

# Representation of data journalism practices in the South Korean and US television news

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## Abstract

Few studies have investigated how television news is represented through data journalism. To fill this gap, this study compared data news content from South Korean and that from US television networks using the grounded theory method. The following differences were found: South Korean television networks (*KBS, SBS, MBC, and JTBC*) highlight social issues, politics, and lifestyle; while American television networks (*ABC, CBS, NBC, CNN*) cover the economy, social issues, and politics. Both television networks rely on government sources and seldom provide raw data. The South Korean networks use a static graph and an infographic most frequently, while the US networks favor a number pull quote and a static graphic. The South Korean networks prefer complex, visually appealing elements (e.g., an infographic), while the American networks prefer less complex and less visually appealing elements (e.g., a number pull quote). The South Korean networks prefer the news forms of ‘visualization,’ ‘condensity,’ and ‘typification,’ and the US networks prefer ‘visualization,’ ‘typification,’ ‘condensity,’ and ‘completeness.’ The degree of user participation is extremely low in both countries’ networks.

## Keywords

Comparison of South Korean and US broadcasting, data journalistic element, grounded theory method, independent information, news forms

South Korean news organizations (e.g., *Newstapa, KBS Data Room*, and *The Hankook-Ilbo*) and other news companies (e.g., *the Guardian, ProPublica, Los Angeles Times*, and *The New York Times*) publish news content based on data collection, software analysis, and visualization. This type of content is called

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‘data news,’ resulting from the combination of open public data, circulation of big data, and open source software (Gray et al., 2012).

Researchers and journalists define the practice of producing data news as data journalism and emphasize that news media are able to reveal the truth by analyzing data not available to citizens using software (Bradshaw, 2010; Parasie and Dagiral, 2012). Data journalism comprises data-driven practices combined with two distinct areas: computer science and journalism (Lim, 2015). Data journalism deserves interest from the scholarly community as well as news businesses for two reasons. First, journalists face an information environment featuring volume and wide availability of data, and journalists need to examine the nature of data instead of gatekeepers at the traditional news media (Bradshaw, 2015). Second, data journalism has been recognized as an alternative to traditional journalism, able to overcome deteriorating credibility and generate revenue (Lim, 2015).

In particular, data journalism practices enable users to participate in the stage of information gathering and give feedback regarding data analysis, visualization, and data opening, thus contributing to narrowing the distance between news organizations and users. Television networks recognize the values of data journalism and produce diverse content assisted by specialized departments and staff members. Data news might be seen as an ideal form of television news, as the latter has high visual appeal. Researchers have previously taken up case studies of infographic applicability (Choi, 2015; Kim, 2014), newspapers’ production of data news (Daniel and Flew, 2010; Karlsen and Stavelin, 2014; Royal, 2010), and the status of data journalism (Anderson, 2013; Cohen et al., 2011; Lim, 2015; Shin, 2014).

However, theoretical research on how data journalism practices are represented in television news is limited, because few have analyzed the characteristics and news forms of data news content of television networks across different countries. In the present study, South Korean and US television networks were chosen for investigation for four reasons. First, South Korean television networks have garnered much interest from the public and the academic by systematically analyzing and visualizing the spread of Middle East Respiratory Syndrome (MERS) since its outbreak in May 2015. KBS and SBS, two Korean networks, have created a data journalism team and led these data journalism practices by regularly producing data news content. Second, this study was based on South Korea, which promotes an open data policy and an analytical approach toward data for public services as well as education. Third, ABC, CBS, NBC, CNN, and many US local affiliated networks actively produce data news contents known as infographics, which offer many interesting examples with similarities to and differences with South Korean television networks. Fourth, Korean broadcasting journalists have visited US networks to learn their data journalism practices (Korea Broadcasting Journalist Association, 2014).

A comparison of data journalism practices of the two countries’ networks can reveal interesting theoretical and practical insights. This study compared one year of data news content from major television networks in South Korea and the US,

which shows the advantages of cross-country analysis and the depth of data collected. The most similar systems design model assumes that countries share both similar as well as dissimilar traits and analyzes how variables of interest vary according to these differences (Przeworski and Teune, 1970). Researchers have also applied this model to an analysis of German and US online journalists' characteristics (Quandt et al., 2006).

Researchers view the utility of data journalism from technological perspectives such as big data and visual software. This optimistic notion is likely to lead to a neglect of the theoretical analysis of data journalism practices, in particular, in television news. In this light, the present study is one of the early attempts to analyze how data journalism practices are represented in South Korean and US television news. This study aims to determine useful concepts for understanding data journalism as news-making processes, namely, news forms. The findings are useful for understanding how news users are served or not through the use of data or data visualizations and different forms of data journalism.

The first objective of this study is to identify the representation of data journalism in television news in South Korea and the US by developing theoretical concepts. These patterns can appear in such diverse elements as graphs, infographics, maps, or tables in combination with television networks' practices. The second objective is to find news forms embedded in data news content. The categorization of news forms could contribute to the better theorizing of data journalism and refining the concept of data news in television content. The third objective is to suggest a direction of data journalism for television news by providing the best and worst data news content.

## **The concept of data journalism and its characteristics**

The term 'data journalism' emerged in 2006 as scholars began thinking of journalism as programming, focusing on data as the essence of news making (Gynnild, 2014). Researchers refer to data journalism in various ways—as 'data-driven journalism,' 'computational journalism,' 'journalism as programming,' 'programming as journalism,' 'open-source movement,' and 'news applications' (Cohen et al., 2011; Gynnild, 2014). These terms testify to the fact that data journalism is different from traditional journalism but that it follows existing news-making routines. The function of providing the public with important issues is significant, although data journalism takes data as its starting point. Accordingly, data journalists consider themselves to be journalists (Karlsen and Stavelin, 2014; Royal, 2010).

In this vein, researchers define data journalism as practices that employ data visualization, news application, and data opening on the basis of computer-assisted reporting and precision journalism (Gray et al., 2012). Data journalism also refers to the process through which news organizations filter data, visualize it, and make a story in order to provide value to users (Lorenz, 2010). Journalists can extract meaning from open data, filtered data, or hidden data to facilitate user understanding. Data journalism is an integrative practice combining in-depth investigation,

statistics, graphic design, and programming (Bradshaw, 2010). From a comprehensive perspective, data journalism is the process of telling a story through data and visualization, and the key sources are quantitative (Knight, 2015).

To understand the theoretical implications of data journalism, researchers can analyze issues in terms of politics/public policies, the economy, the institution/field, news media, journalistic culture, and technology (Anderson, 2013). The relationship between the four causes and the nature of technology proposed by Heidegger (1977) can help understand the implications. Heidegger suggests that the four Aristotelian causes explain the nature of technology. The first is *causa materialis* (material cause), or producing something; the second cause is *causa formalis* (formal cause), or deciding the forms or ways through which a material exists; the third cause is *causa finalis* (final cause), or showing the purpose of a material or forms; and the fourth is *causa efficiens* (moving cause), or making the final material (Heidegger, 1977). Heidegger explains the four causes by discussing a silver chalice. Silver is the *causa materialis* making the chalice, and an aspect is the *causa formalis* allowing the chalice to be what it is. What enables the chalice to exist in the area of consecration is the *causa finalis*, while a silversmith who produces the chalice based on the three causes is the *causa efficiens* (Heidegger, 1977: 7–8).

When it comes to data journalism, data such as quantitative forms or documents are the material cause, while visualization and infographics are the formal cause (Karlsen and Stavelin, 2014). The final cause is the function of news media (such as satisfying the public's right to know), while the moving cause is the journalists and programmers who produce news by combining news gathering techniques and programming skills. Data programmers, developers, and journalists have the same role as traditional journalists, and they produce news content with advanced technologies (Royal, 2010). Data is the key to data journalism practices; and journalists prefer linear forms for making stories based on graphics and view computing as useful for data analysis (Karlsen and Stavelin, 2014).

## Impact of data journalism on news making

Many news organizations have adopted data journalism practices for producing news content (De Maeyer et al., 2014). The typical indicators for the popularity of data journalism include international award events for data-driven news projects and journalists' participation in training camps for data analysis. Data journalism awards by the Global Editors Network have attracted major news media, including *the Guardian*, *BBC*, *The New York Times*, *The Wall Street Journal*, *The Washington Post*, *Financial Times*, *ProPublica*, *Zeit Online*, and *The Economist*. News organizations and interested groups from 39 countries also participated in the awards since 2012; 76.8% of these organizations were newspapers, television networks, and other news organizations (Kim and Lim, 2016).

News organizations and journalists show considerable interest in data journalism practices. Diverse news organizations participate in training programs provided by the National Institute for Computer Assisted Reporting and the

University of King's College (Vallance-Jones, 2014). Some data journalists form Facebook groups and promote their data news and share their knowledge with other journalists (Appelgren, 2016).

In addition to increasing interest in data journalism, these practices have the advantage of improving the current status of journalism, which has suffered from poor credibility by inducing participation from users. By utilizing analytic software and technologies, data journalism practices help users understand current issues. Because data journalism is based on crowd-sourcing and an open-source environment, users can experience news from their perspectives (Hamilton and Turner, 2009). In particular, data journalism practices seek the sacredness of fact in data and break the gap between news coverage and reality because innovative journalists, developers, and entrepreneurs change news-making processes through use of analytic tools (Rogers, 2013).

However, the application of data journalism to news-making processes remains low. Data news content constituted only 6–22% of the stories in 15 British newspapers, including *the Guardian*, *Daily Mail*, and *The Independent* (Knight, 2015). The most frequent data journalistic elements in the newspapers included an infographic, a static map, a chart, and a number pullout, while the least frequent elements included an interactive map, a list, a data description, a table, and a timeline. The content relied on institutional sources. Further, journalists are not interested in providing users with raw data and prefer to use a graphic, a table, or a search function as supporting materials for a story (Karlsen and Stavelin, 2014). The data news content of the *Chicago Tribune* from 2002 to 2009 featured an in-depth interview, a chart, a table, and a map (Parasie and Dagiral, 2012). The data journalism practices are likely to be reflected in specific news forms.

## News forms and data news

News forms are not the results of technology, but products of political culture and reflect power relations between journalists, politicians, and the public (Barnhurst, 2012). News forms are a useful concept for understanding news texts. For instance, an analysis of television news reveals three news forms: narrative, visualization, and talk (Corner, 1995). The narrative of television news creates a meaningful and important story, while visualization helps viewers understand news coverage visually. Visualization also induces viewers to check sources and evaluate the credibility of the coverage. Television news consists of description, interpretation, and evaluation. These three forms are summarized as 'news as stories,' 'news as pictures,' and 'news as words' (Corner, 1995).

Forms of online news include 'information and knowledge,' 'essence and variability,' and 'participation and response' (Lim, 2006); newspaper and television sites emphasize immediacy over interactivity (Domingo, 2008). Online newspapers seek experimentation, moderation, and standardization as news forms (Barnhurst, 2012). For experimentation, online newspapers introduce diverse elements such as surfing within news sites, interactivity, or links. For moderation, online

newspapers control the placement of content, follow-up coverage, and usage of wire services. Standardization refers to the emergence of similar content.

Similar news forms can be present in the data news content of television networks. Television news represents issues symbolically through visualization instead of direct description (Corner, 1995). This trait can relate to the implications of visual elements of data news content. Visual elements include a dynamic map, a graph/a chart, an infographic, a list, a number pullout, a static map, a table, and a timeline (Knight, 2015). These elements allow users to experience the relevance and immediacy of issues. When this study reviewed previous data journalism research in terms of these news forms, data news content was found to be based on ‘interpretation,’ ‘visualization,’ ‘complexity,’ and ‘participation.’

Data journalist elements such as maps or other visuals contain these news forms and have a certain complex and visual appeal. For instance, an interactive map and an infographic have a high level of interpretative complexity and visual appeal (Knight, 2015). This interactivity contributes to increased visits to news homepages and revenue generation. The *Texas Tribune* generates thousands of dollars in revenue by linking the state employees’ salary database to external surveys (Batsell, 2015). User participation through databases and surveys was found in the quiz in *The New York Times* on 21 December 2013, named ‘How Y’all, Youse, and You Guys Talk.’ The 25-question quiz showed a dialectical map describing readers’ dialect patterns (Katz and Andrews, 2013).

User participation and news experiences are possible in the existing online news, but data journalism further emphasizes users’ data literacy. The purpose of data journalism is to cite sources and data and integrate them to help users understand data easily (Bounegru, 2012). Video content is essential for television news, and thus, television news can be ideal for data journalistic elements and user participation. The way that television networks apply data journalism to news content production can be both quantitative and visually appealing.

## Research questions

Patterns of data journalism vary with country, and there is a sharp contrast between countries with rich media resources and those with poor media resources (Fink and Anderson, 2015). Given this consideration, the present study compares data news content in the South Korean and US television networks and identifies the patterns of data journalistic elements and news forms. Previous research divided data journalistic elements into an infographic, a static map, a chart, a number pull quote, a list, a table, and a timeline (Knight, 2015). Given the review of previous data journalism research, this study asks the following research question:

RQ1: How are such data journalistic elements as infographics, maps, or tables presented in the news content of major South Korean and US television networks?

Specific forms embedded in data news content could imply the nature and direction of the production of this content. Accordingly, this study asks the second research question:

RQ2: What types of news forms are embedded in the data news content of major South Korean and US television networks?

Method

Unit of analysis and data collection

South Korean and US national television networks and cable networks were the focus of analysis. Following previous research (Knight, 2015), this study defined data news as content that contains such elements as a table, a static or dynamic graphic, or a chart, either supporting or independent of a news text. Dynamic content provides numbers, short descriptions, or other relevant information when users place a cursor on their corresponding elements.

Table 1 shows a specific location for data collection. For the South Korean networks, three national networks (*KBS*, *SBS*, and *MBC*) and a cable network (*JTBC*) were chosen. *KBS* operates its specialized department, called the ‘Dataroom,’ and its website provides relevant data news content. *SBS* published a series entitled ‘Data news,’ but the network website did not allow access to content containing this term. This study collected the content by searching keywords ‘SBS News’ and ‘Data news’ on Google. This study evaluated whether the content clearly belonged to SBS by examining stories headlined ‘Date news’ as well as bylines. This procedure captured more data news stories of SBS than those of any other networks. *MBC* provided news content under the sections named ‘15seconds,’ ‘MBVideo,’ and ‘MBCard,’ where this study collected data news.

Table 1. Sites for data news content from South Korean and US television networks.

Nation	Network	Web address
South Korea	KBS	<a href="http://news.kbs.co.kr/news/list.do?mcid=0909#l">http://news.kbs.co.kr/news/list.do?mcid=0909#l</a>
	SBS	<a href="http://news.sbs.co.kr/news/endPage.do?news_id=N1002656741">http://news.sbs.co.kr/news/endPage.do?news_id=N1002656741</a>
	MBC	<a href="http://imnews.imbc.com/n_newssas/n_story/2016.html">http://imnews.imbc.com/n_newssas/n_story/2016.html</a>
	JTBC	<a href="http://news.jtbc.joins.com/article/article.aspx?news_id=NB11152522">http://news.jtbc.joins.com/article/article.aspx?news_id=NB11152522</a>
US	ABC	<a href="http://abcnews.go.com/us/infographics/">http://abcnews.go.com/us/infographics/</a>
	CBS	<a href="http://www.cbsnews.com/search/?q=data+visualization">http://www.cbsnews.com/search/?q=data+visualization</a>
	NBC	<a href="http://www.nbcnews.com/pages/search/?q=data+visualization">http://www.nbcnews.com/pages/search/?q=data+visualization</a>
	CNN	<a href="http://edition.cnn.com/search/?text=data+visualization">http://edition.cnn.com/search/?text=data+visualization</a>



*JTBC* published content under the heading of ‘Today’s data news.’ This cable network has focused on data-journalism related content as compared with *YTN*, another cable news channel. *JTBC* has been the most popular news channel in 2016, because 45% of Koreans chose the network for news consumption, followed by *KBS* (18%) and *YTN* (10%) (Jung, 2017).

The examined US television networks included *ABC*, *CBS*, *NBC*, and *CNN*. *CNN* was chosen because it was a popular news channel. *NBC Universal*, a merger of *NBC* and *Universal* in 2004 owns *NBC News*, *MSNBC*, and *CNBC*. Data news content from these three channels was also collected. Local and regional television stations affiliated with the national networks and *CNN* also produced data news content, which was collected. For instance, *WHTM-TV* is located at Harrisburg, PA and has a partnership with *ABC*; *NBC 10* is a local station in Philadelphia affiliated with *NBC*. However, data news content from wire services was excluded.

Unlike their South Korean counterparts, the US television networks did not label their content as ‘data news.’ This study searched stories by entering the following terms into network websites: ‘data visualization,’ ‘visualization,’ ‘interactive,’ ‘infographic,’ ‘interactive infographics,’ ‘mapping,’ ‘tables and data,’ ‘charts and data,’ ‘data infographics,’ ‘data analysis,’ ‘data mapping,’ ‘data cleaning,’ and ‘visualization and interactive.’

Visual contents of these stories cannot be presented in this study as copyright regulations do not allow reproduction without permission. Instead, this study provides the following links as some examples of visual data news content. Readers can view these by visiting the links.

CBS: <http://www.cbsnews.com/news/twitter-celebrates-its-10th-anniversary/>

CNN: <http://money.cnn.com/2016/02/26/news/economy/middle-class-americans/index.html>

The data collection period was one year from 1 April 2015 to 30 March 2016 and aimed to capture the most recent data news. The one-year period may be considered relatively short, but given that data journalism has been established in television newsrooms, the period should be sufficient to identify relevant data news content for analysis.

## Procedure of data analysis

### *Basic variables*

This study focused on news topics, data journalistic elements, complexity and visual appeal of the elements, and data sources based on previous data journalism research (Knight, 2015). News topics were divided into leisure/entertainment, lifestyle, international issues, social issues, science/environment, health/welfare, politics, economy, education, and sports.

Data journalistic elements included 18 categories in a sequential order: a static table, a dynamic table, a static graphic, a static infographic, a dynamic graphic,



a dynamic infographic, a static graph, a dynamic graph, a static chart, a dynamic chart, a static map, a dynamic map, a data video clips, a timeline, a list, a number pull quote, raw data, and a news application.

The complexity of these elements was measured through the degree to which the production of the elements required analysis and interpretation (Knight, 2015). The visual appeal of the elements referred to the degree to which the elements visually appealed to users. Each coding category was assigned a unique number, with a high number indicating high complexity and high visual appeal. The complexity of elements was rated between the lowest and highest: a number pull quote (1 point) and an infographic (15 points). The following elements fell in between: (2) raw data; (3) a static graphic; (4) a static map; (5) a list; (6) a timeline; (7) a static table; (8) a static graph/a static chart; (9) a dynamic table; (10) a dynamic graph/a dynamic chart; (11) a dynamic graphic; (12) a dynamic map; (13) data video clips; and (14) a news application.

The lowest and highest visual appeal elements were a number pull quote (1 point) and an infographic (9 points), respectively. The following elements fell in between: (2) raw data; (3) a list; (4) a timeline; (5) a static graphic, a map, a graph, a chart and a table; (6) a dynamic graphic, a map, a graph, a chart, and a table; (7) data video clips; and (8) a news application.

The sourcing types were divided into seven categories on the basis of previous research (Knight, 2015): government, companies, research institutions (nonprofit, university), international organizations (e.g., United Nation), poll/news media data, non-governmental organization, and no provision. Further, it was examined whether news content provided raw data for the elements, and whether the elements provided enough information for understanding their meaning independently of a story was evaluated.

### *News form*

To identify how data journalism practices were represented in television news, this study assumed that open coding for possible categories was important. It was expected that reliance on existing categories would result in forcing content to fit the preexisting frame (Kim, 2011). This study used the grounded theory method (GTM), which extracts meaningful categories from data. GTM focuses on categories by comparing data constantly (Glaser and Strauss, 1967), and analyzes such diverse areas as in-depth interviews, observation, news texts, statistical data, and diaries (Lim and Kim, 2015). GTM is an attractive tool that includes such distinct styles including Glaserian, Straussian, and constructivist GTMs. This study chose the constructivist GTM because it collects and analyzes data simultaneously, extracts categories without hypotheses, and follows a systematic approach such as writing analytical notes (Charmaz, 1996). Earlier, it had been successfully applied to an analysis of news coverage of North Korean defectors (Lim and Kim, 2015).

The researcher and an assistant read data news content from the eight television networks and extracted as many categories as possible regarding the representations of data news content. The focus was on writing theoretical observations by considering the nature of data journalistic elements instead of the specific content themes. This approach was an active analysis involving identifying the meaning of the elements. A short summary of thoughts and opinions through this procedure is a code (Charmaz, 2012)—which is a meaning that is revealed clearly from the data—and the concept resulting from the relationship between codes is a category (Rennie, 2006). The present study performed a theoretical sampling that collected relevant data to the point of saturation where no new categories appear (Boeije, 2002). For instance, the present study stopped collecting data when similar categories emerged repeatedly.

Second, this study compared a category with other categories and combined similar categories into top categories. This refers to a constant comparative method that identifies top categories with a comparison of the relationship between categories (Rennie, 2006).

As a qualitative analysis, the constructivist GTM needs to secure the trustworthiness of qualitative research. Qualitative research should satisfy the requirements of truth value, applicability, consistency, and neutrality (Lincoln and Guba, 1985). Truth value refers to the degree to which research findings are true. The present study collected the data news content from the eight television networks for one year and analyzed data journalistic elements to extract categories. Applicability refers to whether similar results can be found in other conditions. This study compared the news content of major South Korean and US television networks. Thus, an analysis of other networks adopting similar news-making processes could be expected to produce similar findings.

Consistency refers to the extent to which reanalysis of the same data yields the same results. This study followed the procedures of constructivist GTM, and it was expected that when other researchers repeat them, they might yield the same results. Neutrality refers to whether the results were based on the data or on the researcher's subjective interests. This study used analytic notes to extract codes and categories, which reduced the risk of biased category analysis.

## Results

### *Background information*

Over a one-year period, television networks in South Korea and the US produced 227 and 246 data news items, respectively. The percentages of data news were similar across both television countries, except for *MBC*. For the South Korean networks, *SBS* produced 80 (16.9%) data news items, followed by *KBS* (65, 13.7%), *JTBC* (59, 12.5%), and *MBC* (23, 4.9%). For the US networks, *NBC* produced 69 (14.6%) data news items, followed by *CNN* (63, 13.3%), *CBS* (61, 12.9%), and *ABC* (53, 11.2%).

Topics of data news

This study compared the rankings of news topics between television networks in both countries. This study performed Kendall’s  $\tau$ -b (tau-b) analysis of the rankings. This correlation analysis is more efficient for small sample sizes than Spearman’s  $\rho$  (rho) (Dimmick and McDonald, 2001; Lim, 2010).

Among 28 correlations of news topic rankings, those of *SBS* were significantly related to those of *ABC* (Kendall’s  $\tau$ -b = .548,  $p$  = .034,  $N$  = 10), and those of *ABC* were significantly associated with those of *CNN* (Kendall’s  $\tau$ -b = .558,  $p$  = .029,  $N$  = 10). This indicated that each television network covered different news topics. For instance, social issues were the most frequent topic for *KBS*, *JTBC*, and *NBC*, while politics were the number one topic for *SBS* and *ABC* in Figure 1. Life style

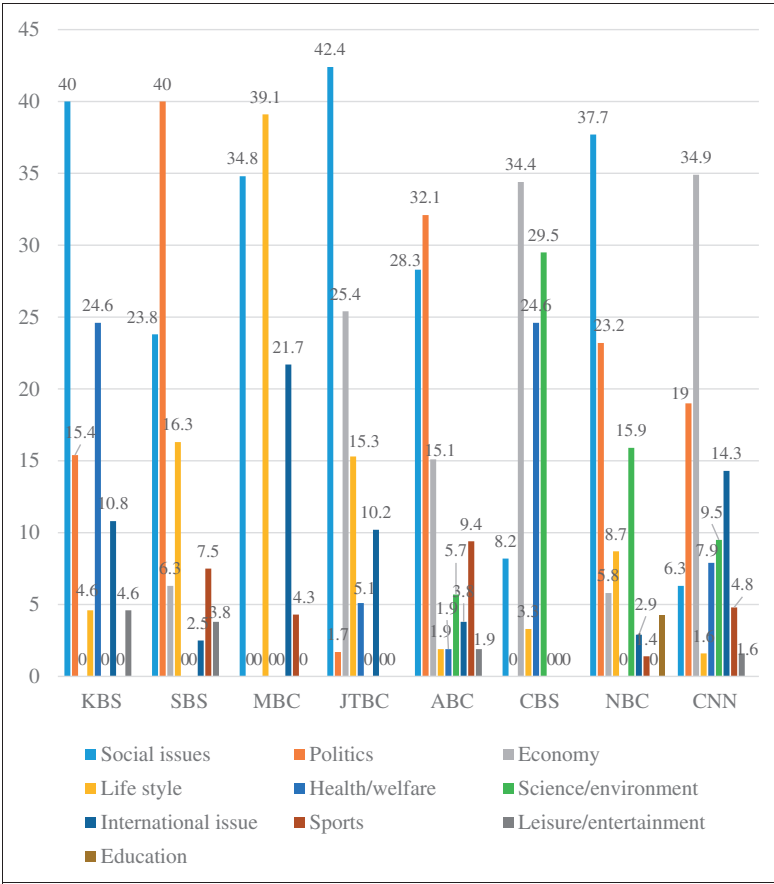


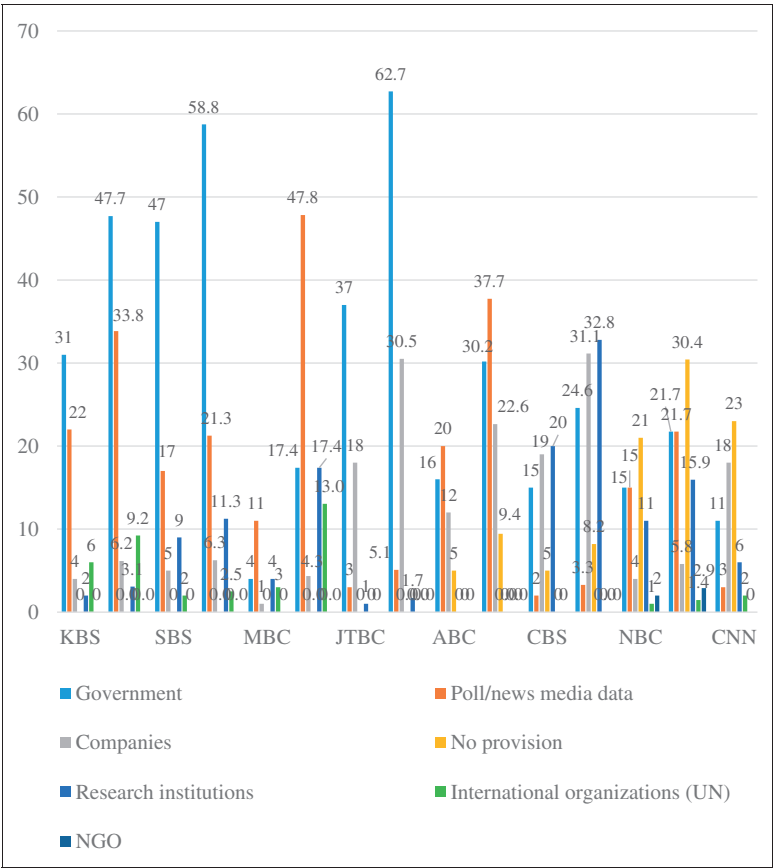
Figure 1. News topics of data news content from South Korean and US television news.

was the most dominant topic for *MBC*, while the economy was the most frequent topic for *CBS* and *CNN*.

*Sources: Government sources versus quantified data*

This study intended to perform Chi-square analysis of sourcing patterns in data news, but the collected data did not satisfy the statistical assumptions of Chi-square analysis. In a Chi-square analysis, there should be no cells containing expected frequencies of less than one, while the proportions of cells containing expected frequencies of less than five should be less than 20% (Michael, 2001).

Figure 2 shows the percentages of frequent sources in television news. The South Korean networks relied on government sources—except for *MBC*, which mostly used poll/news media data. In contrast, poll/news media data were a dominant



**Figure 2.** Sources of data news content from South Korean and US television networks.

source for *ABC*, and research institutions were the most frequent source for *CBS*. *NBC* and *CNN* did not identify sources in their data news. This is an interesting contrast. Government sources are most preferred by traditional television networks, and this is consistent with perspectives of an elite model or an indexing hypothesis (Althaus et al., 1996; Reese et al., 1994). The elite model assumes that power elites are interconnected within and across television networks. The indexing hypothesis explains that official discourse decides the boundaries of news media discourse and that officials' views are reflected in news coverage. These theoretical concepts are applied to data journalism practice. For instance, the data news content of the *Chicago Tribune* from 2002 to 2009 used the Illinois state government and federal government as sources (Parasie and Dagiral, 2012). In the present study, the Korean networks were found to follow the journalistic rule of giving more weight to official sources, even for the production of data news. In contrast, US counterparts relied on quantified sources that could fit the focus of data journalism on the data itself.

### *Less provision of raw data: Low level of transparency*

Data journalism demands our attention because it allows users to analyze data and compare their own results against reporters' analysis (Daniel and Flew, 2010; Gray et al., 2012). In the present study, the South Korean television networks did not make data available to users at all and the US networks did not provide the data in 98.8% of the data news content. *ABC* linked three data news items to PDF files containing detailed analytic results. These findings were consistent with previous research (Lim, 2016) in which cases of reporters providing raw data for news content constituted only 7.1% of the total.

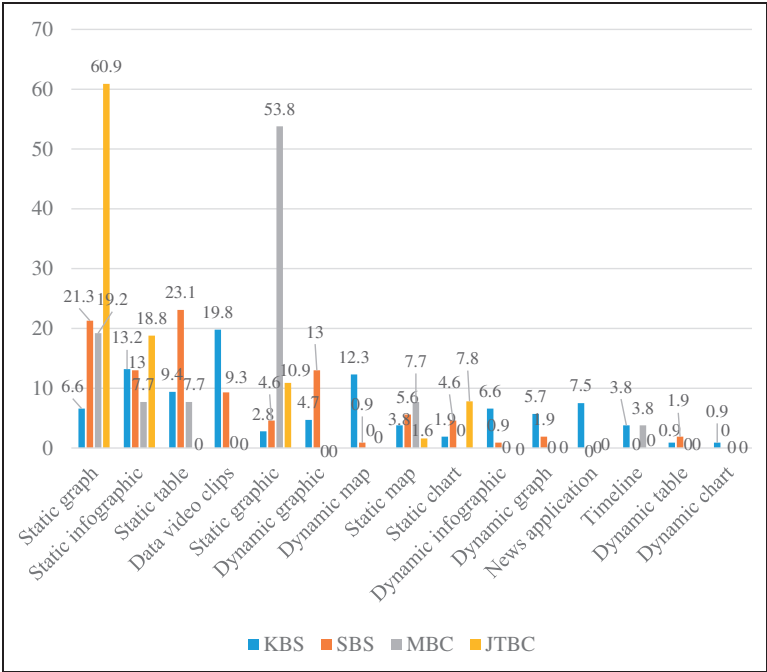
The degree of data opening is linked to the issue of transparency of news-making processes. The level of transparency of data news content for both countries' networks was surprisingly low, given that data journalism values user participation, feedback, and sharing data analysis with users.

### *Findings of research questions*

Different types of data journalistic elements and news forms were present in the same content. The South Korean and US television content contained multiple data journalistic elements and news forms. For instance, one item consisted of a text, a news application, a static graphic, and a static table. Thus, this study performed an analysis of multiple responses in IBM SPSS Statistics 21, yielding frequencies, a percentage, a percentage of cases, and crosstab results.

The first research question asked how such data journalistic elements as infographics, maps, tables were present in the content of major South Korean and US television networks.

The multiple responses analysis revealed that a static graph was the most frequent element for Korean television networks (24.3%, percentage of cases: 32.6%,

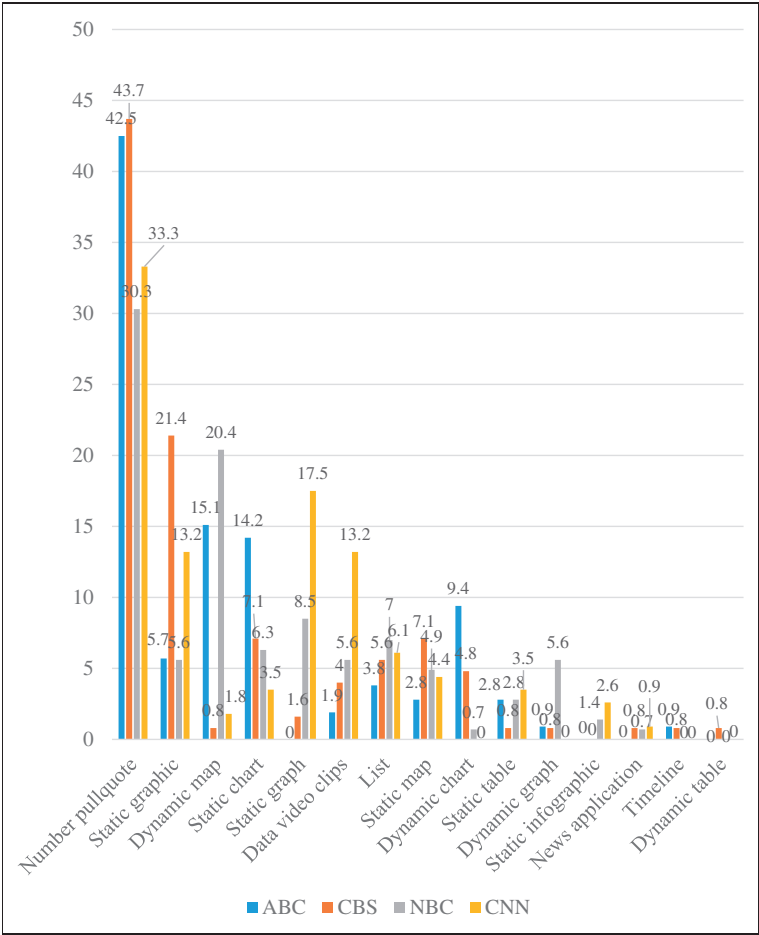


**Figure 3.** Fifteen data journalistic elements in content of the South Korean television networks.

complexity score: 8/15, visual appeal score: 5/9). The second-most frequent element was a static infographic (13.8%, percentage of cases: 18.5%, complexity score: 15/15, visual appeal score: 9/9). The next frequent elements included a static table (12.2%, percentage of cases: 16.3%), data video clips (10.2%, percentage of cases: 13.7%), and a static graphic (9.5%, percentage of cases: 12.8%). These were the top five data journalistic elements for the South Korean networks. A dynamic graph, a news application, a timeline, a dynamic table, and a dynamic chart were the five least-frequent elements.

For each network of South Korea in Figure 3, *KBS* mostly used data video clips (19.8%), which were complex (13/15) and visually appealing (7/9). In contrast, *SBS* used a static table (23.1%, complexity score: 7/15, visual appeal score: 5/9). *MBC* preferred a static graphic (53.8%, complexity score: 3/15; visual appeal score: 5/9), and *JTBC* mostly used a static graph (60.9%, complexity score: 8/15, visual appeal score: 5/9). This indicated that *KBS* emphasized complexity and visual appeal in data news content.

Regarding the content of major US television networks, the most dominant element was a number pull quote (37.1%, percentage of cases: 73.6%, complexity score: 1/15, visual appeal score: 1/9), and the second-most dominant element was



**Figure 4.** Fifteen data journalistic elements in news content of the US television networks.

a static graphic (11.5%, percentage of cases: 22.8%, complexity score: 3/15, visual appeal score: 5/9). These were followed, in frequency, by a dynamic map (9.8%, percentage of cases: 19.5%), a static chart (7.6%, percentage of cases: 15%), and a static graph (7%, percentage of cases: 13.8%). The five least-frequently used elements included a dynamic graph, a static infographic, a news application, a timeline, and a dynamic table.

In Figure 4, the US networks preferred a number pull quote in creating data news content. For the next most frequent elements, *ABC* used a dynamic map (15.1%, complexity score: 12/15, visual appeal score: 6/9) and a static chart (14.2%, complexity score: 8/15, visual appeal score: 5/9). *CBS* used a static graphic (21.4%, complexity score: 3/15, visual appeal score: 5/9). *NBC* used a dynamic map



(20.4%, complexity score: 12/15, visual appeal score: 6/9) and *CNN* used a static graph (17.5%, complexity score: 8/15, visual appeal score: 5/9). This demonstrated that the US networks, except for *ABC*, relied on a number pull quote, which was both less complex and less visually appealing. In contrast, *ABC* considered complex, visually appealing elements.

These findings suggest that South Korean networks apply more complex, visually appealing elements to the production of data news. However, the networks prefer less interactive content, which can be linked to low levels of participation from users because the content does not allow user control. In contrast, the US networks preferred relatively simple elements that were not visually appealing. The US networks focused on the interactivity of content with users. This contrast was another informative finding of the study.

The second research question concerned the types of news forms embedded in the content of South Korean and US television networks. To identify the news forms, this study summarized theoretical observations made while analyzing data journalistic elements, leading to the extraction of categories. For instance, one summary read as 'a dynamic map providing foreclosure information and its degree according to a county, a number and a color, easy to understand, but lack of context, supportive of a story.' This study further determined whether incorporated elements were independent of or dependent on storylines. An independent element contained concise explanation and relatively detailed information that allowed users to understand it without reading a story. If it did not meet this characteristic, it was coded as dependent on a story.

This study created a summary of each data journalistic element and compared each to the extracted categories. These initial categories were compared again to identify the second set of categories, which were compared with one another to lead to the third category. When no more similar categories emerged, they were determined as the top categories. These procedures yielded 10 categories, as follows: 'visualization,' 'typification,' 'participation,' 'contextuality,' 'detailedness,' 'condensity,' 'linkage,' 'completeness,' 'sorting,' and 'information amount.'

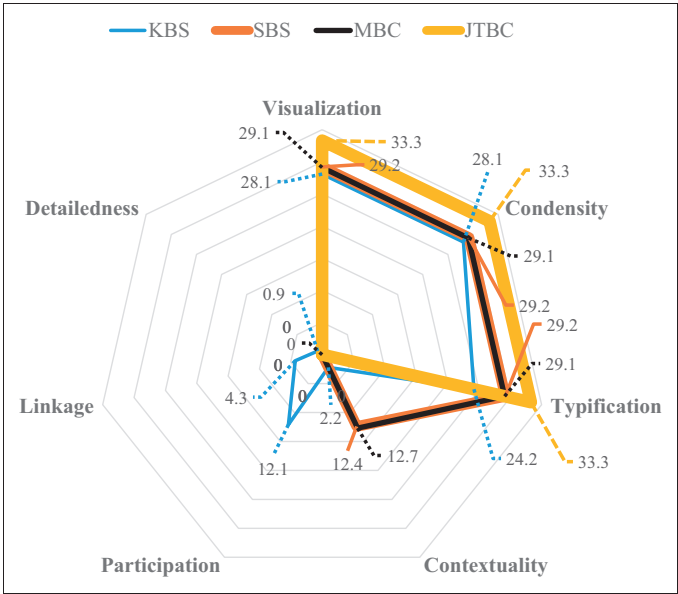
Visualization referred to analytical results represented as visual elements, such as a table, a graph, a chart, a map, or an infographic. Typification referred to the degree to which data journalistic elements divided information into clear categories or variables. Participation denoted that the elements allowed users to enter information and find relevant content. Contextuality referred to the degree to which the elements provided background or context for understanding their meanings. Detailedness meant the extent to which the elements were detailed and specific, while condensity rated how concise and condensed the information provided by the elements was. Linkage referred to the degree to which the elements provided raw data or other relevant materials. Completeness demonstrated whether the elements contained sufficient information for understanding their meanings. Sorting referred to the ascending or descending order of numerical values in the elements, while information amount referred to how much information the elements provided.

As discussed in the Methods section, this study compared these 10 categories and collapsed similar categories into top categories. This procedure, a constant comparative method, contributes to revealing high-level theoretical concepts. Through the procedure, the study extracted two top categories: ‘understandability’ and ‘information independence.’ Understandability meant how easy the information of data journalistic elements was to understand. Information independence referred to the degree to which the elements provided sufficient information to render them independent of a story. When the 10 categories were appropriately represented in news content, the level of comprehension of the information in the content was enhanced, and the elements were considered not reliant on a news text. Figures 5 and 6 visualized findings from a multiple responses analysis.

Visualization, condensity, and typification were the key news forms constituting the data news content of the South Korean television networks. However, contextuality, participation, linkage, and detailedness were either minimal or absent in the content.

The data news content of US television networks was based on visualization, typification, condensity, and completeness. In particular, the US networks emphasized the completeness of information unlike their South Korean counterparts, indicating that the former might be better than the latter in terms of information quality. Contextuality was at low level and participation absent in this content.

Visualization, condensity, and typification were the major news forms accounting for the data news content of both countries’ television networks. Because data



**Figure 5.** Seven news forms in content of the South Korean television networks.

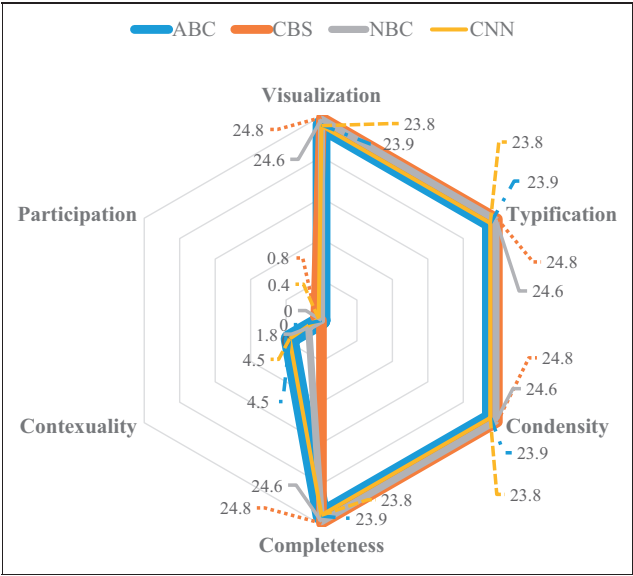


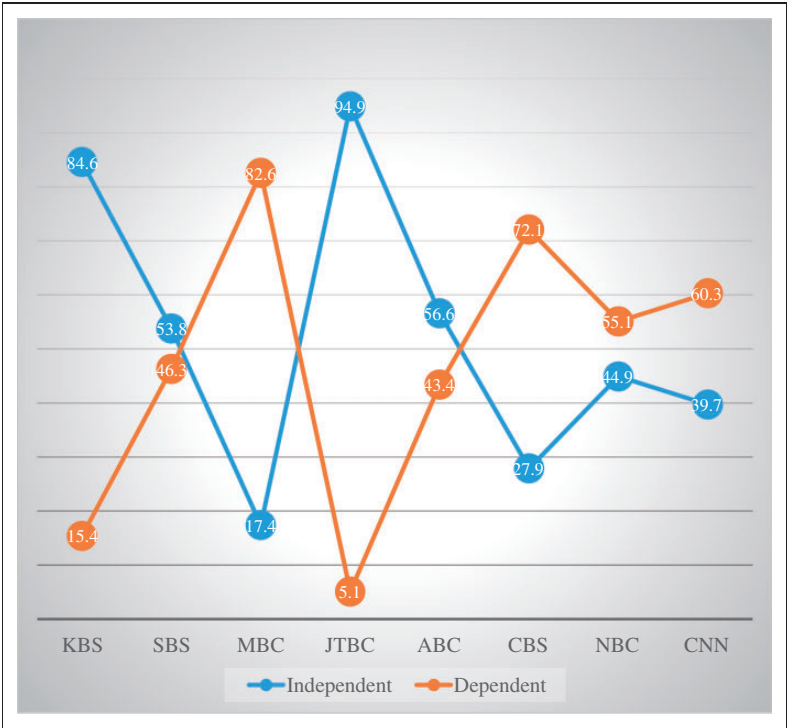
Figure 6. Six news forms in content of the US television networks.

journalism highlights visual processing, it is understandable that visualization was the key news form. However, the two countries’ networks did not focus on contextuality and participation, which could be a fundamental limitation of the current data journalism practices across the countries. The exception was that 12.1% of *KBS*’ content was based on the news form of participation, possibly because the network produced many news applications.

The top categories of news forms in the content of the eight television networks analyzed included ‘understandability’ and ‘information independence.’ These two categories emerged simultaneously from the content of the eight networks and implied the direction of data journalism practices for television networks. This study considered whether data journalistic elements such as a table, a map, or a news application were independent of a news text. If they relied on a text, they were subsumed under it.

The data journalistic elements in the South Korean television networks were more independent of, than dependent on, news texts. In contrast, those in the US television networks were more dependent on news texts than not. This difference was significant ( $\chi^2(473, N = 1) = 36.716, p < .001$ ). These patterns were remarkably different according to each network.

Figure 7 shows that in the news content of the three South Korean television networks (*KBS*, *SBS*, and *JTBC*), data journalistic elements were more independent of news texts than dependent on them. For *MBC*, the elements relied more on news texts. In contrast, the news content of the three US television networks (*CBS*, *NBC*, and *CNN*) had data journalistic elements more dependent on a news text



**Figure 7.** Relationship between data journalistic elements and a news text.  $\chi^2(473, N = 7) = 101.275, p < .001$ .

than independent of them. However, *ABC* showed an opposite pattern. These differences between the two countries’ networks were statistically significant ( $\chi^2(473, N = 7) = 101.275, p < .001$ ). Accordingly, the Korean networks were better than their US counterparts for presenting data journalist elements independent of a news text.

Given these findings, this study provided evidence of the good and bad types of data journalism to help readers understand data news content. An example of good execution of data journalism in television news includes *CBS*’ story of 3 August 2015, entitled ‘Soda infographic goes viral: How does cola really affect the body.’ The data journalistic element was a static infographic, showing how our body responds to soda 10, 20, 40, 45, and 60 minutes after drinking it. The infographic provided concise, easy-to-understand statements in red: after 10 minutes, 10 spoonsful of sugar enter our body; 20 minutes later, the sugar level in the blood increases, causing an increase in insulin. The liver starts to transform the sugar into fat. This static infographic provided its source (*TheRenegadePharmacist.com*) and was independent of a news text because it provided adequate information.

An example of poor execution of data journalism in television news is *MBC*’s story on 26 April 2015, entitled ‘[Coverage Plus] Seoul Likely to Enter the Era

of Light Subway Systems.’ The story had a static graphic, which contained brief descriptions such as ‘30 meters, 1/7 length of normal subway’ and ‘transfer on 4th line, transfer on 6th line, transfer on 1st and 2nd lines.’ The descriptions were too brief and provided neither context nor background. Thus, it was difficult to understand what the graphic meant without referencing the story. The graphic did not identify its source and was dependent on the story.

## **Discussion**

This study compared the data news content of television networks in South Korea and the US and found similarities and differences in news topics, sourcing patterns, data journalistic elements, and news forms. The South Korean networks focus on social issues, politics, and lifestyle, while the US networks cover the economy, social issues, and politics. Government sources are the most frequent sources used by television networks in both countries. Next, the South Korean networks rely on polls/news media data, while their US counterparts do not provide sources or use companies as sources. Networks in both countries seldom provide users with raw data.

Regarding the usage of data journalistic elements, the South Korean networks use a static graph and a static infographic most frequently, and the US networks use a number pull quote and a static graphic most frequently. In terms of the complexity and visual appeal of data journalistic elements, the South Korean networks prefer complex, visually appealing elements, such as infographics, while US counterparts use less complex, less visually appealing elements, such as number pull quotes. Visualization, condensity, and typification are the key news forms in South Korean television news and participation, linkage, and detailedness are less important. In the US news networks, visualization, typification, condensity, and completeness are the most dominant news forms. Interestingly, participation is the least frequently used news form in both countries’ networks.

These findings have informative theoretical implications. Certain types of news forms regulate the production of data news content in both countries’ television networks in similar and different ways. News forms reflect political culture and reveal power relations between journalists, politicians, and citizens (Barnhurst, 2012). From the perspective of power relations, the finding that the news form of participation is rare in both countries’ data news content implies that the networks try to control the process of producing content, and considering the audience as passive. Because the television networks are responsible for producing data news content, the representation of the content focuses on its delivery to audiences. Consequently, visualization, condensity, and typification are the most dominant news forms. Without the active participation of users, the data news content of the two countries’ networks serve as functional items aided by visuals and numeric information.

The theoretical advantage of news forms includes the fact that it helps us to define what data journalism is. That is, data journalism is a process through which

news media represent public issues with visuals and categories, condense information, include sufficient information, and provide context. Furthermore, data journalism practices induce user participation and produce easy-to-understand news content independent of a story. Previous research suggests that the visualization of television news enables viewers to check sources and estimate the credibility of coverage (Corner, 1995). However, without facility to secure a high level of user participation, visualization is limited to a supportive role. The irony is that the presence of contextuality in data news content for the two countries' networks is low, despite the fact that data serves as a basis for further reasoning and accounts for empirical evidence (Kitchin, 2014). A context, a background, or a history should be emphasized in data news content. In this sense, the present study defines data news content as public news about current issues visualized and contextualized on the basis of data analysis.

The other theoretical implication comes from intriguing results aided through comparing the data news content of South Korean and US television networks on the basis of the most similar systems design model. This model of cross-country analyses should be performed extensively in data journalism research. The cross-country analysis in this study shows that the television networks in both countries reveal similarities and differences regarding the production of data news. The US networks take a more quantitative approach than their South Korean counterparts, but both networks seldom provide raw data to users. Follow-up studies are required to examine the causes of these similarities and differences by considering journalistic culture and news-gathering routines.

Some noteworthy differences in data news content between South Korean and US television networks indicate that different journalistic rules regulate the production of content. For instance, the Korean networks apply the traditional journalistic rule of relying on official sources to the production of data news. In contrast, the US networks use quantified sources, which reflect the focus of data journalism on data. The South Korean networks prefer more complex, more visually appealing, and less interactive elements. Though it may seem contradictory, the rule of controlling the production of data news by limiting user participation explains this tendency. The South Korean networks are likely to consider data journalism as a channel for attracting more visitors to consume their content. The US networks use simple elements that are not visually appealing, but are more interactive. Thus, the South Korean networks consider more visual aspects of data news content, while the US networks value data-oriented interactive aspects of content.

This study suggests three possible guidelines with regard to the production of data news for television networks. First, television networks need to incorporate the participation of users into news-making processes because they are essential for the success of data journalism. Reporters view guaranteeing users' access to information as a major advantage of data journalism, as compared with traditional journalism (Lim, 2016). The two countries' networks did not develop a procedure through which users can actively participate in the production of data news

content. One solution for facilitating participation might be to produce such interactive content as news applications that allow users to search and identify what they need. In addition, CEOs of television networks need to hire programmers and designers for news applications and provide reporters with training programs. The cooperation of reporters with computer experts and graphic designers, as well as training in computing, is essential to the success of data journalism (Flew et al., 2012).

Second, television networks need to provide visual, multi-dimensional information independently of news text. In this study, data journalistic elements often only supported a news text. More detailed information should be provided in a format independent of the news text. This phenomenon could weaken the depth and diversity of information that data journalism seeks. The elements provide what a story misses as an independent representation. Without this, news organizations have no reason to link graphics, infographics, tables or maps to a story. A story can describe many aspects and, if necessary, simple visual content can be provided. This situation could negate the need for data journalism in newsrooms and we might thereby not expect any changes in news-making processes. Data journalistic elements need to exist independently of stories and provide information, explanation, or interpretation in a visual way. The elements described and a story cohabitate, rather than having a relation of domination-subordination. In doing so, television networks balance the amount of information and the level of understanding gleaned. This is important because too much information negatively affects users' understanding of data news content.

Third, television networks could enhance the transparency of news-making processes by introducing data journalism practices. The two countries' networks seldom provide raw data to users, making it difficult for them to overcome the tendency to control the whole process of news making. The value of data journalism lies in the possibility that it can overcome the less transparent practices of the existing news-making processes. For instance, news organizations could make data collected available to users so that they can conduct independent analyses and evaluate reporters' analyses against their own findings. This is related to the transparency that the movement of open public data pursues. However, in this study, no data news content from South Korean television networks provided raw data to the public, and only 1.2% of US data news content provided raw data. News organizations need to link data journalistic elements to news texts, and provide data and detailed materials to users for further feedback.

In summary, the practices of data journalism are established in television networks in different countries (e.g., South Korea and US) in similar and different ways. The practices raise several further research questions, such as how data journalism coexists with traditional journalism focusing on objectivity and inverted-pyramid writing and the extent to which user participation may be secured in the production of data news. The content of the two countries' networks simultaneously reveals similarities and differences, indicating the need for more cross-country analyses. Future researchers need to conduct a wide comparison of



data news practices across multiple different countries such as Asia, Europe, North America, South America, and Africa. The potential of data journalism to change the fundamentals of current news-making industries are likely to depend on thorough theoretical analysis and explanation of current trends in data journalism. The present study's findings could serve as a baseline for such endeavors.

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