6 https://jmh.usembassy.gov/.
7 https://jmh.usembassy.gov/2018020899847/.
8 https://en.yna.co.kr/view/AEN20220825002900320.

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HUMANITIES AND SOCIAL SCIENCES COMMUNICATIONS | (2024)11:1232 | https://doi.org/10.1057/s41599-024-03600-6

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Author contributions

JHP conceptualized, wrote, and modified manuscripts, and was also responsible for data collection and analysis. HWP was responsible for the composition of methodologies and the review and editing of manuscripts. These authors contributed equally to this work.

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