

**DATA JOURNALISM: PRINCIPLE DEVELOPMENT AND  
KNOWLEDGE ADAPTATION IN THAILAND**



**Ekapon Thienthaworn**

**A Dissertation Submitted in Partial  
Fulfillment of the Requirements for the Degree of  
Doctor of Philosophy (Communication Arts and Innovation)  
The Graduate School of Communication Arts and Management  
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## ABSTRACT

<b>Title of Dissertation</b>	DATA JOURNALISM: PRINCIPLE DEVELOPMENT AND KNOWLEDGE ADAPTATION IN THAILAND
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This research aims to: 1) study the knowledge and use of Data Journalism in other countries; 2) study the knowledge and use of Data Journalism in Thailand as well as the obstacles and problems in the development of knowledge and use of Data Journalism in Thailand; and 3) create the guidelines for development the knowledge and promotion of the use of Data Journalism in Thailand.

The qualitative research methodology is used to conduct a research. Firstly, the documentary research was used to examine and analyze all related documents , which were found in the international academic online database system. Second, the case study analysis is applied to conduct case studies of the best practices of Data Journalism in foreign countries as a benchmark to compare Data Journalism in Thailand. Third, the in-depth interview is applied to gather information from journalists and executives in media organizations who presented news using Data Journalism, and academics and specialists in related data sciences. Then, the focus group is applied to collect the quasi-experimental data from the sample of Generation X and Generation Y.

The results indicate that Data Journalism in Thailand was still far from international standard in terms of knowledge and application by media organizations, due to several challenges. Therefore, the findings from this study together with the related concepts, to propose guidelines for development of the knowledge and promotion of the use of Data Journalism in Thailand can be carried out following the DATA model as follows. 1) D: Develop - Develop the knowledge ; 2) A: Adopt - Adopt Data Journalism into news organization ; 3) T: Tech & Info Support - Technology and Public Information ; 4) A: Act - Act upon the creation of the works.

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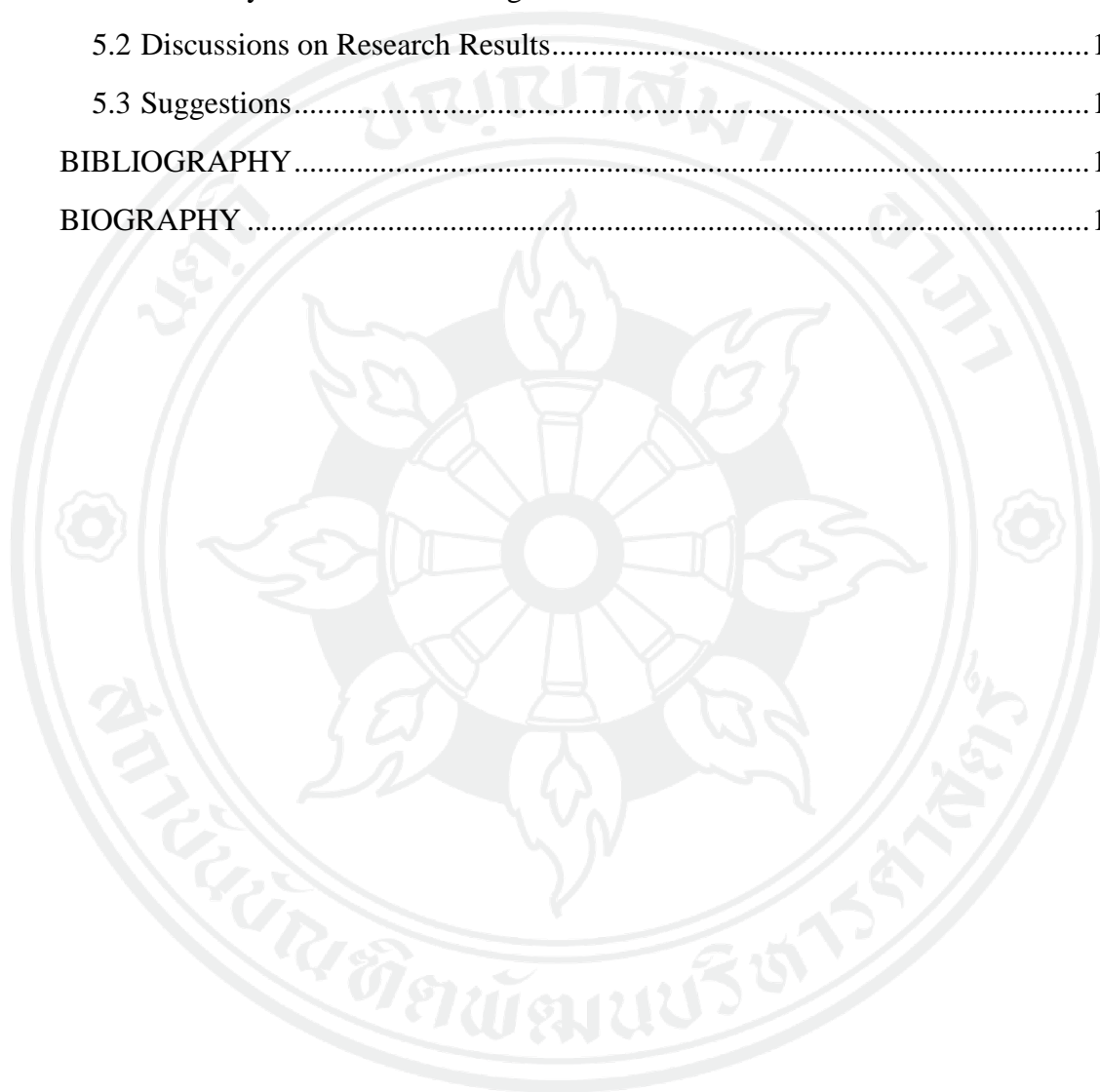
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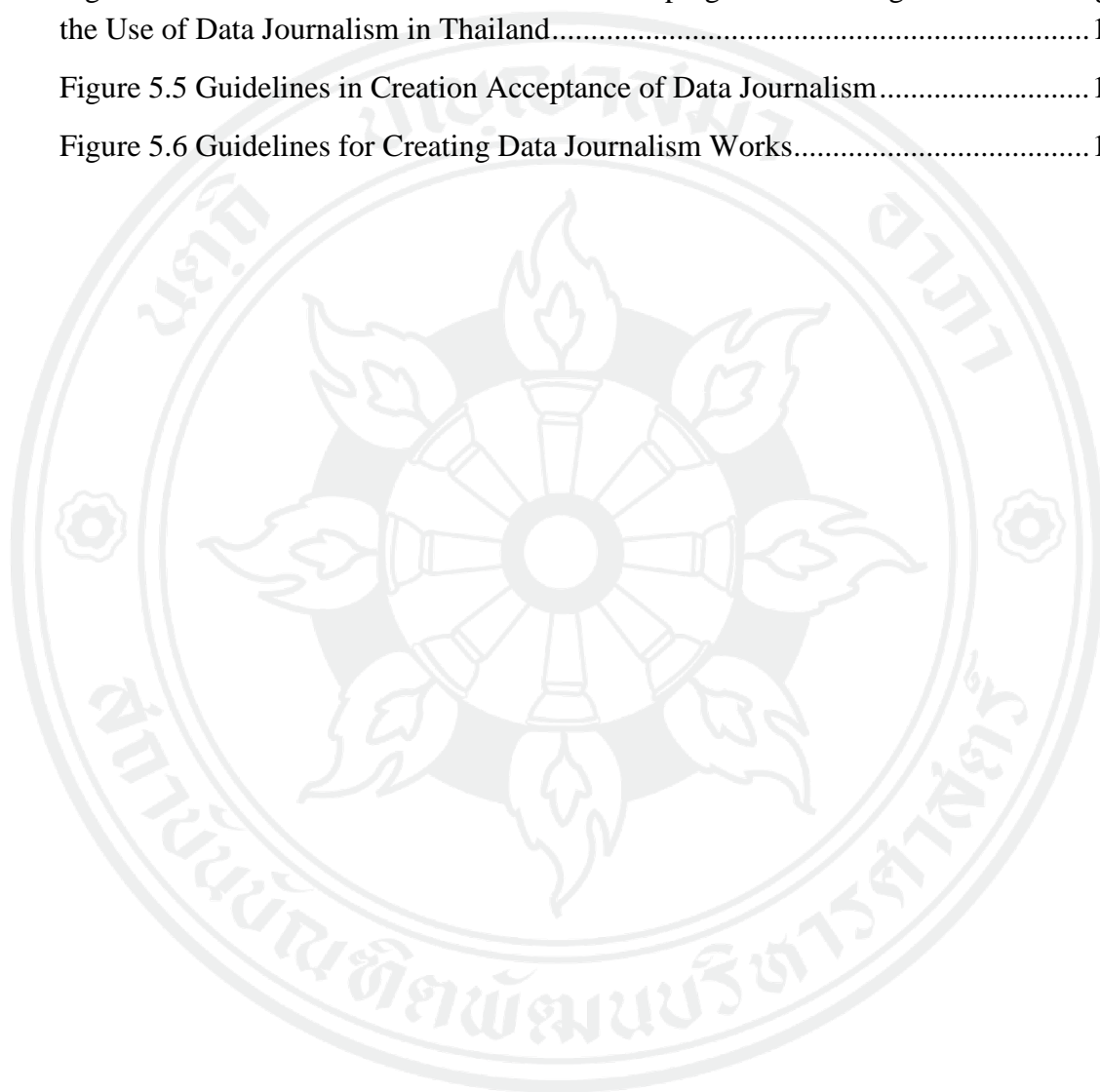
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# **CHAPTER 1**

## **INTRODUCTION**

### **1.1 Background and Significance of the Problem**

Advances in information technology and communication have made the World become an Information Society. New media formats now have massive amounts of data. News is as commonplace as information about the weather once was. This changes the media landscape.

The behavior of recipients is quite different in the way they choose to receive their news anytime, anywhere, and they can participate in the production of information by themselves. Television and radio are trending downward as online news consumption has grown rapidly. Surveys of Internet usage in 2018 by the Electronic Transactions Development Agency (ETDA) show that Thai people spend an average of 10 hours and 5 minutes a day on the Internet, resulting from the transition to digital life. Online as activity on Facebook, Twitter, or Instagram average up to 3 hours 30 minutes per day (Electronic Transactions Development Agency, 2018). Entering the Information Society era removes borders to the World. Data and news play an important role in social mobilization. On the one hand, many people are expecting this change to take society to the next level, allowing political decentralization, access to education, and improvement in the quality of human life. Governments and business sectors in many countries see the importance, so they seriously invest in and support the development of information technology. In Thailand, there is a policy called Thailand 4.0 to support the economy. This policy is focused on propelling the economy with innovations by using information as a link to integrate important structures and activities into a data network (Sikabundit, 2017). However, there is also the view that the information society will remain unequal and that there is dominance from the authorities, not unlike the society in the past. Although there is a great deal of data and news, there is a disparity in access due to

social class disparities and this may lead to problems where people are unable to adapt to change in time (Rananand, 2002).

This change has had an impact on all sectors, especially the mass media. Media organization are all struggling to survive. When consumer behaviors change, traditional media exposure decreases. This will affect the revenue from advertising. As the Digital Advertising Association (Thailand), or DAAT, reported, digital media advertising in Thailand in 2018 was worth 15,000 million Baht, a 21% increase compared to 2017 (Positioning, 2018). Nielsen Thailand reported that although television ads are still important, advertisements for other traditional media, such as newspapers, magazines, or radio, are significantly reduced. (Positioning, 2018) and when income is less, media organizations must compete to produce more interesting news content than ever before. As a result, there is violation of media ethics, lack of credibility, and a reduction of critical public news such as investigative reporting.

In the midst of changes in the Information Society era, consumers' trust in mass media institutions, which are regarded as The Fourth Estate, has decreased, and disparity in access to information, along with the development of technologies that make communication no longer monopolized by professional media, has all led to the creation of the Fifth Estate, which is a public inspection mechanism. One case in which the role of the fifth estate is clearly shown is the work of WikiLeaks, which has become a parallel mechanism to the work of mass media institutions. (Dutton, 2009).

WikiLeaks is an international nonprofit organization that publishes a number of secret papers released by governments and organizations around the world. Founded by Julian Assange in 2006, the goal is to provide important information to the public along with the source data so that the public can look at the references. WikiLeaks works as a public-sector-based monitoring tool that uses information technology as a tool. Activists, hackers, or the public can send clues or information to WikiLeaks as an intermediary for further broadcasting. (Wikileaks, 2015).

Assange (2010), the founder of WikiLeaks, talked about the process of data selection prior to broadcasting. The data has to be important to the world or bring about a reform, especially data that various agencies have invested resources to conceal. That kind of data is even more likely to benefit the public. The case that made WikiLeaks well known around the world in 2010 was the broadcasting of video

footage of air attacks on Baghdad by the US military that killed civilians, and the publication of over 400,000 classified documents about the Iraq war, which led to the widespread trend of sending leaked information. However, WikiLeaks is not able to communicate the stories to people around the world by itself. Publishing data online is just the beginning of a news process. The data still need to be analyzed, compiled, and transformed into an easy-to-understand format. It therefore depends on the work of the media organizations. Moreover, on the other hand, even if society is benefiting from the freedom of the new media to smuggle confidential data, privacy protection should not be overlooked. So, it is still arguable whether such actions should be called "benefits" or "threats".

Another phenomenon that has taken place amidst the changes in the Information Society era is the post-truth stream, which means that facts influence public opinion less than personal emotions and beliefs do. The Oxford Dictionary selected the word "Post-Truth" as its word of the year in 2016 after the use of this word increased by 2000 percent due to two political fluctuations, Brexit and the 2016 election in the US (Oxford Dictionaries, 2016).

At the time of these events, there were environmental factors that caused Post-Truth. The first was fake news in the online world that mixed with general news; for example, fake news during the US presidential election campaign, which spread in the final curve, supporting one side and attacking the other. The definition of "fake news" here is broad, from fake news where the authors intended to mislead the recipients, to fake news where the authors did not intend to mislead but just to put some spice into the news for attention, all the way to fake news that did not come from the authors but came from the news sources that did not speak the truth or the whole truth. However, research by Allcott and Matthew (2017) indicates that fake news has little influence on the attitudes of recipients, and only 10 percent of recipients believe that fake news is true. What is disturbing in the findings of this research is that the recipients are likely to seek data and news that are consistent with their own attitudes in order to confirm their original beliefs following the Post-Truth phenomenon.

An emphasis on personal emotions and beliefs over facts, coupled with growing fake news, has led to distrust in data. This problem is undeniably related to the role of "Journalism" in society because one of the important functions of media institutes is



to provide quality news that is vital to supporting the development of information literacy (McQuail, 2016).

"Journalism" is news relaying, which is very important for driving the various sectors of society. Journalism has continuously evolved from the past to the present which is considered a time of big changes. The important issue of news organizations in this era is how to provide information that is useful to the people in a way that is both interesting, reliable, easy to understand, and can be used immediately. At the same time, news organizations must be able to generate revenue for business survival, too. All of these are the driving forces behind the invention of a variety of news reporting innovations, one of which is "Data Journalism or Data-Driven Journalism". The meaning of "Data Journalism" has not yet been unanimously agreed upon. Academics and media professionals have offered a wide range of meanings. One consistent point is that the term "data" refers to structured data, which can be manipulated in a statistical way. Thus, "Data Journalism is a process of news reporting driven by structured data using Data Science, which includes searching, collecting, monitoring and organizing data, analyzing with statistics, and processing the data, to present it to the recipients in an easy-to-understand format.

Although the term "Data Journalism" was widely used in academic and professional journalism in 2010, if we look back, we will see how data-driven coverage has been with journalism for a long time. It can be counted as one shade of investigative reporting, which is an important tool of the media to protect the rights of people to receive data and news and examine and criticize matters affecting the public interest. The focus is on gathering facts by searching for data from events and evidence (De Burgh, 2000).

Nonetheless, data-driven coverage in the past faced barriers in terms of return on investment because it took time and effort to handle large amounts of data, until the 19<sup>th</sup> century when Meyer (2002) proposed the use of quantitative research method to support the work of news reporting that he referred to as "Precision Journalism". With computer technology having become widespread, computer-assisted reporting became popular and made news reporting more effective, as data, charts, graphs and maps were also processed into statistics using programs such as Access, Excel, SPSS (DeBarros, 2000).

The growth of information and communication technology in the 2000s has enabled journalists to access data and quickly analyze the data with tools. As a result, data-driven news coverage has become more popular. Later on in 2010, the growing trends towards "Data Journalism" was spreading wider after WikiLeaks published secret documents about the war in Afghanistan on the Internet. The world's leading media outlets such as the New York Times and The Guardian analyzed and restructured the data, and presented it until it received attention from all over the world.

Growing trends towards "Data Journalism" have continued to exist from 2012 to the present. The Global Journalists Awards are hosted by the Global Editors Network, sponsored by Google News Lab Knight Foundation, and Chartbeat, to appreciate Data Journalism works that are well-known in each year. In 2018, there are 630 entries from media organizations in 58 countries around the world. This indicates that Data Journalism is growing strongly at an international level (Data Journalism Awards, 2018).

That being said, Data Journalism is not a substitute for traditional news coverage, merely another alternative tool to news coverage for mass media organizations, per its outstanding features as detailed below (P. Bradshaw & al., 2014; Gray, Bounegru, & Chambers, 2012)

#### 1. Consistent with the context of modern media landscape

The characteristics of Data Journalism are consistent with the context of the modern media landscape, which is flooded with big data, both user-generated content which is due to the expansion of social media, and public and private sector databases which are increasingly being published online resulting from requests for open data, such as the fact that the Thai government established the Digital Government Development Agency (DGA) in 2016. However, most of the data is not in an easy-to-use format, so there is an opportunity gap for Data Journalism news organizations to process the data into information that is easy to understand and that is usable immediately.

#### 2. More reliable than traditional news

The news from the Data Journalism is more credible than from traditional news, especially in times of a faith crisis towards media institutes, because Data



Journalism uses Data Journalism methodology to help interpret information, and it is not tied to the speculation or opinion of a person or source. In addition, when presenting news using Data Journalism, most of the time raw data are attached with the news content or data sources are also specified for transparency, such as the news coverage by The Guardian of the war in Afghanistan that specified the data sources so that the public could verify its accuracy by themselves.

### 3. Resulting in news coverage that is different

Data Journalism is a new way of reporting, which has strength in finding, collecting, analyzing, and interpreting large amounts of data in an easy-to-understand format. It is one of the options to make news coverage different from the news of another media organization or individual. It can be seen that the quantitative use of data has appeared in the news of leading media organizations that have received a lot of global attention recently, including on economic, scientific, health or corruption issues, such as the Panama Papers case where the International Consortium of Investigative Journalists (ICIJ) disclosed data from more than 11.5 million secret documents about the concealment of properties and the camouflage of the financial routes of individuals and organizations from many countries around the world. It features traditional news, infographics, animation, and interactive information, and received international attention and the Pulitzer Prize, one of the biggest awards in the American press in the descriptive news category, in 2017.

### 4. A new alternative to earning money for media organizations

Data Journalism is a new way of earning money for media organizations because it transforms raw data, which is a common resource in the digital age, into information that is more valuable, as in the case of the Bloomberg news agency which, apart from performing as a media organization, also provides financial data services that can generate large amounts of revenue for the organization, or in the case of non-profit media organizations such as the ProPublica news agency, offering free and paid subscription information services.

In terms of Data Journalism literacy development, Ausserhofer, Gutounig, Oppermann, Matiassek, and Goldgruber (2017) have documented methods and findings in research related to journalism. They found that the research in this field is growing rapidly. It began clearly in early 2010 with a growing number of academic

papers, mostly in the US and UK. The teaching of Data Journalism has been active since 2010, too. There has also been the launch of courses in Data Journalism, particularly in higher education. Courses are available for professionals in the US and in Europe. There has been a collaboration between both academic and professional journalists in the production of textbooks, an introductory guide to Data Journalism, and online courses (MOOCs: Massive Open Online Courses) for interested individuals (Howard, 2013).

However, considering Data Journalism in Thailand, there are challenges. Thailand has a long history of journalism. Thailand has also played a role as a cultural stage between the West and the East, as an area for class conflict, as a battleground for capitalism. It has also received new technologies to use in news reporting. The transition to new style news coverage will not replace all the traditional coverage in one go. Today's journalism industry in Thailand still has a gap between traditional news coverage and the news coverage with new innovations (Avasadanond, 2013).

Currently, the work of journalists in Thailand is mainly focused on on-site interviewing and is driven mainly by opinions from news sources, although there are some investigative news reporting using data as the core of the work. For example, the Isra news agency's investigative news reporting analyzes data on false bank account reporting and procurement of the government sector, but still lacks a presentation format that is easy to understand. For example, in news on Pathomphol Chan-o-cha registering a partnership entity in a military camp – reporting a financial budge of having 700,000 THB worth of tools (Isra News Agency, 2016), Isra compared the current asset list with the value of construction contracts until they found some irregularities, but did not use Data Journalism to do so. Some media organizations that transform data into an interactive data mostly just use data from various agencies presented without analysis or interpretation.

The online new agency Thai Publica can be recognized for the intense use of Data Journalism. In many news stories, Thai Publica joined forces with Data Science companies such as Opendream, a social enterprise, to develop data into an interactive format, such as the "30 Years of Map Ta Phut: the past and the present, what are the differences?" coverage (Thai Publica, 2012) which analyzed data and presented it in an interactive format.

Interestingly, while Thai Publica, a small alternative media organization, has been able to intensely apply Data Journalism, mainstream commercial media organizations that are primarily profit-oriented have not. A survey of the needs of field reporters and mass media editors, conducted May 11-24, 2016 by the Thai Journalists Association, found that 39% of journalists responding to the questionnaire wanted to receive training in Data Journalism skills.

In academia, there is only an attempt to gather basic knowledge, such as for the textbooks of future journalism groups. There is no direct research on Data Journalism. It is interesting that while the knowledge of and use of Data Journalism in foreign countries is growing, there are problems and obstacles to the knowledge and use of Data Journalism in Thailand.

This research is intended to be a guideline for the knowledge development and promotion of the use of journalism in Thailand.

## **1.2 Research Problems**

1.2.1 What is the knowledge and use of Data Journalism in foreign countries?

1.2.2 What is the knowledge and use of Data journalism in Thailand? What are the problems and obstacles?

1.2.3 How to develop knowledge and promote the use of Data Journalism in Thailand?

## **1.3 Research Objectives**

1.3.1 To study the knowledge and use of Data Journalism in foreign countries

1.3.2 To study the knowledge and use of Data Journalism in Thailand, as well as the problems and obstacles to the development of the knowledge and use of journalism in Thailand

1.3.3. To develop guidelines for knowledge improvement and to promote the use of Data Journalism in Thailand

## **1.4 Expected Benefits**

1.4.1 Academics can apply the knowledge of Data Journalism in foreign countries to their teaching and can use it as a database for further research in Data Journalism

1.4.2 Media organizations can use the information to improve their work, enhance competitiveness for business survival, and balance the pursuit of profit with professionalism

1.4.3 Professional organizations can provide professional training courses for media professionals to better understand Data Journalism and increase the capacity of the media in Thailand

## **1.5 Definitions**

1.5.1. Data Journalism refers to the process of presenting factual information, which is core data, using a structured data management method.

1.5.2 Data refers to the features or properties of things that may be in numerical form, letters or symbols that are empirical. When combined, it has one meaning, and it can be structured to be processed and interpreted by statistical methods.

1.5.3 News Organizations refers to organizations that produce news content and present it through various media, including television, radio, newspapers and online media, who use Data Journalism as part of the process.

1.5.4 Knowledge of Data Journalism refers to knowledge of the principles, concepts, and theories related to Data Journalism such as in documents, textbooks, reports, research results, academic articles, or the websites of the agencies both domestic and foreign.

1.5.5 Use of Data Journalism refers to the application of the Data Journalism processes in media organizations at the level of operations, production and presentation, cost management, and personnel development

1.5.6 Generation X refers to people born 1965-1980 according to the Electronic Transactions Development Agency (ETDA). This generation grew up in an era when traditional media were still flourishing.

1.5.7 Generation Y refers to people born 1981-2000 according to the Electronic Transactions Development Agency (ETDA). This generation grew up in the midst of Internet technology development and widespread use of online media.



## 1.6 Conceptual Framework

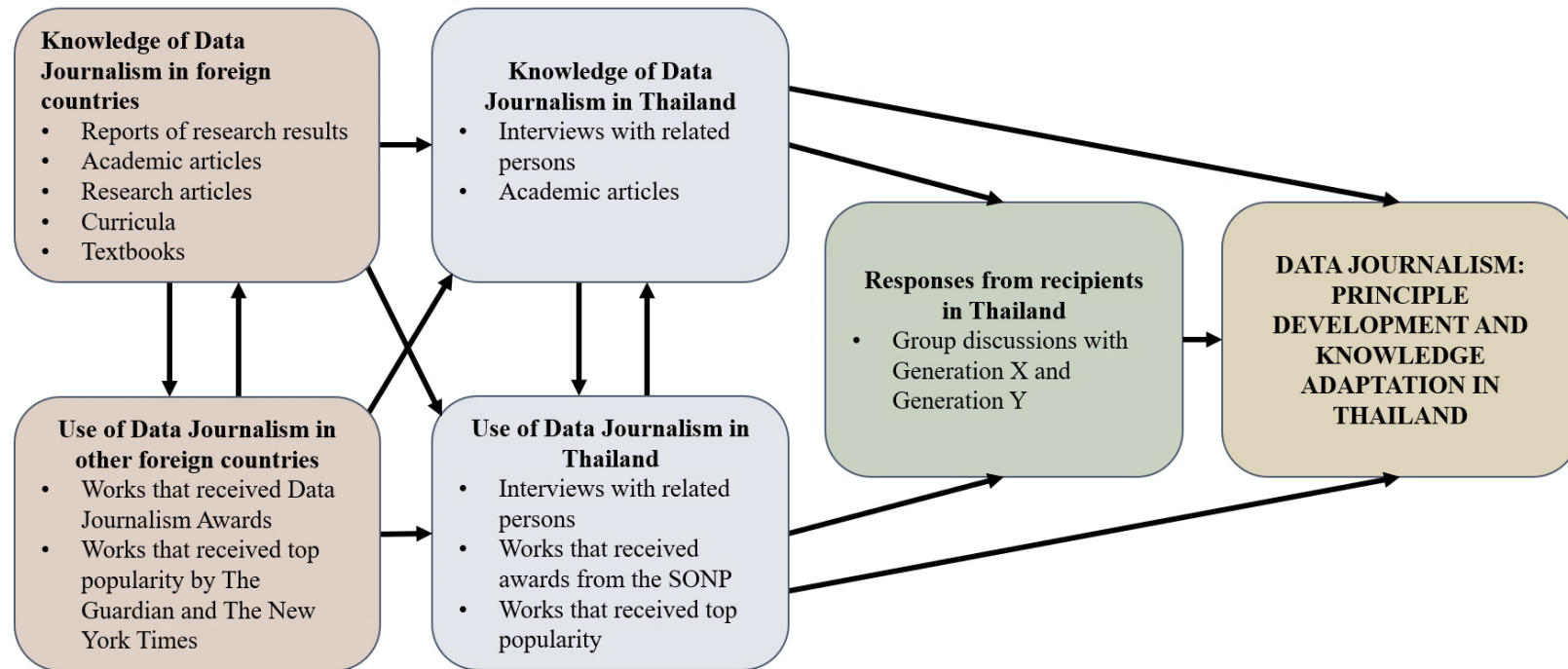


Figure 1.1 Conceptual Framework



## **CHAPTER 2**

### **LITERATURE REVIEW**

The literature review covers the following areas:

- 2.1 Concepts regarding the Information Society
- 2.2 Concepts regarding Journalism
- 2.3 Concepts regarding Data Journalism
- 2.4 Concepts regarding Innovation Acceptance
- 2.5 Related studies

#### **2.1 Concepts regarding the Information Society**

The concept of the information society focuses on explaining the dynamics of society at a time when information and communication technologies are rapidly evolving. The point that all academics agree on is that the information society is a society rich in data and news, and these play an important role in driving society. This concept can be used to explain changes in knowledge development and the application of Data Journalism.

The concept of the information society has been widely discussed since the 1970s, when the West was experiencing a recession. Governments and business sectors in many countries then turned to invest in and support the development of modern technologies, including information technology, in the hope of solving economic problems. The first written work on this concept was by Marc Uri Porat in 1977; it was a large-scale research project on the information economy phenomenon in the United States. The project found that information activities and jobs that used information-related skills played an important role at the time and accounted for more than 40 percent of national income. It therefore could be considered that the US economy in 1977 was an information economy (Rananand, 2002).



Later on, Daniel Bell, a prominent American sociologist, developed his original ideas regarding the dynamics of post-industrial society, giving emphasis to the importance of information in the new economic and social structures that would replace the existing ones, and this prompted interest in concepts regarding the information society. Works that were developed further from the above concepts focused on the positive aspects of information technology that would drive society to a better place; for example, political decentralization, improvement of the quality of human life, environmental protection etc. However, these concepts might seem to have neglected to address the negative impacts of the information society; for example, unemployment, violations of privacy, and problems that would arise from the fact that people in the information society could not adjust to the changes well enough (Webster, 2014).

In the initial stage of these concepts, there were also academics who had different ideas about the information society. Webster (2014) divided concepts of the information society into 5 dimensions, divided by the criteria that each academic group used to identify an information society. The 5 dimensions are as follows:

1. Technological dimension: the concept of this academic group focused on the changes that lead to the information society, believing that information and communication technologies are the main drivers of social changes in the order of evolution, which is inevitable. An example of an information society concept in a clear technological dimension is the provision of information society indexes in countries around the world in 2000, or the Information Society Index 2000, which used four infrastructure variables -- which are computers, the Internet network, information infrastructure, and social infrastructure.

2. Economic dimension: the concept of this academic group began with the attempt to measure the size of the information industry in the US during the early 1960s, using statistical means. The studies found that 29 percent of the US national income came from knowledge-related industries or industries that relied on information mainly.

3. Occupation dimension: the concept of this academic group was that any society where the population is engaged heavily in information-related occupations

can be considered an information society. The information-related occupations refer to jobs that use information for decision-making more than labor.

4. Geographical dimension: the concept of this academic group was that the geographical format of a new city type will be influenced by the shortening of time and place through information technology. Castells (2004) used the term "Network Society" to extend the characteristics of an information society as a society in which important structures and activities are managed by an electronic system and an information network, resulting in a grouping of people with common beliefs, visions and interests – be it their economic, political or religious beliefs – even though members of this network came from different origins. In addition, some of the academics in this group even argued that the physical form of big cities would be disappearing because there was no longer the original function of centralization of various types of activities, which would be replaced by new processes; such as, long-distance working, long-distance learning, or even long-distance medication, all of which would be linked by the information network.

5. Cultural dimension: the concept of this academic group viewed that today's society is filled with numerous signs that come with so many new media outlets. Consumers have the means to choose the news they want, wherever and whenever they want, and they can engage in the production of their own signs by themselves, too -- the signs that come with this information will play a role in the way of life and the culture of mankind inseparably.

In addition to the above-mentioned dimensions, that can be considered an overview of the main concepts, there were also the views of academics who were interested in the information society, but their concepts were clearly different from those of the mainstream. (Rananand, 2002) divided these concepts into 3 groups as follows:

1. The group that disagreed that there was a social change so big that it could be called a new type of society. This group argued that developments and changes that the mainstream academics believed would lead to an information society were actually not new. Rather, they were more of a continuation of the existing processes; for example, rationalization, industrialization, and modernization, all of which began in the 19th century.

2. The group that looked at the negative aspects of the information society. This group denied the belief that the information society is better than the society of the past. They argued that, in the information society, there would still be inequality and dominance by those in power. An academic in this group, Herbert Schiller, argued that the information society would still be a society of capitalism, because the information that is going to be produced would be like a product which is used to make profits in the same way as other products in the previous society. Although there would be a great deal of information, there would still be a disparity in access, which is the result of social inequality. In addition, the information society would also help to expand multinational capitalism. The development of information technologies is therefore in the interests of those in power, not for the benefit of the public.

3. The group that disagreed that information and communication technologies would drive society to a better place. The academics in this group criticized the studies and analysis of the mainstream academics in that they focused only on quantitative data and used only one form of technological theory as a determinant, seeing technology as the main factor behind every change in society. Moreover, the group also argued that the increased information resulting from the development of technologies would bring more harm than good. Baudrillard (Webster, 2014) argued that information in the information age might be increasing, but the meaning may be decreasing, because people are facing so much information that they cannot distinguish between signs and truths.

From all of this, it is evident that even though academics from different institutions found common ground in the concept of the information society being a society rich in information and this information playing an important role in society, there were also different perspectives; for example, looking at the positive and negative aspects of the information society, or viewing the information society as a development following human societal evolution, as well as the view that it is just a continuation of the existing processes from the previous society. The researcher used the analysis, discussions, arguments, and disagreements surrounding these aspects as a framework for this research.

## 2.2 Concepts regarding Journalism

This research aimed to study the knowledge of and use of Data Journalism to develop guidelines for knowledge development and promotion of the use of Data Journalism in Thailand. To be able to really understand Data Journalism, it is indispensable to first do a literature review of concepts regarding Journalism, which is fundamental.

“Journalism” in the general understanding is often defined specifically as the course of news reporting through publications only. In the past, publications were the first mass media and the main medium for disseminating information. However, the evolution of communication did not stop at printed media; there are also many other types of media used for the dissemination of information. Thus, the true definition of “Journalism” has a very broad extent as it refers to the course of telling a news story which is not limited to only one particular medium (Bunyasiripan, 2007).

Journalism is a process that is relevant to political, economic, social, and cultural systems and is expected to serve societal norms. Deuze (2005) studied and defined the professional identity and the ideology of journalism, saying the journalism profession is related to the public interest, justice, credibility, independence from intervention, presenting truth, speed, social responsibility, and ethical consciousness.

Journalism can be traced back to the ancient days when people began to inscribe stories to communicate in society. However, this communication was concentrated mainly in the upper classes. It was not until the 15th century that a number of printers were invented. After the emergence of printing technology, the world's first type of mass media, which is newspapers, was born in European countries, where information was presented and reported to the public, along with concepts of freedom and democracy. The function of the journalists at the time was perceived to have an effect on those in power. Many times, journalists in this early age were attacked by those in power who were unhappy with reporting. It was not until the 18th century -- when printing technology as well as the education system had advanced -- that the issue of freedom of the press was to be debated widely in Europe, leading to the issue of laws protecting the freedom of the press in many countries. At the same time, the United States also proclaimed freedom of speech in their constitution (Lamble, 2016).

In Thailand, the first newspaper was introduced at the end of the reign of King Rama III. Dan Beach Bradley, an American missionary, started publishing a newspaper called the Bangkok Recorder. It often presented new issues to Thai society until the Thai royal court saw it as a cultural colonizing tool from the West. This situation forced the Thai royal court to publish their own publications like the Government Gazette. Later on, printing technology in Thailand was more advanced. There were many elite newspapers. At the end of the reign of King Rama V, more Thai people began to be literate, so there were newspapers for commoners, such as K.R.S. Kulap, the first commoner to who printed the newspaper Tienwan , which criticized the government's performance at the time; and Kulap Saipradit, who proposed ideas of equality and democracy for Thai society. Since then, the Thai mass media has shifted from being a stage for cultural clashes between the West and the Thai royal court, to clashes of the social classes (Siriisaranan, 2008).

The atmosphere of political thought clashes continued with the development of the journalism industry in Thailand, until the Thai People's Council stepped in and changed the government system in 1932, resulting in the endorsement of the rights to freedom of communication to the public in the first constitution of Thailand. However, when the military junta came to power, the law was extended to allow state officials to revoke licenses or close media. After the end of the Cold War, Thailand alternated between dictatorship and a semi-democratic state. Nevertheless, the rights of the Thai media gradually improved. The 1997 constitution of Thailand certified the people's rights to freedom and equality. This contributed to a huge boost in the mass media industry. Many new media outlets were born. Capitalism made the advertising business the economic basis of the media industry. As a result, the survival of each media outlet depended on the market trend. All media competed with each other for advertising revenue. The mass media shifted from being a stage for the clashes of social classes to a battlefield under capitalism.

Sirimanont (1986), one of the prominent journalists in Thailand, said the mass media industry was socially and business specific. That is, the business conditions of a mass media organization are the same as those of a general business that needs to make products to make a profit. However, the products produced by a media organization are not ordinary products like the products in the market, but have the



power to have an impact on the society as a whole. Therefore, it is important to have a professional code of conduct to ensure that these very special products produced by media organizations will not become destructive to society. On the other hand, such products must promote the betterment and development of society. If any media organization strictly adheres to ethical standards, then the media organization is respected and trusted. This is one of the most important things in the media business.

Just as jobs related to journalism have had a long development over time, journalism knowledge has also continued to evolve as well. The knowledge of Journalism in other countries became more tangible after the establishment of a newspaper academy at Columbia University, USA, in 1903 with funds from a donation by Joseph Pulitzer who aimed at giving news reporters training and education just as in other professions. Since then, journalism has expanded to be a course in Communication Arts faculties (Thitiamonpan, 2010).

In Thailand, the first Journalism program was introduced in 1939. Chulalongkorn University opened a Journalism course at the diploma level in the Faculty of Arts, and later it was upgraded and expanded into a degree majoring in newspapers, while Thammasat University established the Journalism Department in the Faculty of Political Science in 1954. Journalism is one of the fields that has been popular. Its teaching and knowledge development continue to be encouraged (Thitiamonpan, 2010).

However, at present, the knowledge of journalism in Thailand has been affected by the changing landscape of the media just as the journalism profession has. The recipients' behaviors changed. The new media that emerged from modern technologies has come a long way in challenging the mass media industry. The labor market in the media industry is sluggish. Students have become less interested further education in Journalism. As a result, many educational institutions have adopted adaptive measures, such as revising the curriculum to make it more modern, erasing the impression that journalism is based solely on print media; or merging journalism with other disciplines, to go along with the media fusion era.

Pijitra Tsukamoto, head of the Journalism Department, Faculty of Communication Arts, Chulalongkorn University, said that journalism teaching must be consistent with the changing current situation. Data Journalism may be one way to

revive Journalism. The course at Chulalongkorn University has a new focus, that is, not only do students need to have skills in general news reporting, they also need to be able to analyze the information that appears on the Internet and be able to report it (Ippoodom, 2017).

Mitchell Stephens, Professor of Journalism and Communication Arts at New York University (Rananand, 2017) suggested that journalism academics and professionals should help differentiate quality journalism from the idea that "anyone can be a news reporter", meaning that the act of reporting has gone far beyond reporting what happened, on the contrary, there must be research and investigation in depth. Journalists need to be able to analyze what is going on or what is going to happen that would have an impact on society, what choices the society has, and what is the best solution for the society regarding each issue. This suggestion by Mitchell is consistent with the features of Data Journalism. In this research, the concepts of journalism are used as a conceptual framework, to create a data collection tool, and primarily in data analysis.

### **2.3 Concepts regarding Data Journalism**

Simon Rogers, Google's data editor, a former data journalist for The Guardian, mentioned that he found that the term "Data Journalism" in its current meaning was first used in 2006. Holtzman who was then a software developer in the Washington Post, used this term to describe the use of Data Science integrated with the news reporting processes (Howard, 2014).

The general meaning of the word "Data Journalism" is broadly based on English words that are synonymous with Data Journalism or are used interchangeably in some contexts such as Algorithmic Journalism, Computational Journalism, Computer-Assisted Reporting, Data-Driven Journalism, Database Journalism, and Quantitative Journalism. In addition, the meaning of Data Journalism is multifaceted, including Journalism, Data Science, and Design. Academics and media professionals determined many meanings for "Data Journalism". Lorenz (2010), a German data journalist, determined that Data Journalism is a process that involves digging into the



data, organizing and restructuring, filtering data by searching for specific data, making presentations of data, and making a news report.

Doig (2012), a Journalism academic at Arizona State University, said that Data Journalism is just one alternative to news coverage, which is not different from other traditional ways, except that in the process of Data Journalism, journalists need to review the news sources to reveal the secrets, instead of interviewing a person.

Broussard (Cronin, 2014), a Journalism academic at Temple University, defined Data Journalism as a search for issues hidden in numbers, and the use of the numbers to present issues.

Achavanuntakul (2015) Co-founder and Editorial Advisor of the Thai Publica news agency said that Data Journalism is news reporting by data where the mass media works with IT professionals and the public sector to help build a news database.

Royal and Blasingame (2015), journalism academics at Texas State University, tried to define the meaning of Data Journalism in research named “Data Journalism: an Explication”, using mixed methodologies and synthesizing definitions from academics and professionals in Journalism, until they arrived at the answer that Data Journalism is a reporting process that uses data analysis and data presentation to convey stories and create engagement with recipients.

Many academics and professionals agree that the term 'data' here refers only to structured data. It is therefore concluded that Data Journalism is a structured data-driven reporting process, which uses Data Science. This includes searching, collecting, monitoring, and organizing data, analyzing the data with statistics, and processing the data to present to the recipients in an easy-to-understand format.

The concepts of Data Journalism may be new and widely used in academic and professional journalism. But looking back, data-driven coverage has long been associated with journalism, as it is closely related to investigative news, which is an important tool for the media to act as a proxy for the rights of people to recognize, monitor, and criticize matters that affect public interests. Investigative news focuses on gathering facts by exploring and digging up data and evidence from events (De Burgh, 2000).

However, in the past, data-driven coverage has often faced obstacles in terms of value for the money invested, because journalists have had to work with a lot of data without modern technology, such as the British Sunday Times newspaper in 1968 that reported on a sedative made by a German drug company which was withdrawn from the market because it was found to affect infants. For this reporting, the Sunday Times took almost a year. Even if at the end this reporting was successful and led to the payment of compensation to the victims, it raised questions about the value for money invested (Greenslade, 2010).

Data-driven reporting had developed at the end of the 19th Century. Meyer (2002) studied and proposed the use of quantitative research methodology to support the work of journalism. He called it Precision Journalism, which includes sampling, data collection, systematic analysis, and concrete results presentation. In the meantime, computer technology had become widespread, bringing the concept of computer use to news reporting. Computer-Assisted Reporting then became popular, and made data-driven news reporting more effective. Data was processed into statistics, tables, graphs and maps with programs such as Access, Excel, and SPSS (DeBarros, 2000).

The growth of information and communication technologies in the 2000s has enabled journalists to access data and to analyze it with a convenient tool, driving data-driven coverage to become more popular. In 2010, the trend towards “Data Journalism” was even more widespread after WikiLeaks published Afghanistan-war-related documents on the Internet, and world-renowned media outlets such as The New York Times and The Guardian brought such data to analyze, structure, and present, receiving attention from around the world.

Bradshaw (2011) described the process of Data Journalism as comprising 5 steps (5Cs).

#### (1) Data Compilation (Compile)

Data Journalism process starts from the issues or questions that journalists need to find answers to, which will lead to data collection. This data may come from diverse sources, such as government agencies, public sources of private organizations, surveys for data collection, public involvement in providing data, and the use of data information in data retrieval which is called scraped data.

## (2) Data verification and organization (Clean)

Once the data has been collected, the next step is to verify and organize the data, validate data sources and data sets, data quality, and data format. Mostly, it consists of two types: human error detection of the data and conversion of all received data into the same or a standardized format. In this step, a program can be used to help organize the data.

## (3) Context analysis (Context)

When the data is reviewed and organized, the next step is to analyze the context of the data received, by asking questions such as who owns the information. What is the storage time? What is the reason behind or the purpose of the data? What should be the method of data collection?

## (4) Data Combining (Combine)

Interesting news stories can be found in just one set but often we need to bring two sets of data together or merge them. In this step, it can be done by using as diagram in the form of two data sets, using a data integration approach based on its issues, or using a computer program.

## (5) Data Communication (Communicate)

The last step is to communicate the data by processing complex issues with enormous data, especially numbers, into an easy-to-understand format; for example, maps, charts, infographics, or animation.

A case study of a news organization that used the process of Data Journalism to report news is, for example, the Reading of the Riots series by The Guardian. The news arose from riots in the summer of 2011 in England. The British government stated that the incident was just looting by criminals. In addition, Prime Minister David Cameron, along with conservative politicians, blamed online social media for inciting and spreading the news. In its news coverage, The Guardian worked with academics to describe concrete occurrences, using the coordinates of each occurrence, data collection from online social media, and interviews with those involved, and then presented the data in many styles, such as traditional news, infographics and interactive news. There were some interesting issues; for example, the cause of the riots was a disgruntled police officer and social inequality. Even though more than half of the gang members were colored people, there were no causes related to racial

discrimination. Online social media platforms like Facebook and Twitter were not used significantly in this event.

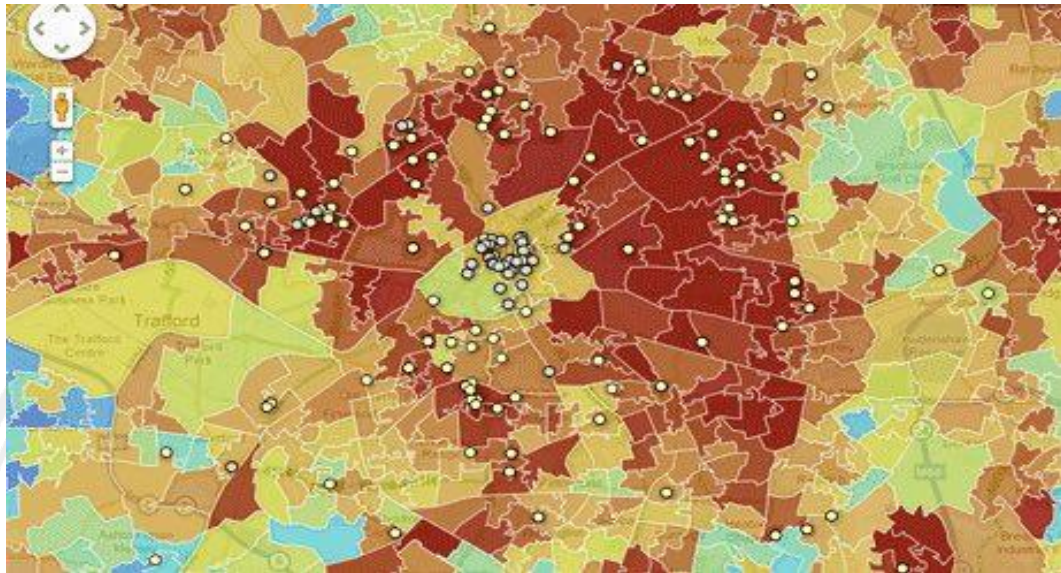


Figure 2.1 Interactive Map in the Reading the Riots news series, showing the areas where the riots occurred, which readers could click to view details

Another interesting case is the Panama Papers news series. This news was published in 2016 by the International Consortium of Investigative Journalists (ICIJ). More than 11.5 million documents have been disclosed, totaling 2.6 terabytes. Anonymous news sources were sent from Mossack Fonseca, the company that established shell companies to conceal the holdings and disguise of financial paths of individuals and organizations from various countries around the world. A network of international investigative journalists collaborated to analyze this data and to present it in a variety of ways, such as traditional news, infographics, and animation. This revealed money laundering, tax evasion, and a global corruption network. After the news was published, it was followed by a series of investigations by various organizations and some key figures stepped out to take responsibility, such as the Icelandic Prime Minister who resigned after it was found that he and his wife hid properties outside the country without declaring them before joining the parliament. Moreover, the news also won a Pulitzer Prize for the 2017 Explanatory Reporting category.



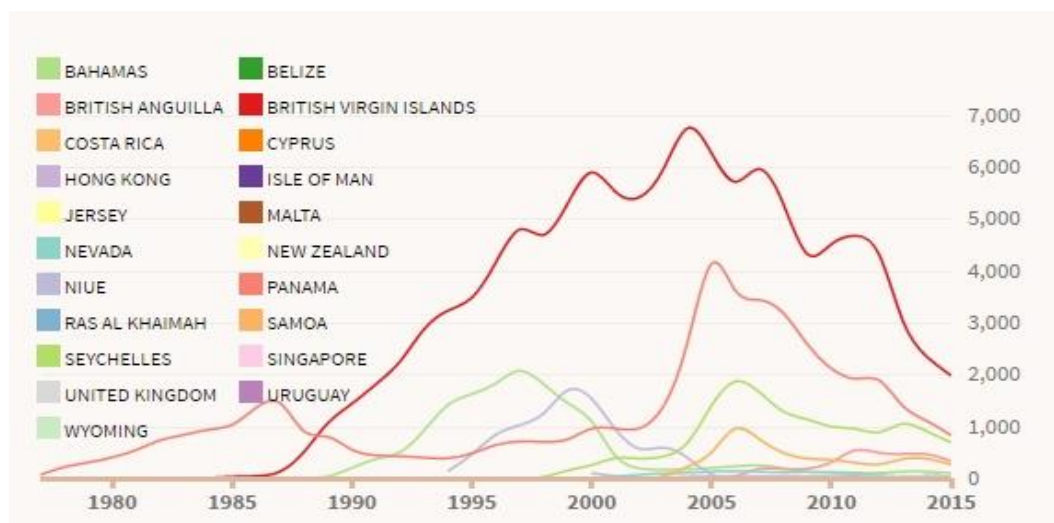


Figure 2.2 Infographic from the Panama Papers news, showing document numbers regarding the shell companies in various countries

In Thailand, the online news agency Thai Publica uses Data Journalism at a serious level. In many news pieces, the Thai Publica has worked with a company who provides computer programming services to help develop data into infographics and interactives, such as the “Lottery... Who gets rich?” news piece where Thai Publica processed data about the Thai government lottery using statistics to present it in an easy-to-understand format, using interactives, enabling recipients to view each item at a specific point. One piece of interesting data was the biggest lottery dealer was the Government Lottery Office Foundation itself. This foundation has been allocated the biggest sales quota of lottery, bigger than the proportion allocated to the disabled.

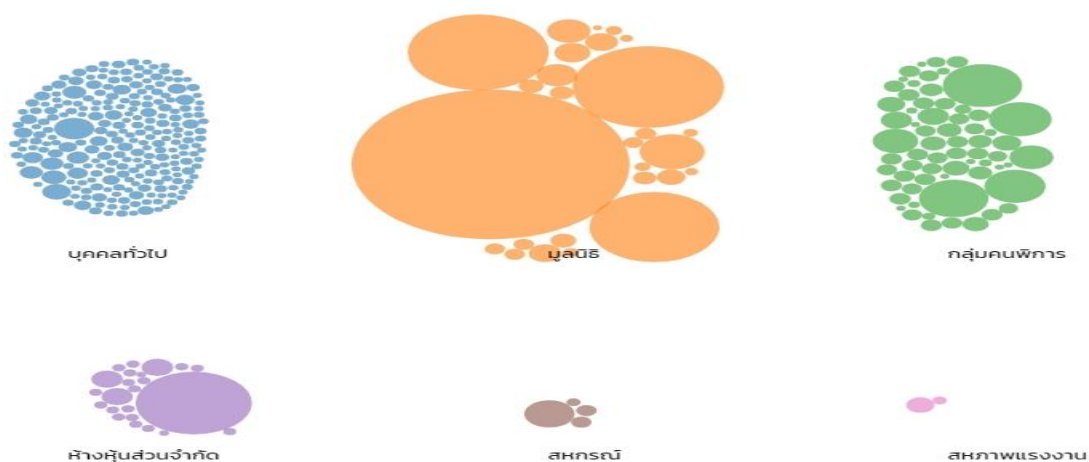


Figure 2.3 “Lottery... Who gets rich?” presented in an interactive format, enabling recipients to view each item at a specific point freely

In the academic sphere, Ausserhofer et al. (2017) have documented methods and findings in research related to Data Journalism. They found that the Data Journalism knowledge body has grown rapidly since 1996. By the beginning of 2016, there have been 40 related academic papers published, both quantitative and qualitative. Mostly these papers used in-depth interviews and content analysis, and often studied the United States or England. There are research gaps on issues such as Data Journalism comparison in different countries, a long-term study, a study on software in Data Journalism professions, and consumer experience.

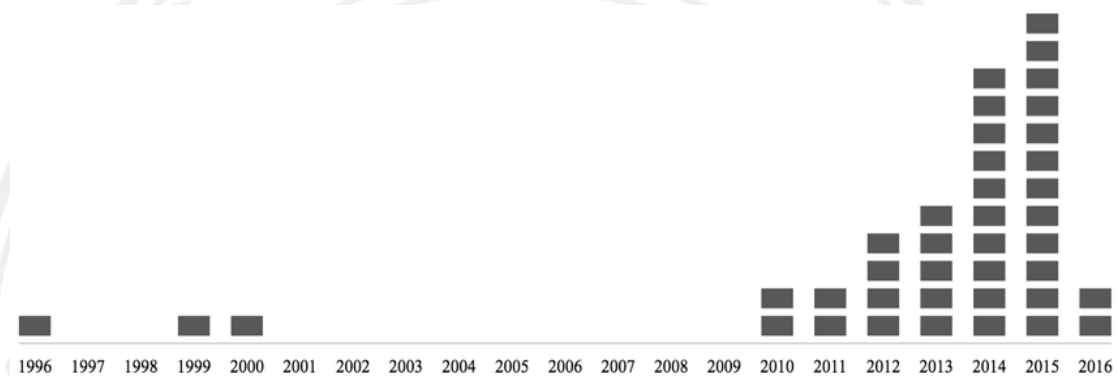


Figure 2.4 A graph presenting academic papers related to Data Journalism collected by Ausserhofer et al. (2017)

For Data Journalism teaching and learning, in the past it was often only part of a course in Investigative Journalism. In the 2010's, courses on Data Journalism were offered, particularly in higher education. Related courses are available for Journalism professionals in the US and in Europe. There is a collaboration of both academic and professional journalists in the production of textbooks for an introductory guide to Data Journalism as well as online courses (MOOC: Massive Open Online Courses) for interested individuals, under the support of international organizations that see the importance of this field such as Google, UNESCO and the European Journalism Center etc. (Howard, 2013)

However, even if many parties are beginning to focus on the study of Data Journalism, there are still many challenges in teaching and learning. For example, those who are interested in this subject are often professionals or journalism students who are unfamiliar with quantitative methods, statistics, and computer programming, while the instructors themselves are often journalists or former journalists with

limited experience in Data Science. Moreover, the Data Journalism knowledge body is constantly evolving and changing, so instructors need to always adjust their curricula (Krueger, 2014).

Berret and Phillips (2016) studied courses related to Data Journalism in the US, and found that, even in the US, which is one of the most active places regarding Data Journalism in the world, there are still problems in offering Data Journalism courses. There are only 46% (59 institutes) of institutions offering courses in the field of Data Journalism, the majority at the basic level. Teaching is usually composed of content such as critical thinking, data table usage, data relationship interpretation, concepts of design, statistics, and concepts regarding programs, respectively.

Regarding Data Journalism in Thailand, it was found that there is only an attempt to gather basic knowledge such as through seminars of professional associations, basic research and report writing, and some courses only available in some institutions. There is no direct research on Data Journalism at all.

The concept of Data Journalism was used as a conceptual framework, to create a data collection tool, and as a criterion for data analysis to find ways to further promote the use and development of Data Journalism knowledge in Thailand.

## **2.4 Concepts regarding Innovation Acceptance**

Data Journalism can be counted as an innovation, so the researcher has used concepts regarding innovation acceptance. Tidd and Bessant (2009) argued that innovation is about seeing opportunities through the linking of things and applying them to the benefits. The word "innovation" is derived from the combination of the word "invention" and "seeking new things" to bring about changes in a better way. Innovation can be divided into 4 areas:

1. Product dimension – it is an innovation dimension that changes the product or service of the organization.
2. Process dimension -- it is the change in the process. This will result in the organization creating a competitive advantage through the development of a change in the production process of the service, or reduce costs in the process of producing services.



3. Position dimension -- it is an innovation dimension that deals with the development and change of the business position of an organization in the consumer's perception, both the change from the original position of the business, and to a new position to create a new image.

4. Business paradigm dimension – it is an innovation dimension that deals with the development and change of the business conduct paradigm.

Rogers (2003) described innovation as something new that spreads to society. Socially accepted innovations generally consist of two parts: the imaginary part and the object part. As to whether an innovation will be accepted, in addition to depending on the recipients of innovation, social systems and communication systems, the innovation itself is also important. Innovations that are likely to be accepted easily must benefit society more than what already exists, and must be consistent with the culture of the society, as well as not being too complicated or complex.

Rogers also discussed the features of innovation that have an effect on its acceptance. There are five aspects:

1. Relative advantage -- it is a feature that enables innovation recipients to recognize that the innovation has more benefits and value than what is already available. The comparative benefits may be in the form of profits or upgrading social status.

2. Compatibility – it is a feature that allows innovation recipients to recognize that the innovation is consistent with users' values, and consistent with past experiences and the needs of the members of society.

3. Complexity – it is a feature that makes innovation recipients understand. The acceptance of innovation can be difficult or easy; innovation that is perceived as difficult and too complex to understand and use is less likely to be accepted than simple innovation.

4. Trialability -- it is a feature that allows innovation recipients to recognize that innovation can be tried. Innovations that can be subdivided into experiments for trials are accepted faster than the innovations that cannot be subdivided for experiments

5. Observability -- it is a feature that makes it possible for innovation recipients to notice the effects of an innovation. Any innovation that can clearly show results to

the society is accepted more easily and faster than the innovations that are difficult to observe.

Speaking of innovation acceptance, Davis (1989) proposed a Technology Acceptance Model or TAM developed from Ajzen and Fishbein's Theory of Reasoned Action, using the basic concept to explain the link between the two main variables. They are:

1. Perceived usefulness -- refers to a person's perceived usefulness, the value of innovative technology used, whether it work more efficiently, make the job more effective, or whether it can make more money, etc.

2. Perceived ease of use -- means that a person recognizes that such innovative technology is easy to use and not complicated.

Davis (1989) described that the perceived usefulness and the perceived ease of use of a person have an effect on attitude toward using, which further leads to behavioral intention to use, which results in actual system use, as shown in Figure 2.5.

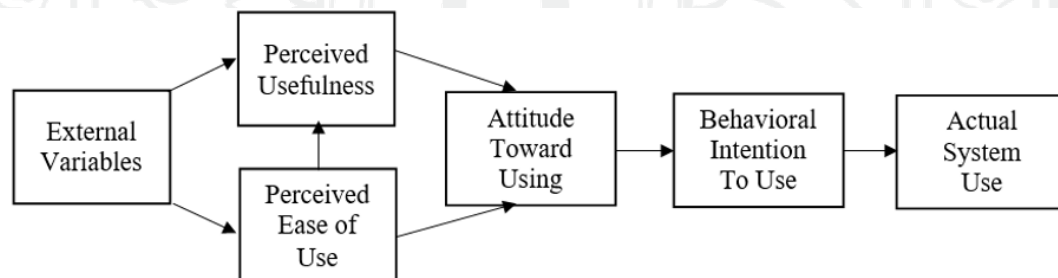


Figure 2.5 Davis' Technology Acceptance Model (1989)

From the above, it can be seen that Data Journalism is a kind of innovation. Therefore, the researcher adopted the concepts of innovation acceptance to create a data collection tool, as well as using them as criteria in the data analysis.

## 2.5 Related Studies

Zanchelli (2011) studied 'Integrating Data Journalism into Newsrooms' to find the structure of work, motivation, and support of the Data Journalism workforce in successful media organizations, including the BBC, The New York Times, The Guardian, USA TODAY, The Washington Post, O Estado de São Paulo, and the

Chicago Tribune. It was done via e-mail and telephone interviews. The study results indicated that the work of data journalists in successful media organizations was very close to the existing newsstand. Data Journalists will work with editors or journalists in each of the relevant boards. There was support for journalists and programmers to work together. The agency will select data journalist work teams from journalists who have a background knowledge of Data Science or programmers with experience in news reporting. Most of the news that the data journalists selected to present would be news they deemed useful and that had an impact on target groups.

Appelgren and Nygren (2014) wrote “Data Journalism in Sweden - Opportunities and Challenges” studying the use of Data Journalism in seven news organizations in Sweden using data online questionnaires to journalists and in-depth interviews with news editors. The study found that Data Journalism had attracted attention from the management teams in corporate news organizations in Sweden. Many organizations devoted resources to strengthening Data Journalism literacy and skills for their own journalists and editors. However, the data derived from the journalists indicated that most journalists' understanding of Data Journalism was still at the beginning. Most journalists had a good attitude towards experimenting with new processes, but at the same time they were distrustful of unfamiliar things. This work also argues that the attitudes about learning the process of Data Journalism are correlated with the level of perception of how Data Journalism works. The obstacles to the development of Data Journalism in the opinions of Swedish journalists were working time factors and news organizations also needed to train and develop the skills of their existing staffers considerably.

Fink and Anderson (2014) wrote “Data Journalism in the United States Beyond the ‘usual suspects’” giving an overview of the use of Data Journalism in the United States using semi-structured interviews with 23 journalists with Data Journalism experiences from newspapers and news websites in the US. The study indicated that Data Journalists in the US were diverse in their education, skills, tools, and aims. Most American Data Journalists, however, encountered similar problems, such as defining their roles with their organizations and complex data management. The obstacles to the development of Data Journalism were the working time factors, especially in small media organizations with limited personnel.

Knight (2015) wrote “Data Journalism in the UK: A Preliminary Analysis of Form and Content” covering the content of news that used Data Journalism in the UK using content analysis from daily and weekly newspapers, both traditional and online, totaling 16 copies, for two weeks. The study found that there were 106 news articles that used the process of Data Journalism. Most of the news was a presentation of social issues, secondly was foreign news. Each news piece used a variety of sources. Statistical tools were used to analyze data, and they were presented in infographics the most. Second was maps and third was graphs, respectively. It was noted that leading newspapers used more intensive Data Journalism, both qualitatively and quantitatively, than the populist newspapers.

Splendore (2015) wrote “Educational Strategies in Data Journalism: A Comparative Study of Six European Countries” studying the Data Journalism skill training process using the analysis of the contents of the courses related to Data Journalism, and in-depth interviews with lecturers from six European countries, including Germany, Switzerland, the Netherlands, Italy, and Poland, then analyzed the data comparatively. The research found that the training in each country could be divided into four levels: academics, professionals, specialist professionals, and general public. There were two main aspects of teaching and learning: (1) the practical guidelines of professions related to Data Journalism and (2) the training in statistical skills and communication skills. Moreover, the paper also noted that most European Data Journalism training courses ignored fundamental principles such as transparency and responsibility.

Berret and Phillips (2016) wrote “Teaching Data and Computational Journalism” studying the teaching and learning of Data Journalism using content analysis of undergraduate courses offered in journalism in the United States and in-depth interviews with instructors. The study found that only 46% (59 institutions) of institutions offered Data Journalism courses in the US. The results of the interviews showed that most journalism institutions recognized the importance of Data Journalism. The main reason that many institutions did not offer data journalism courses was that they could not find a specialist to teach. Moreover, at the end of the study, Berret and Phillips also synthesized research data into a framework for teaching Data Journalism.

Young, Hermida, and Fulda (2018) wrote “What Makes for Great Data Journalism?” studying the features of good Data Journalism works by analyzing the content of award-winning Canadian media organizations or those that were named in the final round of the Data Journalism Contest 2012-2015. The study found that most of the sample Data Journalism works were made by only one or two journalists. Those who were related were editors, web designers, project managers, software developers, data analysts and others, respectively. The most common content was investigative news and explanatory news. It was often news which was good in terms of intimacy. The source data was often kept by government agencies, which the news organizations had access to by legal authority. Most of the presentations included dynamic maps, graphs, videos and infographics, almost all of which used interactive rendering creating abstract pictures from information. The limiting factor in the use of Data Journalism was the inflexibility of the programs available for free online, and most Data Journalism projects also still needed to work within the framework of traditional media organizations as well.

For studies in Thailand, Techatuttanon (2016) produced a “Comparative Study of Data Journalism in Thailand and other countries” using content analysis to compare between news from the Data Journalism process published on The Guardian's websites and the news from Data Journalism processes published on the Thai Publica website. The study indicated that news from the Guardian's Data Journalism process was categorized specifically and the data came from diverse sources. For most of the data, The Guardian provided raw data for the recipients to check or use. In terms of presentation, infographics were used the most. The second was pinning on Google Maps. However, for the news from the Data Journalism process of Thai Publica's website, six articles were found using Data Journalism, all of which presented information in an interactive format. Data were collected from a variety of sources but data from the government and academics were not used as much, reflecting the limitations of disclosure in Thailand. This study also noted that news on Thai Publica did not provide raw data sources to allow recipients to find the source information.



## CHAPTER 3

### RESEARCH METHODOLOGY

"Data Journalism: Principle Development and Knowledge Adaptation in Thailand" is qualitative research using documentary research, case studies, in-depth interviews, and focus groups. The results obtained were analyzed to find conclusions based on the research issues. The details are given below.

Table 3.1 Research Issues and Research Methodology Used to Find Answers

Research Issues	Research Methodology
1) What is the knowledge and use of Data Journalism in foreign countries?	Documentary Research Case Study Analysis
2) What is the knowledge and use of Data Journalism in Thailand? What are the problems and obstacles?	Case Study Analysis In-depth interviews
3) What should the knowledge improvement and promotion of the use of Data Journalism in Thailand look like?	In-depth interviews Focus Group

#### 3.1 Documentary Research

The researcher gathered information from documents such as textbooks, research reports, online lessons, academic articles, and the websites of agencies related to Data Journalism.

##### 3.1.1 Population and sample

1) All academic works related to Data Journalism based on the operational definitions of this research, published before December 31, 2017 in Thai and English



that the researcher could access, from 12 online databases: ACM Digital, EBSCO, Google Scholar, IEEE, JSTOR, ProQuest, Science Direct, SpringerLink, Taylor & Francis, Web of Science, Wiley, and CRCnetBASE

2) Information about the teaching of Data Journalism, from courses at the top 10 universities in the field of communication according to QS World University Rankings 2017: University of Southern California; University of Amsterdam; London School of Economics and Political Science (LSE); Stanford University; University of Wisconsin-Madison; University of California, Berkeley (UCB); University of Texas at Austin; Goldsmiths, University of London; University of California, Los Angeles (UCLA); and University of Pennsylvania respectively, and from online Data Journalism courses that were accessible to the researcher without fees: Google News Lab and the European Journalism Center

3) Popular textbooks on Data Journalism: Houston's "Computer-Assisted Reporting: A Practical Guide", which is the most widely used textbook for teaching Data Journalism in the United States (Berret & Phillips, 2016); and the two textbooks that have most been referred to in Data Journalism research: Philip Meyer's "Precision Journalism", and Gray et al.'s "The Data Journalism Handbook" (Ausserhofer et al., 2017)

### **3.1.2 Data Collection**

1) The researcher collected academic papers related to Data Journalism from online databases with relevant words: "algorithmic journalism", "computational journalism", "computer-assisted reporting", "data journalism", "data-driven journalism", "database journalism", "quantitative journalism" and the search results were selected from titles, keywords, and abstracts.

2) The researcher collected data about Data Journalism teaching from leading university courses in Communication and courses related to Data Journalism available online; the researcher accessed the website of each course that indicated the course title and the course description in brief.

3) The researcher collected data from popular textbooks on Data Journalism, accessed through the Office of Academic Resource and Information Technology, Suan Sunandha Rajabhat University.

### 3.1.3 Research tools

Research tools include a record of data generated from relevant indicators. The researcher used this record of data to analyze the content validity by requesting advisors to check the validity and content coverage.

#### 1) Data collection form for academic works related to Data Journalism

Table 3.2 Data collection form for academic works related to Data Journalism

Factors	Characteristics
<b>Title of work</b>	...
<b>Author</b>	...
<b>Published year</b>	...
<b>Types of Research Article</b>	research article academic article report doctoral dissertation master's thesis
<b>Main Issues</b>	Work process of Data Journalism Content of Data Journalism Teaching of Data Journalism Definition of Data Journalism other
<b>Main Points</b>	...

2) Record form for Data Journalism teaching, data from leading university courses in Communication, and textbooks on Data Journalism. The researcher used relevant indicators from Berret and Phillips (2016).

Table 3.3 Record Form for Data Journalism Teaching, Data from Leading University Courses in Communication, and Textbooks on Data Journalism

Factors	Characteristics
Name of institution, name of textbook and author	...
1) Content about Journalism	with/without - contains information about reporting information. Is there a question or criticism issue?
2) Content about Spreadsheets	with/without - contains content about using data tables and Is a software package used to handle structured data?
3) Content about Relationship Databases	with/without - Is there any content related to the relationship between the data sets?
4) Content about Design	with/without - Is there any design content?
5) Content about Statistics	with/without - Is there any content related to the use of statistics?
6) Content about Programming	with/without - Is there programming content?

### 3.1.4 Data Analysis

The researcher analyzed the data from the research papers using concepts of Information Society, concepts of Journalism, concepts of Data Journalism and concepts of Abstract Image Creation (Communication Design).

## 3.2 Case Study Analysis

The researcher used case studies of the best practices of Data Journalism in foreign countries as a benchmark to compare Data Journalism in Thailand.

### 3.2.1 Population and sample

1) Case studies of successful Data Journalism in foreign countries selected from news coverage that won Data Journalism Awards in the category of Data Visualization of the Year and Investigation of the Year in 2016-2017, one category per year, four in total, and popular Data Journalism in 2017 from two world-class media organizations: The Guardian and The New York Times

2) Case studies of Data Journalism in Thailand selected from news coverage that won a first prize from the Thai Online News Providers Association in 2017 in the category of The Best Investigative News and The Best Digital News, one for each type, in total two types; and the most popular Data Journalism works in 2017, which are Thai Publica and The Matter

### 3.2.2 Data Collection

1) The researcher collected case studies of successful Data Journalism in foreign countries through the websites of media organizations. The case studies were selected by popularity based on social media platforms like Facebook, the same logic as for case studies selected from The New York Times, i.e. by measuring the popularity of interactions with the upshot page, which is data content in the New York Times. However, The Guardian does not have a Facebook page, so the researcher measured popularity from the content-sharing counts of the Data Blog category from the official website to Facebook instead.

Table 3.4 Case Studies of Successful Data Journalism in Foreign Countries

Works	Affiliation	Awards/Popularity
The Panama Papers	ICIJ	Investigation of the year 2016 Data Journalism Awards
Spies In The Skies	BuzzFeed News	Visualization of the year 2016 Data Journalism Awards
Unfounded	The Globe and Mail	Investigation of the year 2017 Data Journalism Awards
The Rhymes Behind	The Wall	Visualization of the year 2017

<b>Works</b>	<b>Affiliation</b>	<b>Awards/Popularity</b>
Hamilton	Street Journal	Data Journalism Awards
Full results of Australia's vote for same-sex marriage	The Guardian	Top 1 popularity for shares from website to Facebook: 6259 times
America's Broken Healthcare System	The Guardian	Top 2 popularity for shares from website to Facebook: 4793 times
How to Reduce Mass Shooting Deaths?	The New York Times	Top 1 popularity for 5809 Reactions, 2472 Shares, 357 Comments
Nothing Divides Voters Like Owning a Gun	The New York Times	Top 2 popularity for 1938 Reactions, 509 Shares, 447 Comments

2) The researcher collected case studies of works that used Data Journalism or similar in Thailand through the website of each media organization. The case studies were selected by popularity based on popular social media like Facebook.

Table 3.5 Case Studies of the Data Journalism or Similar in Thailand

<b>Works</b>	<b>Affiliation</b>	<b>Awards/Popularity</b>
Solving the puzzle of “Business Advisory Program for Thai Enterprise Development”	Thairath Online	The best digital news coverage in the form of investigative news
“Prompt Pay” Is it promptly ready? What is it? Pros and Cons. Why use it?	Thairath Online	The best digital news coverage in the form of infographics
The Ghosts of Thailand in “The Shock: Explore Thai Ghosts through Thriller Stories”	The Matter	1429 Reactions:, 981 Shares, 142 Comments
"Lottery" Who gets rich?	Thai Publica	299 Reactions, 104 Shares, 6 Comments

### 3.2.3 Research Tools

The tools used to collect data for case study analysis were data collection forms made from the application of indicators in the work of Loosen, Reimer, and Silva-Schmidt (2017) together with the concepts of Journalism and Data journalism. The data collection forms were analyzed for content validity by requesting advisors and experts to check the validity and content coverage.

Table 3.6 Data Collection Form for Case Study Analysis

<b>Factors</b>	<b>Characteristics</b>
Title of work	...
Media Organization	...
Types of Organization	Private Media Organization Non-profit media organization
Distribution channel	Online Traditional media
Producer Name	...
Release Date	...
Coverage Issue	social/economic/political etc.
News value	Popularity - matters about people, animals, things, or events that are known in society Intimacy - issues close to the target audience Timeliness - new issues or just discovered General public interest – topics related to human emotions/feelings Conflict - issues related to competition, fighting, or conflict Impact - issues affecting the target audience Mystery - suspicious, interesting issues Disaster and progress -catastrophic or beneficial issues for a lot of people. Sexual elements - issues concerning sexual attraction Bizarre - issues different from the ordinary, cannot



Factors	Characteristics
	be seen in general.
Data size	Small – data used in the news less than 100 records Medium - data used in the news from 100 – 400 records Big - data used in the news from 401 records
Data Source	Government organizations Private organizations Non-profit organizations Media organizations collecting data themselves Unknown
Data Access	It is publicly available information, accessible to everyone. Media organization requests information from owners. Media organizations collect data themselves. Use of data science techniques in online data retrieval (Scraped) Confidential information from anonymous sources sent to media organizations (Leaked) Unknown
Time of data	Cross-sectional storage - The data is stored in a single, closed period. Long-term storage - archived for many years.
Transparency in work	Reveal the source of the information? Have links for recipients to access to the sources?
Data Analysis	Data Exploration - Frequency Distribution, Median Calculation, Comparative Calculation Predicting-Classification Clustering Regression
Purpose of Data Analysis	Features Description – basic feature processing of

Factors	Characteristics
	data Relationship Analysis - Finding relationships to see data relevance
Data Presentation Format	Message News –communicated and narrated mainly in written language Infographics –communicated and narrated mainly with still pictures Animation - communicated and narrated mainly with motion pictures Interactive - communicated and narrated mainly with an interactive application
Using Visualization	Table/Chart/Map/Video/Playable Visualization Audio
Use of Data Science	What steps taken at all? - Search, gather, organize/analyze/present

### 3.2.4 Data Analysis

The researcher analyzed the data from case study analysis by comparing news from successful Data Journalism in foreign countries with news that used Data Journalism in Thailand., using analysis criteria following the concepts of Information Society, concepts of Journalism, concepts of Data Journalism, and concepts of Abstract Image Creation to find an explanation of how Data Journalism in Thailand is the same as or different from foreign countries.

## 3.3 In-Depth Interviews

The researcher interviewed journalists and executives in media organizations who presented news using Data Journalism, and academics and specialists in related data sciences, using concepts and theories related to create questionnaires in semi-structured interviews to understand the use of Data Journalism in media organizations in Thailand and guidelines for promoting Data Journalism in Thailand.

### 3.3.1. Population and sample

The researcher selected the samples in in-depth interviews by selecting 12 key informants related to Data Journalism in Thailand as shown below.

Table 3.7 Sample Group for In-depth Interviews

Sample Group	Details
1. Ms. Kanokporn Prasitphon	Director of New Media Development Center, Thai Public Broadcasting Service (Thai PBS)
2. Mr. Jarun Ngamvirojcharoen	Chief Data Scientist from Sertis Co., Ltd., who has been involved in the production of Data Journalism works with the online news agency “Thai Publica”
3. Mr. Chavarong Limpattamapanee	President of The Confederation of Thai Journalists, advisor for the Online News Providers Association, Chief of the Information Centre of The Thairath Daily Newspaper
4. Mr. Tomorn Sookprecha	Editor of The101.world online media, an agency -- though is not yet being used – who is interested in Data Journalism, and already sent reporters to participate in the UN training projects
5. Ms. Boonlarp Poosuwan	Executive Editor at the online news agency “Thai Publica”, one of the co-authors of the work “‘Lottery’ Who Gets Rich?” which is the most complete Data Journalism news in Thailand
6. Asst. Prof. Pijitra Tsukamoto	Head of the Journalism Department, Faculty of Communication Arts, Chulalongkorn University; lecturer in courses regarding Data

Sample Group	Details
	Journalism
7. Mr. Peerapong Techatuttanon	Creative and Public Communication Affairs Manager, Thailand Development Research Institute (TDRI)
8. Ms. Pattarawadee Thielor	Lecturer at the Department of Convergent Journalism, Faculty of Communication Arts, Panyapiwat Institute of Management; Lecturer of Data Journalism
9. Mr. Puripant Ruchikachorn, Ph.D.	Lecturer at the Department of Statistics, Faculty of Commerce and Accountancy, Chulalongkorn University; Co-Founder of Boonmee Lab; one of the co-authors of the work “‘Lottery’ Who Gets Rich?” which is the most complete Data Journalism news in Thailand; and a co-lecturer in courses about Data Journalism at Chulalongkorn University.
10. Ms. Sarinee Achavanuntakul	Co-founder and Editorial Advisor of the online news agency “Thai Publica”
11. Mrs. Sudarat Disayawattana Chantrawatanakul, Ph.D.	Deputy Director of Public Media Strategies, Thai Public Broadcasting Service (Thai PBS)
12. Mr. Arthit Suriyawongkul	Coordinator at Thai Netizen Network, which is important in driving the use of open data in Thailand

### 3.3.2 Data Collection

The researcher collected data by face-to-face interviews, video interviews and phone interviews for the convenience of the data providers. Each session was 45-60 minutes.

### 3.3.3 Research tools

The tools used in the in-depth interviews were open questionnaires so that informants could give opinions freely and provide both wide and deep information.

The responses were then analyzed for content validity by requesting advisors to check the accuracy and coverage of the content. In this research, the questionnaires were divided into two parts: questions to study the use of Data Journalism in Thailand and questions about developing the knowledge of and promoting the use of Data Journalism in Thailand.

1) Questions to study the use of Data Journalism in Thailand, and problems and obstacles in the development of the use of Data Journalism in Thailand

1.1) Questions about the process of using Data Journalism in news reporting:

- What is Data Journalism in your understanding?
- What is the procedure for using Data Journalism?
- What are the strengths and weaknesses of using Data Journalism?
- What skills are needed in order to use Data Journalism?
- What are the similarities and differences in the use of Data Journalism and traditional Journalism?

- How do you adapt to Data Journalism?
- Do you find barriers and problems in using Data Journalism? And how?

1.2) Questions about adoption of Data Journalism innovations:

- Does Data Journalism have a benefit and help you make better report news?
- Does Data Journalism correspond to the current state of the news reporting?
- Can Data Journalism be something that can be learned and practiced easily?
- Do you have a discussion with the users of Data Journalism information?

And how?

- Do you a plan to use Data Journalism in your work in the future? And how?

1.3) Questions about the use of Data Journalism in the media industry:

- How to recruit staff to work in Data Journalism? (Ask editors only)
- What is the structure of Data Journalism work in your organization?
- What is the payoff for news reporting using Data Journalism?
- What is the response to the media's duty in news reporting using Data Journalism?

- What is the response from the target audience to news reporting using Data Journalism?

- What are the barriers and problems in using Data Journalism in your organization?

- What are the expectations for using Data Journalism and trends in the future?

2) Questions for knowledge development and promotion of use of Data Journalism in Thailand

These are divided into question sets for all contributors, and a subset of questions for each type of informant.

2.1) Questions for all informants:

- Is Data Journalism important to Thai society?
- How much Data Journalism is widely available in Thailand?
- What factors encourage the use of Data Journalism in Thailand?
- What factors impede the use of Data Journalism in Thailand?
- How should institutions contribute to the use of Data Journalism in Thailand?
- How should media organizations contribute to the use of Data Journalism in Thailand?
- How should professional associations contribute to the use of Data journalism in Thailand?
- What should the government sector do to support the use of Data Journalism in Thailand?
- What should consumers do to support the use of Data Journalism in Thailand?

2.2) Questions for journalism professionals:

- Does Data Journalism matter to professional journalists? And how?
- For journalists who want to start using Data Journalism, how should they adapt?
- What should media organizations' use of Data Journalism look like in Thailand?

2.3) Questions for journalism academics:

- Is Data Journalism important to journalism academics? How?
- What are the current courses on Data Journalism in your institution?
- What should be taught about Data Journalism in Thailand?



- What should research on Data Journalism in Thailand be like?

#### 2.4) Questions for experts in creating abstract images from data:

- Is creating abstract images from data to support news reporting, important?

And how?

- What is the current abstract image creation from data to support news reporting like in Thailand?

- What should creating an abstract image based from data to support coverage in be like in Thailand?

- Is use of Data Journalism i related to the knowledge of abstract image creation from data or not? And How?

- What should we do to improve abstract image creation from data in the news by media in Thailand?

#### 2.5) Questions for Data Science experts:

- Is the use of Data Science to support news coverage important or not? And how?

- What is the current use of Data Science in supporting news coverage in Thailand?

- Is the use of Data Journalism related to the knowledge Data Science? And how?

- What should the use of Data Science to support news coverage be like in Thailand?

- What should be done to improve the use of Data Science to support news coverage in Thailand?

### 3.3.4. Data Analysis

The researcher analyzed the data from the in-depth interviews by classifying answers according to the concepts of Information Society, concepts of Journalism, concepts of Data Journalism, concepts for creating abstract images, and concepts of innovation acceptance to find guidelines for bringing Data Journalism into use, to try to explain how Data Journalism affects the processes of news organizations in Thailand, to find out what are the problems and obstacles, and to find ways to promote the use of Data Journalism in Thailand.

### 3.4 Focus Group

The researcher collected the quasi-experimental data from the sample groups by receiving news pieces from the Data Journalism process and then collected the data through group discussions using related concepts and theories to create questionnaires to find out guidelines for promoting the use of Data Journalism in Thailand

#### 3.4.1 Population and sample

Population and sample groups in the group discussion included consumers who were exposed to daily news for more than one hour per day, using purposive sampling to obtain a qualified and voluntary sample for two groups, based on the criteria of generations according to survey report of Internet users in Thailand by the Electronic Transactions Development Agency (2018) selecting only Generation X (persons born 1965-1980) and Generation Y (persons born 1981-2000), which are the primary targets of the digital media organizations, one group per generation, five persons for each group, with different ages, sexes, and occupations.

Table 3.8 Sample Group for Group Discussions from Generation X

<b>Sample Group</b>	<b>Sex</b>	<b>Age</b>	<b>Occupation</b>
Nattanan	Male	37	Employee
Thavit	Male	38	Employee
Sineenat	Female	41	Freelancer
Soralux	Female	43	Employee
Pornpisit	Male	45	Government Officer

Table 3.9 Sample Group for Group Discussions from Generation Y

Sample Group	Sex	Age	Occupation
Weeraya	Female	21	University Student
Nattaya	Female	22	University Student
Sirinporn	Female	25	Employee
Theetawat	Male	30	Employee
Raksak	Male	34	Business Owner

### 3.4.2 Data Collection

The researcher gathered data from the group discussions after informing about the objectives of the research, describing the necessary terminology, and informing about the rules in giving comments, then asked the participants to introduce themselves, then started a conversation from general questions to specific questions, showed three different case studies of Data Journalism to the groups, and requested for comments and opinions.

Table 3.10 Data Journalism Works for Group Discussion

Works	Media	Data Size	Complexity	Presentation Format
Exploring the occupation of the main characters from Ch7 TV series	The Matter	Small	Low	Text with infographics
A case summary of luxury watches of Pravit Wongsuwan's	CSI LA	Small	Medium	Infographics
"Lottery" Who Gets Rich?	Thai Publica	Large	Medium	Interactive Text

### 3.4.3 Research tools

The tools used to collect data from group discussions were open questionnaires so that the informants could comment and provide data both broad and deep. The responses were analyzed for content validity by requesting the advisors to check the validity and content coverage. The questionnaires used in the interviews were tailored to fit and communicate in a consistent manner with each informant.

- Have you ever received news coverage from Data Journalism and what factors influenced your decision in choosing your daily news?
- How do you feel about the news being presented by the Thai media today?
- What do you think about the samples of Data Journalism?
- What do you like or dislike most? And why?
- How do you feel about news from the Data Journalism?
- If the same issue is presented in a variety of formats, will you still receive news coverage from the Data Journalism?
- What do you think is a barrier to the development of Data Journalism in Thailand? And how should it be developed?

### 3.4.4. Data Analysis

The researcher analyzed the data from group discussions by classifying answers according to the concepts of Information Society, concepts of Journalism, concepts of Data Journalism, concepts of creating abstract images, and concepts of innovation acceptance to know the feedback from consumers and find ways to promote Data Journalism in Thailand.

## **CHAPTER 4**

### **RESEARCH RESULTS**

"Guidelines for Developing Knowledge and Promoting the Use of Data Journalism in Thailand" is qualitative research. The researcher collected data using documentary research, case studies, in-depth interviews, and focus groups, and then analyzed the data and presented it in three sections as follows:

4.1 Knowledge and use of Data Journalism in other countries

4.2 Knowledge and use of Data Journalism in Thailand

4.3 Guidelines for the development of knowledge and promotion of the use of Data Journalism in Thailand

#### **4.1 Knowledge and use of Data Journalism in Other Countries**

Here, the researcher presents the results of the study of knowledge and use of Data Journalism in other countries, using data from documentary research to represent the knowledge of Data Journalism in other countries and using data from analysis of case studies to represent the use of Data Journalism in other countries.

##### **4.1.1 Knowledge of Data Journalism in Other Countries**

Based on documentary research, it was found that the knowledge of Data Journalism has been based on the use of computer-assisted reporting (CAR), which has attracted academic attention since the 1960s, but most of the academic works on Data Journalism before the 2010s have focused on a different point. The researcher would like to explain more about the definition of Data Journalism. This research therefore starts from the first set of knowledge that is related to Data Journalism. This is the works of the American journalism research group from 1996-2000. They aimed to study how news organizations used computer technology in helping to manage data



for news reporting. From collecting data through online databases, the researcher found academic works related to Data Journalism from 1996 to 2017, totaling 64 items, 47 of which are in the form of research articles, followed by 9 academic journals, 5 reports, 2 doctoral dissertations, and 1 master's thesis, respectively, as shown in Table 4.1 below.

Table 4.1 Knowledge of Data Journalism in Other Countries on Online Databases

No.	Title	Author	Year	Category	Aspect
1	Computers in Newsrooms of Michigan's Newspapers	Davenport; Fico; Weinstock	1996	Research Articles	Process
2	Newspaper Size as a Factor in Use of Computer-Assisted Reporting	Garrison	1999	Research Articles	Process
3	Computer-assisted Reporting in Michigan Daily Newspapers	Davenport; Fico; Detwiler	2000	Presentation Articles	Process
4	Accountability Through Algorithm	Hamilton; Turner	2009	Report	Process
5	Narrative Visualization: Telling Stories with Data	Segel; Heer	2010	Research Articles	Content
6	The Guardian Reportage of the UK MP Expenses Scandal	Daniel; Flew	2010	Presentation Articles	Content
7	Computational Journalism: A Call to Arms to Database Researchers	Cohen; Yang; Yu	2011	Research Articles	Process
8	Computational Journalism: How computer scientists can empower journalists	Cohen; Hamilton; Turner	2011	Research Articles	Process
9	Trends in Data Journalism	Aitamurto; Sirkkunen; Lehtonen	2011	Report	Process

No.	Title	Author	Year	Category	Aspect
10	Data Visualization in Online Journalism and Its Implications for the Production Process	Weber; Rall	2012	Presentation Articles	Process
11	Integrating Data Journalism into Newsrooms	Zanchelli; Crucianelli	2012	Report	Process
12	The Promise of Computational Journalism	Flew; Spurgeon; Daniel; Swift	2012	Research Articles	Process
13	A New Style of News Reporting: Wikileaks and data-driven journalism	Baack	2013	Research Articles	Process
14	Computational Journalism	Stavelin	2013	Doctoral Dissertations	Process
15	Computational Journalism in Norwegian Newsrooms	Karlsen; Stavelin	2013	Research Articles	Process
16	Data-driven Journalism and the Public Good	Parasie; Dagiral	2013	Research Articles	Process
17	Model trees with topic model preprocessing	Rusch; Hofmarcher; Hatzinger; Hornik	2013	Research Articles	Content
18	Open Source and Journalism	Lewis; Usher	2013	Research Articles	Process
19	Algorithmic Accountability	Diakopoulos	2014	Research Articles	Process
20	Code, Collaboration, and the Future of Journalism	Lewis; Usher	2014	Research Articles	Process
21	Data Journalism in Sweden – Opportunities and Challenges	Appelgren; Nygren	2014	Presentation Articles	Process
22	Data Journalism in Sweden:	Appelgren;	2014	Research	Process

No.	Title	Author	Year	Category	Aspect
	Introducing New Methods and Genres of Journalism into "Old" Organizations	Nygren		Articles	
23	Data-Driven Sourcing: How Journalists Use Digital Search Tools to Decide What's News	Fink	2014	Doctoral Dissertations	Process
24	Interactive Infographics and News Values	Dick	2014	Research Articles	Process
25	Journalism Innovation Leads to Innovation Journalism	Gynnild	2014	Research Articles	Process
26	The Art and Science of Data-Driven Journalism	Howard	2014	Report	Process
27	The View on Open Data and Data Journalism	Radchenko; Sakoyan	2014	Research Articles	Content
28	By the Numbers	Caroline	2015	Research Articles	Education
29	Clarifying Journalism's Quantitative Turn	Coddington	2015	Research Articles	Definition
30	Computational Journalism in the UK Newsroom	Hannaford	2015	Research Articles	Process
30	Content, Context, and Critique: Commenting on a Data Visualization Blog	Hullman; Diakopoulos; Momeni; Adar	2015	Presentation Articles	Content
32	Data Journalism in the UK: A Preliminary Analysis of Form and Content	Knight	2015	Research Articles	Content
33	Data Journalism in the United States: Beyond the "Usual Suspects"	Fink; Anderson	2015	Research Articles	Process
34	Data-driven Revelation? Epistemological Tensions	Parasie	2015	Research Articles	Process

No.	Title	Author	Year	Category	Aspect
	in Investigative Journalism in the Age of "Big Data"				
35	Models and Streams of Data Journalism	Uskali; Kuutti	2015	Research Articles	Process
36	Small Departures, Big Continuities? Norms, values, and routines in The Guardian's big data journalism	Tandoc; Soo- Kwang	2015	Research Articles	Content
37	Stabbing News: Articulating Crime Statistics in the Newsroom	Lugo-Ocando; Brandão	2015	Research Articles	Process
38	Waiting for Data Journalism: A Qualitative Assessment of the Anecdotal Take-up of Data Journalism in French- Speaking Belgium	De Maeyer; Libert; Domingoc; Heinderyckxd; Le Cam	2015	Research Articles	Process
39	When Data Become News: A Content Analysis of Data Journalism Pieces	Loosen; Reimer; Schmidt	2015	Presentation Articles	Content
40	A Numbers Game	Treadwell; Ross; Lee; Lowenstein	2016	Research Articles	Education
41	Data Journalism Classes in Australian Universities	Davies; Cullen	2016	Research Articles	Education
42	Data Journalism in Uruguay	Rodríguez	2016	Research Report	Process
43	Data Journalism Versus Traditional Journalism in Election Reporting	Solop; Wonders	2016	Research Articles	Content
44	Data Journalism, Impartiality and Statistical	Cushion; Lewis;	2016	Research Articles	Content

No.	Title	Author	Year	Category	Aspect
	Claims	Callaghan			
45	Data Journalism: An Explication	Royal; Blasingame	2016	Research Articles	Definition
46	Data journalism's actors, practices and skills: A case study from Quebec	Tabary; Provost; Trottier	2016	Research Articles	Process
47	Data journalists using Facebook; a study of a resource group created by journalists, for journalists	Appelgren	2016	Research Articles	Others
48	Digital Watchdogs? Data Reporting and the News Media's Traditional 'Fourth Estate' Function	Felle	2016	Research Articles	Others
49	Educational strategies in data journalism	Splendore; Di Salvo; Eberwein; Groenhart; Kus; Porlezza	2016	Research Articles	Education
50	Learning to teach data journalism	Hewett	2016	Research Articles	Education
51	Reader engagement with data journalism	Michalski; Kilker; Bates	2016	Doctoral Dissertations	Content
52	Storytelling in the Age of Big Data	Yang; Du	2016	Research Articles	Education
53	Teaching Big. Educational strategies in the field of data journalism	Splendore; Di Salvo; Eberwein; Groenhart; Kus; Porlezza	2016	Research Articles	Education
54	Teaching Data and Computational Journalism	Berret; Phillips	2016	Report	Education



No.	Title	Author	Year	Category	Aspect
55	The state of data and statistics	Nguyen; Lugo-Ocando	2016	Research Articles	Education
56	Transformation of Communication Processes: Data Journalism	Kayser-Bril; Valeeva; Radchenko	2016	Research Articles	Process
57	Unravelling Data Journalism: A study of data journalism practice in British newsrooms	Borges-Rey	2016	Research Articles	Process
58	‘Machines don’t have instincts’: Articulating the computational in journalism	Bucher	2017	Research Articles	Process
59	An Illusion of Interactivity: The paternalistic side of data journalism	Appelgren	2017	Research Articles	Content
60	From computer-assisted to data-driven: Journalism and Big Data	Hammond	2017	Research Articles	Others
61	Social survey reportage: Context, narrative, and information visualization in early 20th century American journalism	Anderson	2017	Research Articles	Process
62	The datafication of data journalism academicship	Ausserhofer; Gutounig; Oppermann; Matiassek; Goldgruber	2017	Research Articles	Others
63	To Post or Not to Post: Online Discussion of Gun Permit Mapping and the Development of Ethical	Craig; Ketterer; Yousuf	2017	Research Articles	Others

No.	Title	Author	Year	Category	Aspect
	Standards in Data Journalism				
64	What Makes for Great Data Journalism?: A content analysis of data journalism awards finalists 2012–2015	Young; Hermida; Fulda	2017	Research Articles	Content

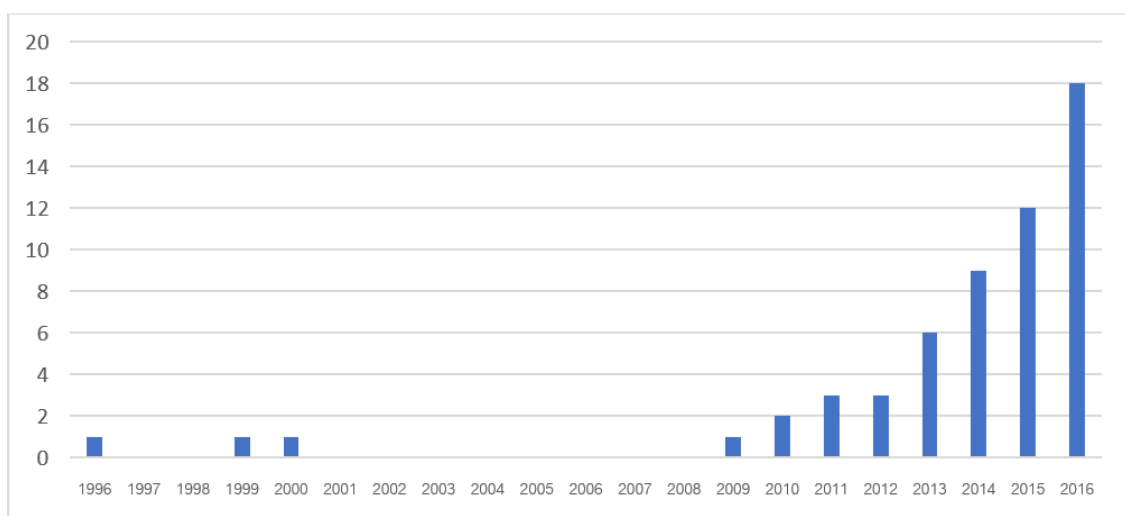


Figure 4.1 Number of Academic Works Regarding Data Journalism from the Past to 2016

Figure 4.1 shows the number of academic works related to Data Journalism, and shows an increasing trend. This issue has been getting serious attention from the academic community since 2009, as a result of the awareness movement and the realization of the importance of “data” from many sectors. In Figure 4.1, the researcher identified the number of related academic works until 2016 only, as this research collected data through online databases in 2017, while academic works produced in 2017 will be published completely on the database by early 2018, after the time period of data collection for this research.

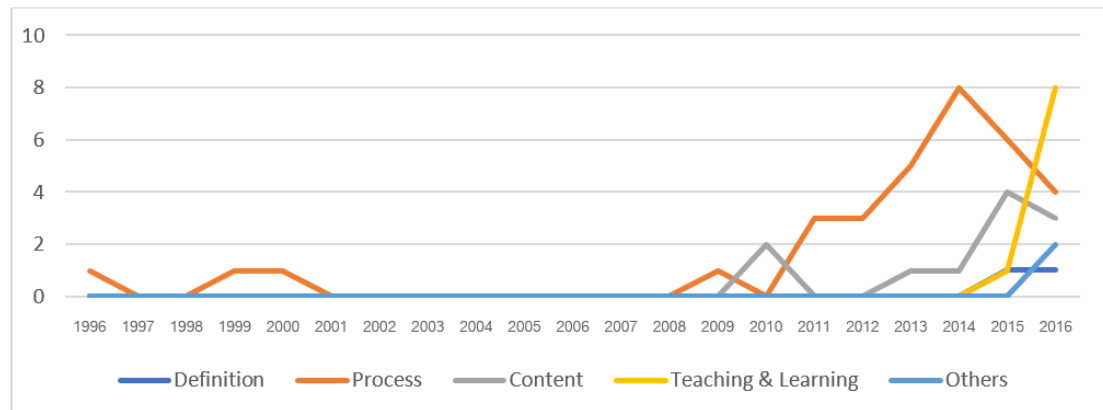


Figure 4.2 Number of Issues in Academic Works Related to Data Journalism

Figure 4.2 represents academic works related to Data Journalism from 2009 to 2016. The picture shows the development of issues in academic works related to Data Journalism. In the first phase they focused mainly on issues related to work processes of Data Journalism in news organizations, and then there were studies on issues related to the contents of Data Journalism in 2010. After 2015, there began to be studies on a wider range of topics.

Most of the academic journal articles related to journalism focused on issues related to workflows, journalism, information on media organizations, followed by study of the content of journalism. There are 9 Data Journalism courses and a study on definitions of Data Journalism. The researcher will process knowledge about journalism in the following areas:

#### 4.1.1.1 Giving a Definition

Based on documentary research, it was found that academic works related to Data Journalism based on the operational definition of this research, which is the process of presenting the facts with data as the core, used a structured data management method. Before 2009, the process was called Computer-Assisted Reporting. Later on, during 2009 - 2014, there were a number of keyword replacements, such as Computational Journalism, Data Journalism, or Data-driven journalism. After 2014, Data Journalism has been used as a key word. However, even though Data Journalism is related and has clearly been influenced by the concepts that came before, if considered thoroughly, the definition of Data Journalism, Computer-

Assisted Reporting, and Computational Journalism is different, leading to a broader definition in academic and professional contexts.

Lorenz (2010), a German data journalist, stated that Data Journalism is a process that involves digging into the data, organizing and restructuring, and filtering data by searching for specific data, creating a presentation from the data, and making a news report from it.

Broussard (Cronin, 2014), a Journalism academic at Temple University, defined Data Journalism as a search for hidden issues in numbers and using the numbers to present those stories.

Finally, there were researchers who studied about giving a definition for Data Journalism. They picked 2 studies: Coddington (2015) and Royal and Blasingame (2015).

Coddington (2015) tried to resolve the ambiguity of the meaning by comparatively studying the definitions of the words “Computer-Assisted Reporting”, “Data Journalism”, and “Computational Journalism”, using more than 90 relevant research papers, resulting in an indicator that shows the difference in the three words in the aspects of Profession Orientation, Openness, Epistemology, and Vision of Public.

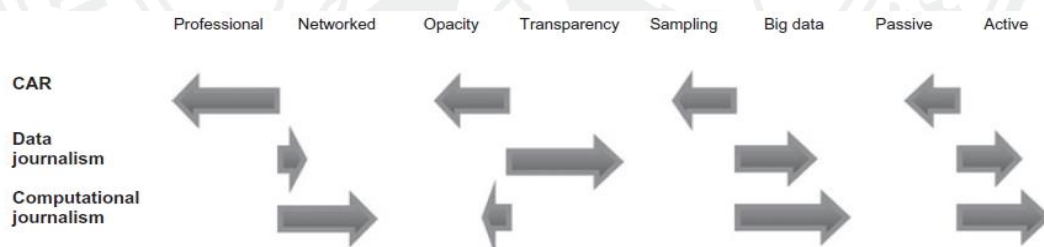


Figure 4.3 Coddington's Meaning Comparison Chart (2015)

From Figure 4.3, it is clear that in the aspect of Professional Orientation, Computer-Assisted Reporting focuses only on the working of professional journalists, while Data Journalism and Computational Journalism tend to disseminate information to relevant stakeholders in other areas, using networks.

In the aspect of Openness, Computer-Assisted Reporting and Computational Journalism would keep data confidential during work processes, while Data

Journalism tends to disclose data with the principle of transparency. It can be seen that many of the news coverages are attached to the raw data.

Epistemology is about how to reach the truth. It brings together different methods of data collection and analysis. Computer-Assisted Reporting has a methodology that is based on a sociological method that focuses on hypothesis testing, therefore it often uses sampling for analysis, while Data Journalism and Computational Journalism are influenced by the Big Data trend, so they often try to collect all the data for analysis by trying to change the characteristics of the data set as little as possible.

In the aspect of Vision of Public, although Computer-Assisted Reporting, Data Journalism, and Computational Journalism tend to look at the public as more active than the viewpoint of traditional Journalism, Computer-Assisted Reporting looks at the public as the least active, while Data Journalism and Computational Journalism look at the public as very active. The process of Data Journalism usually allows the recipients to understand the data by themselves. Data Journalism professionals will facilitate and present data in an easy-to-understand format. Computational Journalism often prepares the right tools along with data sets for the recipients to scrutinize and understand by themselves.

Regarding the four aspects, Coddington (2015) said they each had a different background concept base. Computer-Assisted Reporting is based on the introduction of sociological research methods into the Data Journalism process, while Data Journalism and Computational Journalism, which came later, even if directly impacted by Computer-Assisted Reporting, use a combination of concepts and methods in the Information Society era. Nevertheless, both Data Journalism and Computational Journalism have different small details as well.

Coddington's work helps to point out the difference of words similar to Data Journalism, but the definition that encompasses Data Journalism has not been accepted by all parties. Royal and Blasingame (2015) used Grounded Theory to identify the definitive meaning of Data Journalism. They found that the indicators of the word "Data Journalism" came from traditional journalistic concepts such as news, narratives, news reporting and there were many more that came from contemporary concepts such as statistics, visualizing, interactives, databases, and programming. In



addition, the work of Royal and Blasingame (2015) has also brought these relevant indicators into categories, so that the definition of Data Journalism has many dimensions, including Process Dimension, Product Dimension, Convergence of Fields, Traditional Journalism Dimension, Outside Influence Dimension, and Skills Dimension.

Royal and Blasingame (2015) said Data Journalism is a process by which analysis and presentation of data are employed to better inform and engage the public. However, Royal and Blasingame (2015) stated that the definition and dimensions of Data Journalism are too broad to be used for specific purposes. Therefore, the definition from this work may be drawn to a certain dimension to suit the purpose of the actual use.

#### **4.1.1.2 Work Process**

Based on documentary research, it was found that the 33 most attention-grabbing topics in the field of Data Journalism were the works from Davenport, Fico, and Weinstock in 1996. The early works focused on the use of computer technology, which was an innovation at that time, to help manage the data of newspaper organizations. This was counted as the beginning of Data Journalism.

In 2009, the academic community began to become more active and there were more academic works regarding the work process of Data Journalism. There were influential works that were cited widely in works in the later period; for example, Cohen, Hamilton, and Turner (2011), whose work tried to point out the advantages of computer science, which was one of the foundations of data science, in helping boost the work potential of journalists. This work stated that the use of quantitative data management methods will enable media organizations to cope with the pressures of economic and technological change in the digital age. Journalists and programmers need to work together. Another piece of work in the same period, was the reporting by the International Center for Journalists (Zanchelli, 2011) that aimed at finding the work structure, motivation, as well as support of the working group of Data Journalism in successful media organizations in the UK, US, and South America, in seven places, which were The BBC, The New York Times, The Guardian, USA TODAY, The Washington Post, O Estado São Paulo, and the Chicago

Tribune, using e-mail and telephone interviews. The results showed that the key factors behind the success of the Data Journalism workforce in these organizations are as follows:

1) The closeness between the Data Journalism workforce and the existing news desk

Members of the Data Journalism workforce who were the sampling group stated that the closeness of the Data Journalism workforce and the existing news desk has made it possible to develop issues with journalists and editors.

2) Encouraging journalists and programmers to work together

Journalists and programmers have specialized skills that can help promote Data Journalism. Brainstorming is therefore important to work in Data Journalism.

3) Selection of Data Journalism Workforce

Most successful organizations selected a Data Journalism workforce based on science-based journalists or programmers with major news experience.

4) Selection of issues

Most of the news issues that the Data Journalism workforce selected to present were useful ones that had an effect on the target audience.

Since 2012, knowledge about Data Journalism has become clearer. There started to be studies of the use of Data Journalism in specific countries; starting with the work of Appelgren and Nygren (2014) in Sweden, Fink and Anderson (2014) in the United States, De Maeyer, Libert, Domingo, Heinderyckx, and Le Cam (2015) in French-speaking areas in Belgium, Hannaford (2015) in England and Rodríguez (2016) in Uruguay.

In the academic works about Data Journalism work in these countries, there were many differences in terms of purpose, definition, and methodology. However, they can be synthesized to understand the work process of Data Journalism as follows:

1) Status of Data Journalism

The academic studies of Data Journalism in different countries have shown that the use of Data Journalism in many countries is still in its early stages. And media organizations do not use Data Journalism much in their news coverage, except in the

case of England and the United States, where Data Journalism was developed before anywhere else.

All the works pointed in the same direction, to the fact that the leading media organizations in the United Kingdom and the United States, such as The Guardian and Times New York Times, are outstanding pioneers and are role models in the use of Data Journalism. However, when considering small news organizations, the United Kingdom and the United States were not different from other countries. Data Journalism is often concentrated in large media organizations, with the resources to invest in bringing in new coverage innovations., In Uruguay, for example, it was found that though the public sector and non-profit organizations were trying to push for the development of Data Journalism, but some smaller private media organizations did not want to risk their investment (Rodríguez, 2016).

In the case of Sweden, Data Journalism has gained the attention of corporate news executives, but the data derived from asking operational journalists indicated that most journalists' insights into Data Journalism were still at an early stage. Most journalists had a positive attitude towards experimenting with new processes, but at the same time they were distrustful of unfamiliar things. The work of Appelgren and Nygren (2014), which studied media organizations based in Sweden, stated that the attitude towards learning about Data Journalism is related to the perception level of how Data Journalism works. In addition, the case of French-speaking areas in Belgium, media organizations were alert and focused on Data journalism, however, the actual application was not that high (De Maeyer et al., 2015).

## 2) The skills required in Data Journalism

In the aforementioned academic works, two pieces focused on the skills required in Data Journalism: Fink and Anderson (2014) in the United States; and Hannaford in the UK, both of which are remarkable and are used as role models for the use of Data Journalism in other countries.

Fink and Anderson (2014) found that although Data Journalism has a strong foundation in US media organizations, the career path of data journalists there was not clear. Data journalists in the United States often differ in their experience and educational backgrounds. Many people reported that they were entering the path of Data Journalism and received an introduction from professional organizations such as

NICAR (Investigative Reporters and Editors) and IRE (Investigative Reporters and Editors), while others stated that they started out as political journalists or economic journalists and then they worked on their own data skills until they became experts. More than that, many data journalists did not start their careers as journalists, but were involved in other related fields, such as programming or designing. Data journalists often have a variety of backgrounds such as a Doctoral Degree in Political Science or a Master's Degree in Information Technology, etc. Data journalists cited in the work of Fink & Anderson stated the same that all journalists in the Data Journalism workforce should have the same basic Data Science skills, while those in the work of Hannaford (2015) found that journalists working in the Data Journalism workforce in media organizations in the UK denied the necessity of programming skills or complex Data Science skills. They stated that they needed only basic skills of data management; for example, Excel, GIS, R or Tableau. At the same time, programmers working in the Data Journalism workforce in the UK refused to call themselves journalists or data journalists.

Table 4.2 Required Skills of Journalists and Programmers in Data Journalism in News Organizations in the UK per Hannaford (2015, 17)

Work and required skills	Programmers	Journalists
Website management	HTML/CSS JavaScript	
Background database management	Python PHP Ruby SQL UNIX	
Data Analysis / Presentation		Excel  MPS SPSS

GIS	GIS
R	R
	Tableau

### 3) Obstacles and problems in the use of Data Journalism

From the academic works that studied Data Journalism, the obstacles and problems in the use of Data Journalism in different countries are similar. The main factors are: limitations on working time, the unclear role in the organization, and restrictions on data access.

#### Limitations on working time:

All the works pointed to the fact that time scarcity is a major problem in the use of Data Journalism, especially with small media organizations with limited personnel. Most samples indicated that it is necessary to spend more time working on news related to data. The sample group from Norway said “the limiting factors are not technological infrastructure, but time and goodwill” (Karlsen, J., & Stavelin, E., 2014, 39). Some part of the sample group in the French-speaking areas in Belgium stated that media organizations there refused to provide sufficient time to work on Data Journalism, because they gave importance to other works, resulting in journalists interested in Data Journalism having to practice their skills and produce news works in their own free time.

#### The unclear role in the organization:

The unclear role in the organization is one of the obstacles to the use of Data Journalism. This is due to the fact that the knowledge of Data Journalism was just newly founded, and the fact that there had only been academic works in recent years that developed a clear definition of Data Journalism, such as the work of Coddington (2015) and the work of Royal and Blasingame (2016). For the works that studied the Data Journalism work process, most of the data found that the definition and role of Data Journalism in media organizations were still unclear, as were workload, costs, and administrative systems; for example, in some organizations, the Data Journalism workforce is assigned a social media manager, a technical consultant in the newsroom, and even someone to manage and maintain electronic devices. Ambiguity



in their role in the organization makes it difficult for data journalists to produce their work.

#### Data Access Restrictions

The restrictions on data access are quite different. The main variables are 'Freedom of the media' and 'transparency of government' in each country. There are two issues involved in the use of Data Journalism. A case study in Quebec, Canada stated that the data provided by local and federal Government agencies was not very good. It was difficult to develop into Data Journalism. The case study in Uruguay states that although the government was relatively transparent compared to other South American countries, it was far from what it should be, compared to developed countries. Most government organizations still used confidentiality measures to protect themselves.

Uskali and Kuutti (2015) produced a study aimed at classifying Data Journalism. They conducted interviews with media organizations using Data Journalism in the United States, England, and Finland, and found that Data Journalism can be divided into three types of work structure and three types of work characteristics, as follows:

#### Classification by work structure:

1) The traditional data desk mode is a work format that is adapted from a traditional news desk that is separated into specific content desks. There is a clear command line in the same way as with other newsstands in the news organization. The personnel in the Data Journalism desk will consist of journalists with Data Journalism skills, programmers, and designers.

2) The flexible data projects model is a work format where work is not separated into specific content desks. There is no clear command line. Instead, a collaborative network is used in the newsroom for each Data Journalism project.

3) The entrepreneur model – or the sub-contractor model -- is a work format where the Data Journalism workforce is not affiliated with any media organization but is contracted to work on a periodic Data Journalism project for the hiring organization.

#### Classification by work characteristic:

1) Investigative Data Journalism (IDJ) is the use of Data Journalism for news reporting in an investigative way. Working in this way, the Data Journalism workforce is often allocated a considerable amount of time. This makes it possible to work with a lot of data and use various and complex scientific tools to manage the data.

2) General Data Journalism (GDJ) is the use of Data Journalism in reporting general news. Working in this way, the Data Journalism workforce is usually allocated a small amount of time, from 1 hour to 3 days, so this kind of work is an introductory processing of interesting data and presentation of it in interesting ways, under the constraints of time.

3) Real-Time Data Journalism is the use of Data Journalism in reporting news at the same time as the event occurs, using an algorithm system for instantaneous data management.

In most media organizations, the Data Journalism process is most commonly Investigative Data Journalism and general Data Journalism, while instantaneous Data Journalism has only been used recently in the United States.

#### **4.1.1.3 Content**

Based on documentary research, a total of 11 academic works was found related to news content that came from Data Journalism, starting in 2010. The work of Flew, Daniel, and Spurgeon (2010) was the first to study Data Journalism news reporting. It analyzed the news coverage of bank accounts disclosure, allowances spending, and concealment and falsification of illegal property transactions by members of the British Parliament from over 2 million documents for The Guardian.

The news was a scandal in 2009, causing widespread dissatisfaction among the British people and resulting in many MPs having to resign and some were prosecuted. Flew, Daniel, and Spurgeon found that The Guardian used the Crowdsourcing process, an analysis of large amount of data with computer programs, and presentation in an easy-to-understand visualization, which could be counted as complete Data Journalism.

The process started with organizing the data and uploading it to the website using the Django software, then readers of The Guardian were invited to register to participate in the investigation to find out what may be illegal, resulting in 460,000 documents reviewed by 26,774 registered readers. When the responses were sent back, the workforce continued their work. The Guardian did not disclose how the data was handled through reader engagement. The results were presented in a neat format. Expenses were categorized by type and it allowed readers to click on the expense item they were interested in to gain access to more details, as well downloading the table file via the archive.

Subsequently, academic works related to the content of the news that came from the process of Data Journalism started to increase. An interesting example is from Loosen et al. (2017) that analyzed 120 examples of Data Journalism content to understand the patterns of news from the Data Journalism process. The research found that most works -- 40% -- came from news published on a newspaper's website. Next was from nonprofit media organizations, like ProPublica. In terms of content, most of the content entries -- about 50% -- were news related to political issues. Second were social issues and scientific issues. In terms of types of information, financial information and geographic information were the most commonly used information in the news. In two out of three of the works, data published by official sources was used. It often used basic data analysis, such as frequency, percentage, and mean, to compare differences or similarities between interesting variables (such as sex and hometown) and they were presented through interactive maps or charts, which allowed readers to tap into details of interest, such as, expanding the map or filtering data as needed.

Young et al. (2018) studied similar issues to find the characteristics of good Data Journalism. They analyzed the content of finalists in a Data Journalism contest organized by the Canadian Association of Professional Media 2012-2015. The research found that there was no definitive answer to what good Data Journalism should be like, since the finalists were very diverse. It can be summed up only by the preliminary features in that the sample portfolio was often investigative news. Also, it aimed to present local stories from media organizations that are usually produced by one person rather than groups. The most common presentation formats were graphs

and videos, with an interactive system that allowed recipients to search for and filter data. These things required programming skills. On the other hand, Young et al. (2018) found that there were two factors that limited the quality of Data Journalism works submitted to the contest:

- 1) The use of free online tools such as Google Maps is limited and less flexible, and
- 2) Many Data Journalism work groups still needed to work under the traditional news structure.

Other academic works analyzed the differences between news reporting in traditional ways and Data Journalism. Solop and Wonders (2016) studied the 2012 US Presidential Elections using qualitative content analysis and found that traditional news reporting highlighted the state of the competition from both candidates. The results of the polls from many agencies were reported, but no concrete data was available. In most cases, the polls would state that the competition was close, thus the wait until the last night before voting. The Data Journalism analyzed a lot of data and presented it in several ways. Most of the news, however, pointed in the same direction, that Barack Obama would win the election with an overwhelming vote. As a result, it is clear that Data Journalism coverage was much more accurate than traditional news reporting. However, this work argues that traditional reporting continues to dominate media coverage. Solop and Wonders (2016) noted that it was due to the influence of marketing factors and the structure of news organizations.

#### **4.1.1.4 Teaching and Learning**

Based on documentary research, it was found that there were nine academic works related to the teaching and learning of Data Journalism, starting in 2015. At that time, leading media organizations brought Data Journalism to work in a serious way, but the knowledge of teaching and learning of Data Journalism was still slight. By 2016, this issue had been widely studied.

Yang and Roselyn Du (2016) studied the readiness of students for Data Journalism, collecting responses from 121 Journalism students in Hong Kong, with in-depth interviews. The results showed that the sample students saw the benefits of and showed efforts to learn about Data Journalism but those students had little

knowledge of Data Journalism and stated that they did not like to work with data. This was partly because the curriculum in Hong Kong had not included these skills. Yang and Du (2016) also said that different sexes had different levels of knowledge about Data Journalism, where male students had more basic knowledge than female students.

Splendore (2015) studied the process of Data Journalism skills training, using content analysis of courses on Data Journalism, and in-depth interviews with lecturers from seven European countries: Germany, Switzerland, The Netherlands, Italy, Poland, and England, then compared the data. They found that most course instructors were in the higher education sector. They usually began with doing research on Data Journalism before becoming a specialist in this field. Most media organizations did not provide training in Data Journalism to the public, but professional associations like the European Journalism Center or the Center for Investigative Journalism played an important role in training and educating in this field, providing an online course that brought together academics and professionals as lecturers. The training in each country was divided into four levels: academics, professionals, specialist professionals, and the general public. Most of the curriculum structures were similar, focusing on gathering data, and data analysis and presentation, but they had a different concentration. There were two main aspects of teaching and learning:

- (1) Code of Conduct for Data Journalism
- (2) Training on Statistical Skills and Communication Skills

Media organizations that were often referred to as role models for using Data Journalism included The New York Times of the United States and The Guardian of England, as they were mentioned in every course. Splendore et al. (2015) also noted that most European Data Journalism courses ignored fundamental principles such as transparency and accountability.

In terms of the difference in the curriculum in each country, Splendore et al. (2015) found that Data Journalism courses in Switzerland, Italy and Poland were still in their infancy, while in England, Germany and The Netherlands, intensive courses had been developed for those who were interested in a wide range of academic and professional interests.



Berret and Phillips (2016) studied Data Journalism courses offered in the United States using course content analysis and in-depth interviews. They found that, even in the United States, which was one of the most active countries for Data Journalism in the world, there were still problems in teaching this subject. There were only 46 percent (59 institutes) in the field of Journalism that offered courses in Data Journalism. The main reason for not teaching it was because there were not enough qualified teachers. Most of the institutes that taught were just at the basic level. Teaching was usually focused on critical thinking, using data tables, linking data relationships, concepts of design, statistics, and concepts for programming, respectively. In terms of text books, all courses together offered over 70 textbooks, which varied from institution to institution. The book “Computer-Assisted Reporting: A Practical Guide” by Brant Houston was the most popular (14% of all courses).

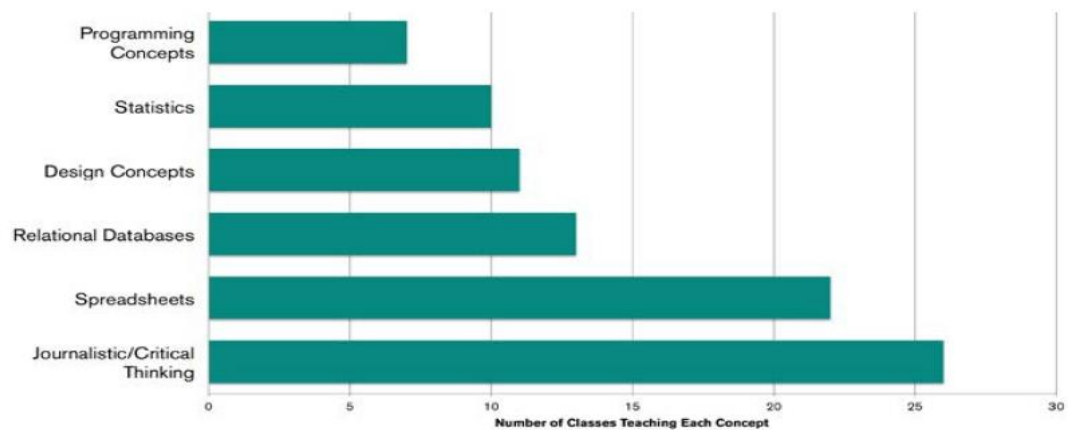


Figure 4.4 Content about Data Journalism in Courses in the United States  
(Berret & Phillips, 2016)

Berret and Phillips (2016) suggested that Institutions that offered Data Journalism may overcome the shortage of experts by collaborating and exchanging instructors between institutions, or helping each other in building an online course, and those courses that were not ready to offer full Data Journalism courses yet could begin with computer-assisted reporting (CAR), which is the basis of Data Journalism. In addition, at the end of their work, five research-based curricula were attached. The first was from the Foundation of Data Journalism and Computing, which Berret and Phillips (2016) argued was essential for every journalism student. The second course

integrated an introduction to Data Journalism and Computing into the core subjects of Journalism. The remaining three courses were offered for teaching Advanced Data Journalism in higher education and postgraduate institutes.

In addition to the academic works mentioned, in terms of knowledge about teaching Data Journalism, this researcher processed data from the top 10 universities in the field of Communication and Media Studies, ranked by QS World University Rankings 2017 (QS Quacquarelli Symonds Limited, 2017) and online journalism courses and textbooks that were popular based on Berret and Phillips' content analysis criteria. Among the top 10 leading universities in the field of Communications, nine institutions offered courses in Data Journalism. In the courses offered on Data Journalism, content about the use of data tables, the relationship between data, and statistics was offered by 9 institutes, followed by concepts of programming (8 institutes) and critical thinking and concepts of design (7 institutes).

Table 4.3 Content in Journalism Courses in the Top 10 Universities in the Field of Communications ranked by QS World University Rankings 2017 (QS Quacquarelli Symonds Limited, 2017)

No.	Institutes	Critical Thinking	Using Data Tables	Relationship between data	Concepts of Design	Statistics	Concepts of Programming
1.	University of Southern California	✓	✓	✓	✓	X	✓
2.	University of Amsterdam	✓	✓	✓	✓	✓	✓
3.	London School of Economics and Political Science (LSE)	✓	✓	✓	X	✓	X
4.	Stanford	✓	✓	✓	X	✓	✓

No.	Institutes	Critical Thinking	Using Data Tables	Relationship between data	Concepts of Design	Statistics	Concepts of Programming
	University						
5.	University of Wisconsin-Madison	There were no direct courses in Data Journalism.					
6.	University of California, Berkeley (UCB)	✓	✓	✓	✓	✓	✓
7.	University of Texas at Austin	✓	✓	✓	✓	✓	✓
8.	Goldsmiths, University of London	✓	✓	✓	✓	✓	✓
9.	University of California, Los Angeles (UCLA)	X	✓	✓	✓	✓	✓
10.	University of Pennsylvania	X	✓	✓	✓	✓	✓

While courses on Data Journalism were available online, only two free courses were available: the Google News Labs course, which provides an overview of how critical thinking works, linking relationships between data, and concepts of design through the use of Google tools; and the European Journalism Center curriculum, which provided content on using data tables, relationships between data, concepts of design, and statistics, lacking only courses on concepts of programming.

Table 4.4 Content Regarding Journalism in Courses Available Online

No	Institutes	Critical Thinking	Using Data Tables	Relationship between data	Concepts of Design	Statistics	Concepts of Programming
1.	Google News Lab	✓	X	✓	✓	X	X
2.	European Journalism Centre	✓	✓	✓	✓	✓	X

For popular textbooks on Data Journalism, the researcher studied “Computer-Assisted Reporting: A Practical Guide” by Brant Houston that was widely used for Data Journalism courses in the United States (Berret & Phillips, 2016); and the two textbooks that were cited the most in the research on Data Journalism which were "Precision Journalism" by Philip Meyer and “The Data Journalism Handbook” by Jonathan Gray et al. (Ausserhofer et al., 2017), using the same criteria and found that most of the content focused on critical thinking and the linking of data relationships followed by the use of data tables, statistics, concepts of design, and concepts of programming, respectively.

Table 4.5 Content Regarding Journalism in Popular Texts

No	Textbook	Author	Critical Thinking	Using Data Tables	Relationship between data	Concepts of Design	Statistics	Concepts of Programming
1.	Precision Journalism	Philip Meyer	✓	✓	✓	X	✓	X
2.	Computer-assisted reporting	Brant Houston	✓	✓	✓	X	✓	X
3.	The Data Journalism Handbook	Jonathan Gray et al.	✓	X	✓	✓	X	✓

#### 4.1.1.5 Others

Based on documentary research, it was found that there were two academic papers related to Data Journalism, but which could not be categorized. Felle (2016) studied the influence of Data Journalism on the role of journalists. This work used qualitative interviews with 26 data journalists from 17 countries. It found that the overwhelming abundance of data and the emergence of modern information technology made Data Journalism an important tool for journalists to function as the Fourth Estate in the digital economy. Data Journalism enabled journalists to conduct extensive data investigative news reporting, such as procurement of the Government sector information or information about election candidates' qualifications. On the other hand, it enables engagement with recipients to benefit from the data received from them, such as using applications and interactive systems allowing recipients to directly access the data. Therefore, in addition to the role of journalists in presenting data, they also played a role in gathering data and acted as an intermediary to create engagement. Although the sampled Data Journalists in this work did not see Data Journalism as a new form of news reporting, just a technology to upgrade the original process, the sampled journalists indicated that, in the near future, Data Journalism would play an important role in the reporting of all news organizations, not only leading news organizations whose target audience is highly educated.

The other work that could not be categorized was by Ausserhofer et al. (2017) which was a study of the knowledge of Data Journalism. It found that from 1996 to early 2016 there were 40 related academic papers. The academic knowledge of Data Journalism was likely to grow rapidly both in terms of quality and quantity. Most research used in-depth interviews and content analysis, and often studied the United States and England. Research gaps were still plentiful as Ausserhofer et al. (2017) pointed out that there was no comparative study of the processes used in Data Journalism in each country and there was no long-term research. There was also no Ethnographic research in the news room of Data Journalism. There was no study on related software. There was also no study about the experience of the recipients of Data Journalistic work. In addition, at the end of their paper, Ausserhofer et al. (2017) presented interesting issues for future research such as the use of Data Journalism in small news organizations, and the issue of sex in Data Journalism professions as well.



#### 4.1.1.6 Summary of knowledge of Data Journalism in Other countries

Based on the study of the knowledge of Data Journalism in the research papers mentioned above, it can be concluded that the knowledge of Data Journalism has been based on the use of Computer-Assisted reporting (CAR), which has attracted academic attention since the 1960s, but most of the academic works on these issues before 2010 have focused on a different point. This research began with the first series of articles related to Data Journalism. The information was the work of the American Journalism Research Group in 1996 and from the online database of academic journals 1996 – 2017, in total 64 items, which is likely to increase continuously. It has attracted serious attention from academia since 2009.

Considering the development of issues in academic work on Data Journalism, the data showed that in the early stages, most of the knowledge focused on issues related to work process of Data Journalism in news organizations, until there started to be studies on issues related to the content of Data Journalism in 2010. After 2015, there began to be a wider range of topics. When considering each issue found, most of the academic works on Data Journalism focused on issues related to the Data Journalism work process of news organizations. Next came studies of the content of Data Journalism, studies on teaching Data Journalism, and studies of the definition of Data Journalism, and other issues that could not be categorized.

Knowledge of the definition of Data Journalism found that academic works related to the process of presenting facts with the data as the core, using structured data management methods, before 2009 would use the key words of Computer-Assisted Reporting. Later on, during 2009-2014, a variety of keyword terms were used, such as Computational Journalism, Data Journalism, or Data-driven journalism. After 2014, Data Journalism began to be used mainly. However, although Data Journalism was related and influenced clearly by the concepts that came before, when thoroughly considered, the definitions of Data Journalism, Computer-Assisted Reporting, and Computational Journalism are different. Until now, the definition of Data Journalism has not been accepted by all parties. Only a few dimensions can be drawn to fit the goal of actual use.

The knowledge of Data Journalism work processes found that, it started in 1996, where the early work focused on the use of computer technology, a new

innovation at the time, to help manage the data of newspaper organizations, which is counted as the beginning Data Journalism. In 2009, the academic community began to become active and there were more academic works on the work process of Data Journalism, which pointed out the benefits of using computer scientists to empower journalists, and the key factors behind the success of the Data Journalism workforce in organizations. After 2012, when knowledge about Data Journalism began to become clearer, there began to be studies of the use of Data Journalism in different countries. There were also studies to identify the type of Data Journalism process that occurred during this period as well.

Data Journalism works and Data Journalism works that were submitted in a contest were studied to find out the shared characteristics of Data Journalism works, which were: most of the content was political, used financial and geographic data, used data published by official sources, and often used basic data analysis such as frequency, percentage, and mean, to compare differences or similarities between interesting variables, presented through maps or an interactive charts, that allowed the readers to tap into the details of interest.

Research into teaching Data Journalism found that it began in 2015. At the time, leading media organizations had made Data Journalism part of their work. Most course instructors were in the higher education sector. Most media organizations did not offer training to the public. Professional associations played an important role in training and educating in this field, as they offered online courses. In the terms of teaching in higher education institutions, it was found that only 46% of higher education institutions in the United States offered courses in Data Journalism. The main reason for not offering such course was that there were not enough instructors. Teaching was usually composed of critical thinking, using data tables, link of data relationships, concepts of design, statistics, and concepts of programming, respectively.

There was a study of the influence of Data Journalism on the role of journalists that stated that in addition to the role of journalists in presenting data, they also played a role in gathering information and as an intermediary to create engagement. Academic works regarding Data Journalism stated that academic

knowledge of Data Journalism was likely to grow rapidly both in quality and quantity, and there were still plenty of research gaps.

#### 4.1.2 Use of International Journalism

Based on analysis of academic works, the researcher has identified the characteristics of successful Data Journalism processes in other countries. They are as follows.

##### 4.1.2.1 General Features

This topic is a compilation of the features of the successful Data Journalism process in other countries in order to give a clear picture of what it takes, before breaking into the details.

Table 4.6 General Features of Successful Data Journalism in Other Countries

Works	Type of organization	Channel	Number of working team	Issues	News Value
<b>The Panama Papers</b> (Investigation of the year 2016)	NGO	Online	More than 100 persons	Economy	Suspense Reputation Impact
<b>Spies In The Skies</b> (Visualization of the year 2016)	Private Organization	Online	2 persons	Society	Closeness Impact
<b>Unfounded</b> (Investigation of the year 2017)	Private Organization	Online	8 persons	Society	Closeness Impact Sex
<b>The Rhymes Behind Hamilton</b> (Visualization of the year 2017)	Private Organization	Online	6 persons	Entertainment	Reputation peculiarity

Works	Type of organization	Channel	Number of working team	Issues	News Value
<b>Full results of Australia's vote for same-sex marriage (Number 1 Popular of The Guardian)</b>	Private Organization	Online	1 person	Society	Sex Impact freshness
<b>America's broken healthcare system (Number 2 Popular of The Guardian)</b>	Private Organization	Online	1 person	Public Health	Closeness Impact
<b>How to Reduce Mass Shooting Deaths? (Number 1 Popular of The New York Times)</b>	Private Organization	Online	2 persons	Society	Closeness Impact freshness
<b>Nothing Divides Voters Like Owning a Gun (Number 2 Popular of The New York Times)</b>	Private Organization	Online	2 persons	Politics	Closeness Controversy Freshness

Table 4.6 shows that most of the case studies were of private media organizations, such as BuzzFeed News, The Globe and Mail, or The Wall Street Journal. In the same way, the size of working teams was found to be 1-2 persons.

Only the Panama Papers used an amount of data so large that it needed the cooperation of more than 370 journalists from 80 countries. All cases were online.

Most case studies covered social, economic, or political issues, but one case study covered entertainment news. Most case studies had “impact” followed by “closeness”. It was noted that the popular case studies would focus on the value of freshness more than the award-winning case studies.

#### 4.1.2.2. Search for, Gather, Monitor, and Organize Information.

Searching for, collecting, and organizing data is the first step in the process of Data Journalism.

Table 4.7 Searching for, Collecting and Organizing Data of Data Journalism in Other Countries

Works	Size	Data Source	Access	Time Period	Transparency
<b>The Panama Papers</b> (Investigation of the year 2016)	Large	Private Organization	Leaked	Long term period (40 years)	Source Disclosed
<b>Spies In The Skies</b> (Visualization of the year 2016)	Large	Private Organization	Public	Cross-Sectional	Source and Data management Disclosed
<b>Unfounded</b> (Investigation of the year 2017)	Large	Government Agency	Upon Request	Long term period (40 years)	Source and Data management Disclosed
<b>The Rhymes Behind Hamilton</b> (Visualization of the year 2017)	Large	Private Organization	Public	Cross-Sectional	Source and Data management Disclosed



Works	Size	Data Source	Access	Time Period	Transparency
<b>Full results of Australia's vote for same-sex marriage (Number 1 Popular of The Guardian)</b>	Large	Government Agency	Public	Cross-Sectional	Source Disclosed
<b>America's broken healthcare system (Number 2 Popular of The Guardian)</b>	Large	NGOs	Public	Long term period (6 years)	Source Disclosed
<b>How to Reduce Mass Shooting Deaths? (Number 1 Popular of The New York Times)</b>	Large	Individual	Collect data by themselves	Cross-Sectional	Source and Behind the Scene Disclosed
<b>Nothing Divides Voters Like Owning a Gun (Number 2 Popular of The New York Times)</b>	Large	Private Organization	Public	Cross-Sectional	Source Disclosed

#### 1) The size of the data used

All cases used large data as the backbone of the news. The largest data collection was The Panama Papers, which disclosed financial information about over 11.5 million concealed property holdings, totaling 2.6 terabytes, the biggest news in world media history

#### 2) Data Source

Most cases used information from private organizations such as The Rhymes Behind Hamilton, which used the main information of lyrics and melody in hip-hop songs from the popular Broadway musical "Hamilton: The Musical", Second was the use of data from the public sector such as "Full results of Australia's Vote for Same-Sex Marriage" that used the results of the referendum in Australia to change the law to allow same-sex marriage from the Australian Bureau of Statistics, while the only

work that used data from NGOs was “America's Broken Healthcare System”, which used public health data and average life expectancy from the Organization for Economic Cooperation and Development (OECD), a nonprofit organization that collects economic and development data from countries around the world. “How to Reduce Mass Shooting Deaths?” used data from the general public and experts.

### 3) Data Access

Most cases used public data that is accessible to the public. “Spies in the Skies” used Flightradar24. There are, however, three case studies with different access methods.

The Panama Papers, had an anonymous source sent data from Mossack Fonseca, the company that formed shell companies to conceal property holdings and disguise the financial paths of individuals and organizations from various countries around the world.

“Unfounded” collected information on police handling of sexual harassment cases through a request with the legal right to access to information from 1,119 police stations across Canada. Only 873 stations returned data.

“How to Reduce Mass Shooting Deaths?” used new data collection: 1) an online survey of 1,975 persons of opinions about how to deal with mass shootings, and 2) a survey of 32 criminology, public health and law experts on the same issue.

### 4) Time Period of Data

Most case studies used cross-sectional data. “Nothing Divides Voters Like Owning a Gun,” used exit poll data for the 2016 United States presidential election. There were some case studies that used long-term data, such as “The Panama Papers,” which used financial data that has been recorded for more than 40 years.

### 5) Transparency

All case studies revealed the source of the data transparently but only half that disclosed how to handle data, such as “How to Reduce Mass Shooting Deaths?” that Identified the methodology used to select the sample and carefully reviewed the sample.

## 4.1.2.3 Interpretation

Interpretation is an important step that is at the heart of Data Journalism. It extracts the hidden meaning in the raw data into information ready for presentation in the final step.

Table 4.8 Interpretation Analysis of Data Journalism Works in Other Countries

Work	Method	Aim
<b>The Panama Papers</b> (Investigation of the year 2016)	Data Forecasting + Data Survey	To analyze relationship, and To describe characteristics
<b>Spies In The Skies</b> (Visualization of the year 2016)	Data Survey	To describe characteristics
<b>Unfounded</b> (Investigation of the year 2017)	Data Survey	To describe characteristics
<b>The Rhymes Behind Hamilton</b> (Visualization of the year 2017)	Data Forecasting	To analyze relationship,
<b>Full results of Australia's vote for same-sex marriage</b> (Number 1 Popular of The Guardian)	Data Survey	To describe characteristics
<b>America's broken healthcare system</b> (Number 2 Popular of The Guardian)	Data Survey	To describe characteristics
<b>How to Reduce Mass Shooting Deaths?</b> (Number 1 Popular of The New York Times)	Data Survey	To describe characteristics
<b>Nothing Divides Voters Like Owning a Gun</b> (Number 2 Popular of The New York Times)	Data Survey	To describe characteristics

Table 4.8 shows that most case studies analyzed data used a data survey. This consists of simple statistical computations such as frequency distribution, median, and

calculation comparison. The main goal of the analysis is to depict the characteristics of the variables in the news, and compare the differences between the two or more variables. “America's Broken Healthcare System” compared the use of the public health budget with the average life expectancy of the population. This showed that the US had a high public health budget, but the average life expectancy was lower than other developed countries.

However, there were some case studies that used data forecasting to see data relationships. “The Panama Papers” used classification and clustering to find relationships and see the links in the financial data to money laundering, tax evasion, and the global corruption network. “The Rhymes Behind Hamilton,” used clustering to analyze complex phonetics to categorize the prosody relationships behind the melody of hip-hop music.

#### 4.1.2.4 Data Processing for Presentation

Data processing for presentation is the final step of Data Journalism that will enable the recipients to understand the information in a very convenient and fast way.

Table 4.9 Data Processing for Presentation of Data Journalism Works in Other Countries

Works	Format	Visualization
<b>The Panama Papers</b> (Investigation of the year 2016)	1) Text News	Interactive Diagram
	2) Text News with visualization	
	3) Role Play Game	
<b>Spies In The Skies</b> (Visualization of the year 2016)	Text News with visualization	1) Interactive Map 2) Visualization VDO
<b>Unfounded</b> (Investigation of the year 2017)	1) Text News with visualization 2) VDO clips	1) Interactive Map 2) Interactive Diagram
<b>The Rhymes Behind Hamilton</b> (Visualization of the year 2017)	Interactive visualization with music	1) Interactive Diagram 2) Visualization with music

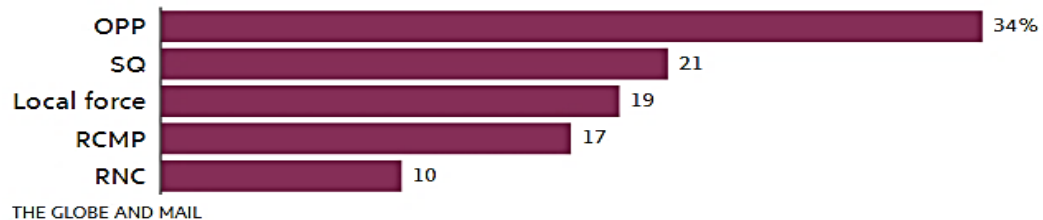
Works	Format	Visualization
2017)		
<b>Full results of Australia's vote for same-sex marriage (Number 1 Popular of The Guardian)</b>	Visualization	1) Interactive Map 2) Diagram 3) Table
<b>America's broken healthcare system (Number 2 Popular of The Guardian)</b>	Text news with visualization	1) Diagram 2) Table
<b>How to Reduce Mass Shooting Deaths? (Number 1 Popular of The New York Times)</b>	Text news with visualization	Diagram
<b>Nothing Divides Voters Like Owning a Gun (Number 2 Popular of The New York Times)</b>	Text news with visualization	Interactive Map

Table 4.9 shows that most case studies used visualization together with providing a large amount of information for easy understanding and to attract recipients. The most commonly used case study formats are: presenting news along with visualization, such as “Unfounded,” which discussed issues related to the handling of sexual harassment by police in Canada, where often the authorities will consider that the accusations did not have enough evidence. “The Globe and Mail” presented it as new series with part of it being text explanation and a visualization to communicate clearly.



### Unfounded sexual assault rate by police service

Percentage of sexual assault allegations cleared as unfounded (2010-2014)



The OPP, which is the second-largest police service in Canada, with more than 6,200 uniformed officers, declined to comment for this story, but former commissioner Chris Lewis defended his former charges. “My gut feeling is 99 per cent of cops out there, if they’re investigating a crime, they want to catch the guy who did it. I think they want to believe the victim and want to prevent the victimization of others,” he says.

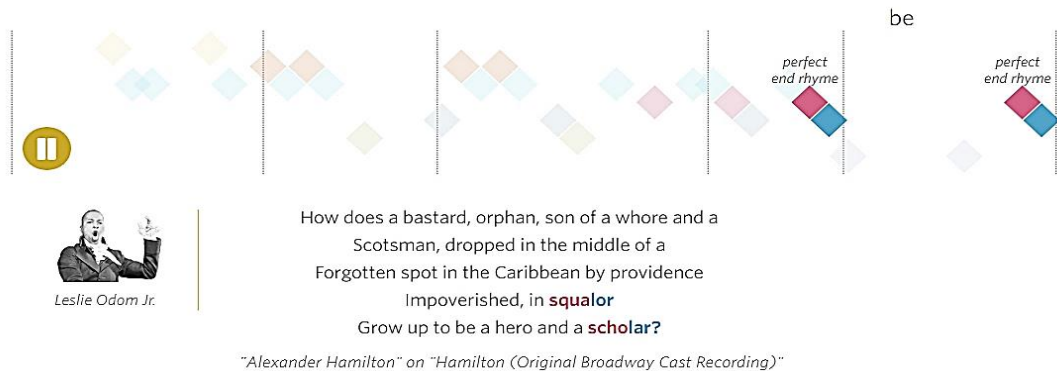
“The vast majority of officers are parents, they’re brothers, they’re fathers, they’re mothers and sisters. And if someone has committed a crime, they want to get them. That’s a general statement. Now are some officers better at it? ... Are all the boxes always being checked? Do sometimes things fall through the cracks? We’re humans, not robots.”

Figure 4.5 Presentation of Text along with Visualization in “Unfounded.”

There were also interesting case studies, including “The Rhymes Behind Hamilton,” which offered information by combining interactive visualization with music. This was an innovative data presentation that would help readers understand the structure behind the success of popular stage music through visualization along with listening to it. Other interesting pieces include “The Panama Papers,” which was presented using role-play games that allowed recipients to choose roles, then choose a way to conceal property holdings and camouflage financial routes to avoid tax. This allowed the recipients to understand the mechanism of the illegal money system.

### PERFECT END RHYMES

A staple of song and poetry is perfect rhyme. In a perfect rhyme, the vowel sounds and consonant endings of two words are identical, as with the words “**squalor**” and “**scholar**” in the opening song.



The visualization shows a sequence of colored diamond shapes (yellow, orange, blue, pink) arranged in a pattern that corresponds to the rhythm and tone of the song. A pause button is visible on the left. The text of the song is displayed below the visualization, with the words **squalor** and **scholar** highlighted in red to show the perfect end rhyme. The text is: "How does a bastard, orphan, son of a whore and a Scotsman, dropped in the middle of a Forgotten spot in the Caribbean by providence Impoverished, in **squalor** Grow up to be a hero and a **scholar**?"

Leslie Odom Jr.

How does a bastard, orphan, son of a whore and a Scotsman, dropped in the middle of a Forgotten spot in the Caribbean by providence Impoverished, in **squalor** Grow up to be a hero and a **scholar**?

"Alexander Hamilton" on "Hamilton (Original Broadway Cast Recording)"

Figure 4.6 Presentation of Interactive Visualization Together with Music in “The Rhymes Behind Hamilton”

Figure 4.6 is a presentation of a combination of interactive visualization and music in “The Rhymes Behind Hamilton,” showing the relationship of prosody to the hip hop melodies through the rectangular shapes that were positioned according to the rhythm of the song and the low/high tone. Recipients could play the music along with visualizing the relationship of the prosody simultaneously.



The presentation features a title "STAIRWAY TO TAX HEAVEN" in large, bold letters. Below the title, a welcome message reads: "Welcome to the secret world of offshore. Your goal is to navigate this parallel universe and hide your cash away. Don't worry! Lawyers, wealth managers and bankers are there to help you." A instruction "Pick a character and don't get caught." is displayed. Three characters are presented in circular frames: Juan Penalti (Soccer Player), Polly Tissien (Politician), and Edmund von Kronen (Business Executive). Each character is accompanied by a small illustration of their profession.

**STAIRWAY TO TAX HEAVEN**

Welcome to the secret world of offshore. Your goal is to navigate this parallel universe and hide your cash away. Don't worry! Lawyers, wealth managers and bankers are there to help you.

**Pick a character and don't get caught.**

**Juan Penalti**  
Soccer Player

**Polly Tissien**  
Politician

**Edmund von Kronen**  
Business Executive

Figure 4.7 Presentation of Role Play Game in “The Panama Papers”

Figure 4.7 is a presentation of the role play game in “The Panama Papers,” which gave recipients the option of playing a role as an athlete, businessman, or politician, then choosing a way to conceal property holdings and camouflage financial routes to avoid tax.

When considering specifically the use of visualization, most case studies used interactive visualization, which allowed recipients to interact with content.

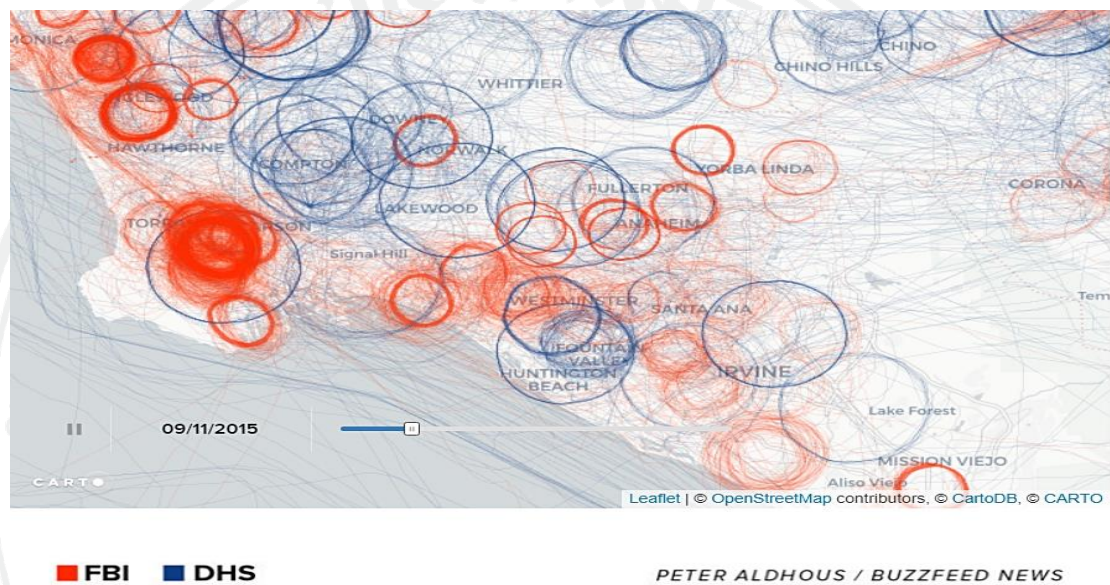


Figure 4.8 Presentation of Interactive Map in “Spies in the Skies”

In Figure 4.8, the interactive map of “Spies in the Skies” reveals that US Government agencies used spy aircraft equipped with high-resolution cameras and tools that can intercept telephone signals in cities of the United States. Information was presented through interactive visualization in a way that allowed readers to explore the information they were interested in. Video visualization made it possible to see the difference in each day of the week.

However, there were some case studies that used visualization as still photo slides. In “How to Reduce Mass Shooting Deaths?”, the data was presented through graphs, matrices, and tables, although they were not interactive, they could communicate simply and clearly.

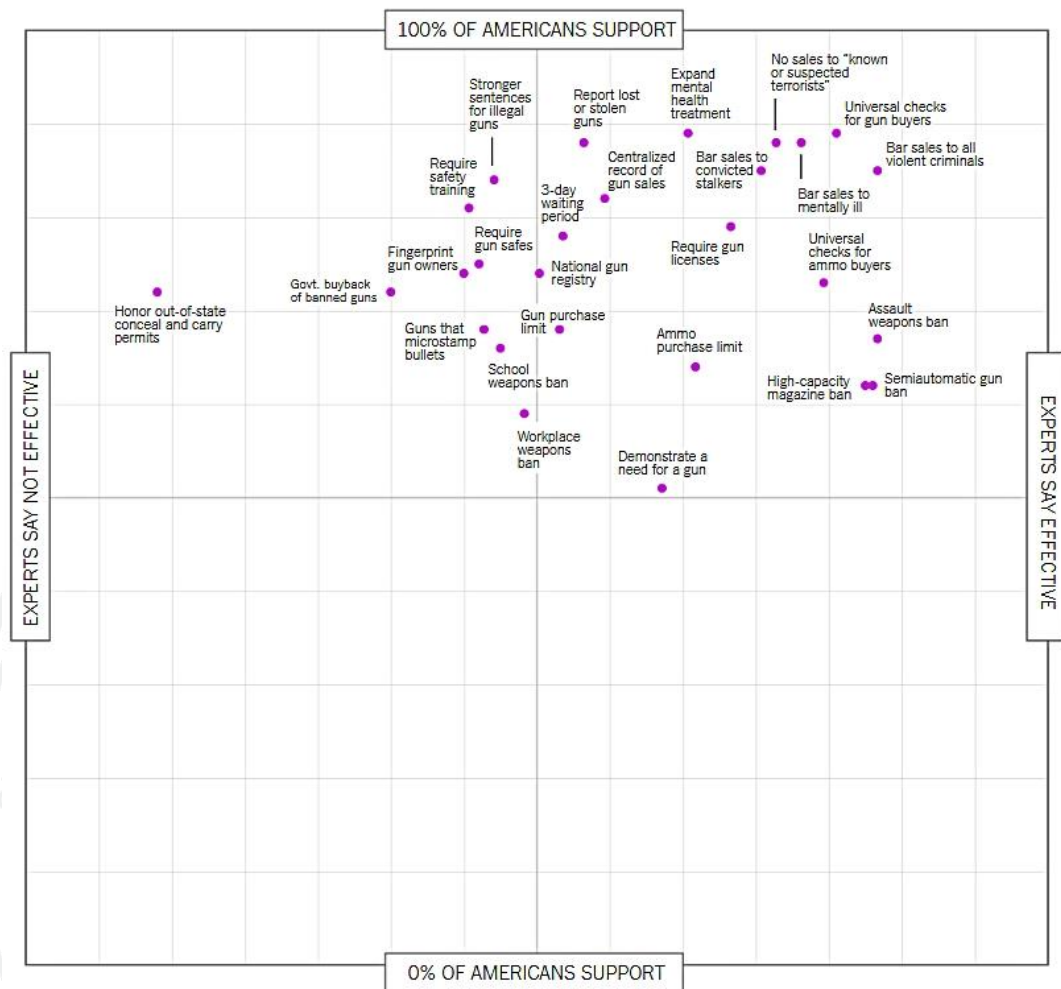


Figure 4.9 Presentation of Matrix Graph in “How to Reduce Mass Shooting Deaths?”

Figure 4.9 is a matrix graph of “How to Reduce Mass Shooting Deaths?” dividing the data into two axes. The vertical axis is public opinion on the solution to mass shootings; the top is the most agreed, the bottom is the least agreed. The horizontal axis is the expert opinion on mass shooting; the left side is thought to have the least effect, while the right is thought to be the most effective. Although the graph is not interactive, it can communicate simply and clearly.

#### 4.1.2.5 Use of Data Science

Data science is a combination of scientific methodology, statistics, and programming skills. Although the work of Data Journalism is not always required in



the field of Data Science, the use of Data Science is an important factor in helping Data Journalism.

Table 4.10 Using Data Science in Data Journalism Works in Other Countries

Works	Use of Data Science in each step		
	Searching, Collecting, Organizing	Analyzing	Presenting
<b>The Panama Papers</b> (Investigation of the year 2016)	✓	✓	✓
<b>Spies In The Skies</b> (Visualization of the year 2016)	✓	X	✓
<b>Unfounded</b> (Investigation of the year 2017)	✓	X	✓
<b>The Rhymes Behind Hamilton</b> (Visualization of the year 2017)	✓	✓	✓
<b>Full results of Australia's vote for same-sex marriage</b> (Number 1 Popular of The Guardian)	X	X	✓
<b>America's broken healthcare system</b> (Number 2 Popular of The Guardian)	X	X	X
<b>How to Reduce Mass Shooting Deaths?</b> (Number 1 Popular of The New York Times)	X	X	X
<b>Nothing Divides Voters Like Owning a Gun</b> (Number 2 Popular of The New York Times)	X	X	✓



From Table 4.10, it appears that successful Data Journalism work in other countries often used Data Science the most in the presentation process, using programming skills as part of the Data Science to create interactive visualization as mentioned in the topic of data processing for presentation. Second is searching for, gathering, organizing, and analyzing data, respectively.

An Interesting observation is that the case studies in the award-winning category used more intensive Data Science than the case studies in the popular category, especially in the process of searching for, gathering, and organizing data. However, in the process of data analysis, most case studies have not brought in Data Science to help.

#### **4.1.2.6 Summary of the Use of Data Journalism in Other Countries**

Data Journalism has been successful in other countries and most of the work was done by private media organizations. There were 1-2 person teams focusing on social, economic or political issues, and focusing on “value of impact” and “closeness.”

In terms of searching for, gathering and organizing data, it was found that all cases used large data as the backbone of the news. Most of the data came from private organizations and government agencies. Public data was also used as was cross-sectional data, and all were transparently disclosed.

In terms of analysis and interpretation, it was found that most cases of data analysis were data exploration, which used simple statistics to process basic data. The main goal of the analysis was to depict the characteristics of the variables in the news and compare the difference between the two or more variables.

In terms of data processing for presentation, it was found that most case studies used visualization to present a large amount of information for ease of understanding and to attract recipients. The most commonly used case study models were presenting data with the use of visualization. Most of the case studies used interactive visualization.

For the use of Data Science, it was found that successful international Data Journalism often used Data Science in the presentation process, using programming

skills as part of the Data Science to create interactive visualization. Second was searching for, gathering, organizing, and analyzing data, respectively.

## 4.2 Knowledge and Use of Data Journalism in Thailand

From the documentary research, there are no academic works on Data Journalism in Thailand, only attempts to gather basic knowledge, such as a textbook and the concept of convergence journalism that Roonkaseam and Aiemsumran mentioned in Chapter 7 of “Data Journalism” (Chantrawatanakul & Permpoon, 2014). work by Techatuttanon (2016) Thus, the researcher will focus on analyzing case studies and in-depth interviews with related persons.

### 4.2.1 Case Study of Data Journalism in Thailand

Based on four case studies, the researcher can compile their characteristics as follows:

#### 4.2.1.1 General Characteristics

This topic is a compilation of characteristics of the works of Data Journalism or works that are similar in Thailand. to get a clear picture before going into details.

Table 4.11 General Characteristics of Data Journalism in Thailand

Works	Type of organization	Channel	Number of working team	Issues	News Value
“Solving the puzzle of ‘Business Advisory Program for Thai Enterprise Development’” (The best digital news coverage in the form of investigative news)	Private Organization	Online	N/A	Crime	Suspense Reputation Conflict

Works	Type of organization	Channel	Number of working team	Issues	News Value
“Prompt Pay” Is it promptly ready? What is it? Pros and Cons. Why use it?” (The best digital news coverage in the form of infographics)	Private Organization	Online	N/A	Economy	Closeness Impact freshness
“The Ghosts of Thailand in ‘The Shock: Explore Thai Ghosts through Thriller Stories’” (The most popular from The Matter)	Private Organization	Online	1 persons	Entertainment	Closeness peculiarity
"Lottery: Who gets rich?" (The most popular from Thai Publica)	Private Organization	Online	N/A	Economy	Closeness Impact

Table 4.11 shows that all case studies are the work of private media organizations, including Thairath, The Matters, and Thai Publica. In addition, the distribution channel for all case studies was online. The size of the working groups was not mentioned in most cases. Only “The Shock: Explore Thai Ghosts through Thriller Stories” mentioned using one person.

Most case studies related to economic issues, while most case studies focused on “closeness”.

#### 4.2.1.2. Searching for, Gathering, Monitoring, and Organizing data

Searching for, gathering, monitoring, and organizing data is the first step in the process of Data Journalism.

Table 4.12 Searching for, Gathering, Monitoring, and Organizing data for Works Related to Data Journalism in Thailand

Works	Size	Source	Access	Time Period	Transparency
“Solving the puzzle of ‘Business Advisory Program for Thai Enterprise Development’” (The best digital news coverage in the form of investigative news)	Small	Government Agency	Collect data by themselves	cross-sectional	Source Disclosed
“Prompt Pay: Is it promptly ready? What is it? Pros and Cons. Why use it?” (The best digital news coverage in the form of infographics)	Small	Government Agency	Collect data by themselves	cross-sectional	Not disclosed
“The Ghosts of Thailand in ‘The Shock: Explore Thai Ghosts through Thriller Stories’” (The most popular from The Matter)	Small	Private Organization	Collect data by themselves	cross-sectional	Source and Handling Disclosed
"Lottery: Who gets rich?" (The most popular from Thai Publica)	Large	Government Agency	Upon Request	cross-sectional	Source Disclosed

#### 1) The size of the data used

Most cases used small data, such as “Solving the puzzle of ‘Business Advisory Program for Thai Enterprise Development’” which used data from a few agencies

involved and the victims, or The Ghost of Thailand in ‘The Shock: Explore Thai Ghosts through Thriller Stories’”, which used data from The Shock program. “Lottery: Who gets rich?” used big data which was information on lottery ticket sales nationwide.

## 2) Data sources

Most of the case studies used the data from the government; for example, “Solving the puzzle of ‘Business Advisory Program for Thai Enterprise Development’” used data from Kasetsart University. “Prompt Pay; Is it promptly ready? What is it? Pros and Cons. Why use it?” used data about the Prompt Pay policy from the Ministry of Finance, Bank of Thailand, and the Thai Bankers Association. Only The Ghosts of Thailand in ‘The Shock: Explore Thai Ghosts through Thriller Stories’” used data from the private sector.

## 3) Data access

Most case studies used new data collection. “The Ghost of Thailand in ‘The Shock: Explore Thai Ghosts through Thriller Stories’” used the content analysis from The Shock program which was broadcast 21-26 August. “Prompt Pay: Is it promptly ready? What is it? Pros and Cons. Why use it?” used the Prompt-Pay related policy. Only “Lottery: Who gets rich?” used data from those who were eligible to sell lottery tickets, via a request to access data on the government lottery, as permitted by law.

## 4) Time Period of Data

All case studies used cross-sectional data. The Ghost of Thailand in ‘The Shock: Explore Thai Ghosts through Thriller Stories’” used data from The Shock program content being broadcast 21-26 August 2016.

## 5) Transparency

Most case studies transparently disclosed the sources of data. The only one where the source id not clearly identified is “Prompt Pay: Is it promptly ready? What is it? Pros and Cons. Why use it?” but it is a public sector publication that is publicly available.



#### 4.2.1.3 Interpretation

Interpretation is an important step that is at the heart of Data Journalism. This is to extract the hidden meaning in the raw data ready for presentation in the final step.

Table 4.13 Interpretation Analysis of Works Related to Data Journalism in Thailand

Work	Method	Aim
“Solving the puzzle of ‘Business Advisory Program for Thai Enterprise Development’” (The best digital news coverage in the form of investigative news)	Summarizing and categorizing	Explanatory
“Prompt Pay: Is it promptly ready? What is it? Pros and Cons. Why use it?” (The best digital news coverage in the form of infographics)	Summarizing and categorizing	Describing characteristic
“The Ghosts of Thailand in ‘The Shock: Explore Thai Ghosts through Thriller Stories’” (The most popular from The Matter)	Data Survey	Describing characteristics
"Lottery: Who gets rich?" (The most popular from Thai Publica)	Data Forecasting + Data Survey	To analyze relationship and to describe characteristics

Table 4.13 shows that the two digital award-winning case studies analyzed data in the form of summary and classification. It was not structured data development, so it was not Data Journalism based on the operational definition of this research. “Prompt Pay: Is it promptly ready? What is it? Pros and Cons. Why use it?” used a summary of data about Prompt Pay made easy to understand and to describe the characteristics of data. “Solving the puzzle of ‘Business Advisory Program for Thai Enterprise Development’” interviewed those concerned, and documented evidence gathered and then summarized it.

For case studies of popular Data Journalism works, there are two types of data analysis:

1) Data Survey -- which is the basic use of statistics to process basic characteristics of data such as frequency distribution, mean value, comparison, computation of variables in news, and comparison of the difference between the two or more variables, with the main purpose being to describe the characteristics of the data. The example is “The Ghosts of Thailand in ‘The Shock: Explore Thai Ghosts through Thriller Stories’” that described the characteristics of ghost beliefs in horror stories that reflect ideas and beliefs.

2) Data Forecasting – which is to find relationships, see the data link, and then describe the characteristics of data by survey. “Lottery: Who gets rich?” used classification to find relationships, looking at the links in the data to classify those who are eligible to sell lottery tickets, from large unclassified raw data sets, then comparing the proportion of eligible people to each type of lottery.

#### 4.2.1.4 Data Processing for Presentation

processing for presentation is the final step in Data journalism that will enable the recipients to understand the information in a very convenient and fast way.

Table 4.14 Data Processing for Presentation of Data Journalism works in Thailand

Work	Format	Visualization
“Solving the puzzle of “Business Advisory Program for Thai Enterprise Development”” (The best digital news coverage in the form of investigative news)	Text news with interview clips and documents	N/A
“Prompt Pay: Is it promptly ready? What is it? Pros and Cons. Why use it?” (The best digital news coverage in the form of infographics)	Infographics	Used icons to help convey message
“The Ghosts of Thailand in ‘The	Text News with	Diagram

Work	Format	Visualization
Shock: Explore Thai Ghosts through Thriller Stories” (The most popular from The Matter)	Visualization	
"Lottery: Who gets rich?" (The most popular from Thai Publica)	Text News with Visualization	Interactive Diagram

From Table 4.14, we see that two case studies were presented in the form of text along with visualization. “The Ghosts of Thailand in ‘The Shock: Explore Thai Ghosts through Thriller Stories’” that describes data about ghosts with the visualization to communicate clearly.

“Solving the puzzle of ‘Business Advisory Program for Thai Enterprise Development’”, which received an award for investigative journalism presented description with text and interview clips, and documentation gathered. “Prompt Pay: Is it promptly ready? What is it? Pros and Cons. Why use it?”, which received an Infographic award, offered infographics.

It was found that most case studies used visualization to support presentation. “Solving the puzzle of ‘Business Advisory Program for Thai Enterprise Development’” did not.

1) “Prompt Pay: Is it promptly ready? What is it? Pros and Cons. Why use it?” was presented with infographics but there was not much visualization. It was used only to support some communication.



Figure 4.10 Infographic “Prompt Pay: Is it promptly ready? What is it? Pros and Cons. Why use it?”

2) “The Ghosts of Thailand in ‘The Shock: Explore Thai Ghosts through Thriller Stories’” used visualization that was still photography, too. The data was presented through a bar graph and a pie chart; even though it was not interactive it could communicate clearly.

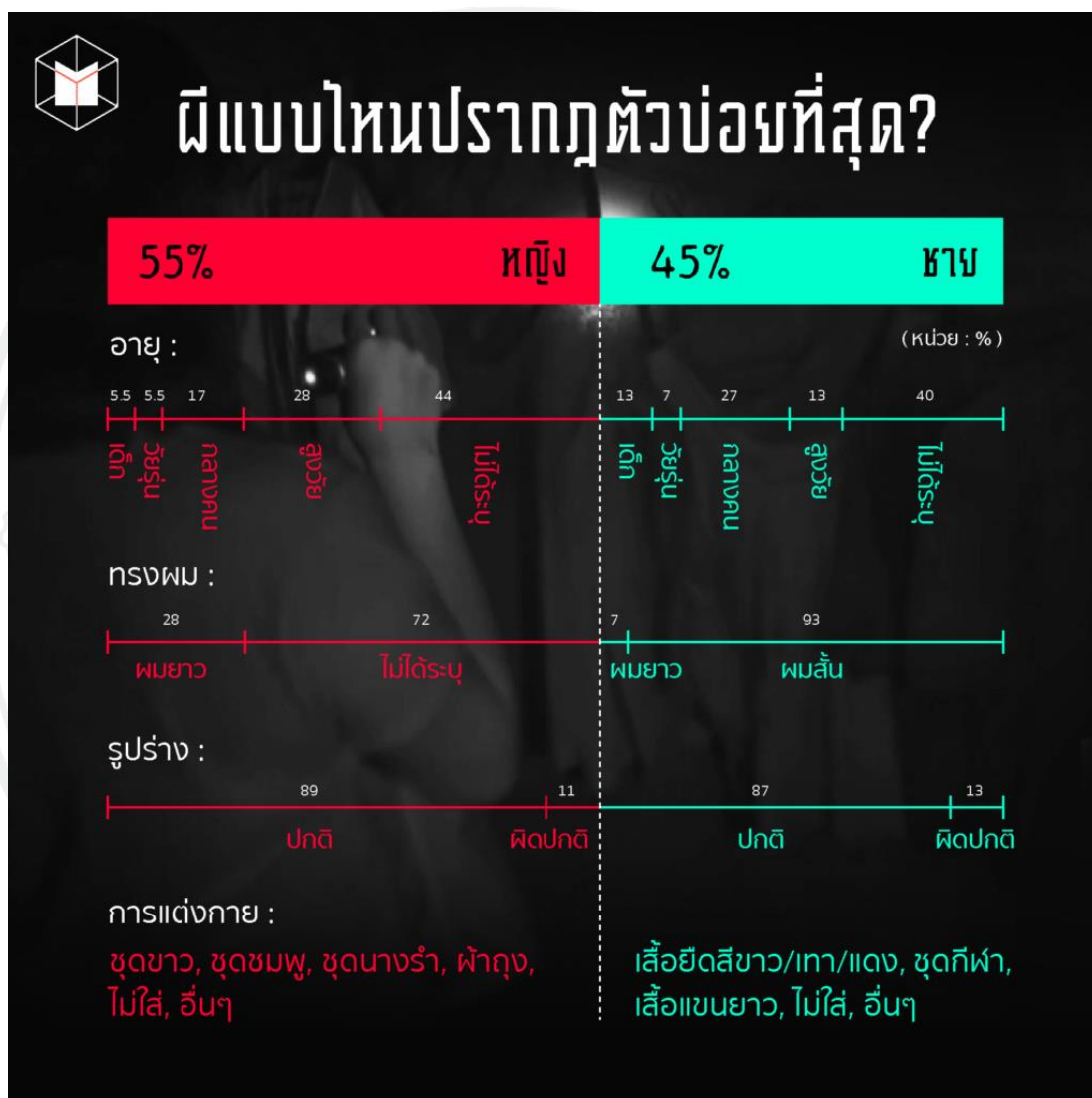
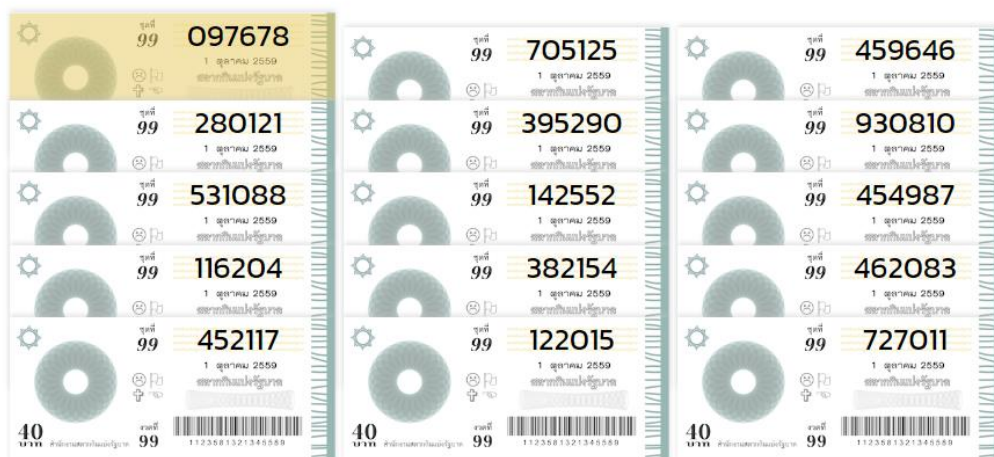


Figure 4.11 Graph in “The Ghosts of Thailand in ‘The Shock: Explore Thai Ghosts through Thriller Stories’”

3) "Lottery: Who gets rich?" used interactive visualization. This allowed recipients to interact with content. Interactive games allowed the recipients to try to buy lottery tickets, and interactive charts allowed recipients to explore the data.



“วันนี้รวยจ้า! เลือกเบอร์ที่ชอบเลยจ้า ก็ใบก็ได้”  
(จำลองเหตุการณ์จริงที่แพง)



เปลี่ยนแบบ

ซื้อหวย ~(๗▽๗~)

วันนี้ดวงไม่ดี ขอย่าน

Figure 4.12 Presentation with interactive game in "Lottery: Who gets rich?"

อันที่จริงแล้ว **กลุ่มคนพิการ\*** ขาดลอตเตอรี่เพียง  
แค่ 8,060,200 ฉบับ คิดเป็น 10.89% ของลอตเตอรี่  
ที่แจกจ่ายให้ผู้ขายทั่วประเทศ

\*เลือกเฉพาะที่แสดงแต่ชัดเจนเป็นองค์กรเกี่ยวกับคนพิการ ซึ่งคนทั่วไปก็  
อาจเป็นคนพิการได้เช่นกัน แต่ในที่นี้ไม่ได้รวมไว้ เพราะข้อมูลไม่เพียงพอ

● กลุ่มคนพิการ ● อื่น ๆ ○ ห้าแสนฉบับ ○ หักแสนฉบับ

กลุ่มคนพิการ  
สมาคม คนพิการจังหวัดสมุทรปราการ  
444,600 ฉบับ (0.60% จากทั้งหมด)

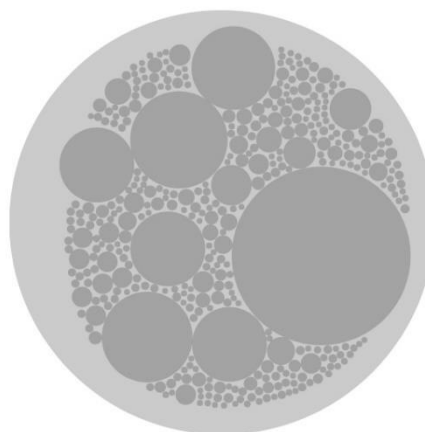
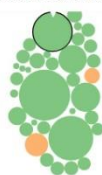


Figure 4.13 Presentation with Interactive Diagram in "Lottery: Who gets rich?"

#### 4.2.1.5 Use of Data Science

Data science is a combination of scientific methodology, statistics, and programming skills. Although the work of Data Journalism does not always require

the field of Data Science, the use of Data Science is important to enable Data Journalism to show its full potential.

Table 4.15 The use of Data Science in Works of Data Journalism in Thailand

Work	Use of Data Science in Each Step		
	Searching, Collecting, and Categorizing	Analyzing	Presenting
“Solving the puzzle of ‘Business Advisory Program for Thai Enterprise Development’ (The best digital news coverage in the form of investigative news)	X	X	X
“Prompt Pay: Is it promptly ready? What is it? Pros and Cons. Why use it?” (The best digital news coverage in the form of infographics)	X	X	X
“The Ghosts of Thailand in ‘The Shock: Explore Thai Ghosts through Thriller Stories’” (The most popular from The Matter)	X	X	X
"Lottery: Who gets rich?" (The most popular from Thai Publica)	X	✓	✓

Table 4.15 shows that most case studies did not use data science. Only "Lottery: Who gets rich?" used data science skills to support large scale non-categorical data analysis and creation or interactive visualization for presentation.

#### **4.2.1.6 Summary of the Use of Data Journalism in Thailand**

All case studies were the work of private media organizations. Most did not specify the size of working groups that produced the work. The issues were both heavy news and light news. Mostly they were relevant to economic issues, while for the value of news, most case studies focused on closeness.

In terms of searching for, collecting and organizing data, it was found that most used small data, often used data from the government, collected fresh data, and used cross-sectional data. Most of the sources of information were transparently used.

In terms of analysis of the definition of Data Journalism, the two digital awards-winning case studies used summation and categorization, so this is not Data Journalism as defined in this research. The other two popular case studies used Data Exploration and Predicting Data. In terms of data processing for presentation of Data Journalism, the two most popular Data Journalism works were both presented with text and visualization, while the two award-winning case studies were presented in different formats. Considering the use of visualization, it was found that most case studies used visualization to support presentation.

For the use of Data Science in Data Journalism, most of the case studies did not use the Data Science. Only "Lottery: who gets rich?" used Data Science skills to support large-scale uncategorized data analysis, and the creation of interactive visualizations for presentation.

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#### **4.2.2 Knowledge Status and the Use of Data Journalism in Thailand**

Interviews with 12 experts involved with Data Journalism were conducted.

- Ms. Kanokporn Prasitphon, Director of New Media Development Center, Thai Public Broadcasting Service (Thai PBS)
- Mr. Jarun Ngamvirojcharoen, Chief Data Scientist from Sertis Co., Ltd., who has been involved in the production of Data Journalism works with the online news agency "Thai Publica"
- Mr. Chavarong Limpattamapanee. President of The Confederation of Thai Journalists, Advisor for the Online News Providers Association, Chief of the Information Centre of The Thairath daily newspaper
- Mr. Tomorn Sookprecha, Editor of The101.world online media, an agency -- though is not yet being used -- that is interested in Data Journalism, and already sent reporters to participate in the UN training projects.
- Ms. Boonlarp Poosuwan, Executive Editor at the online news agency "Thai Publica", one of the co-authors of the work "Lottery: Who gets Rich?" which is the most complete Data Journalism news in Thailand
- Asst. Prof. Pijitra Tsukamoto, Head of the Journalism Department, Faculty of Communication Arts, Chulalongkorn University; Lecturer in courses regarding Data Journalism
- Mr. Peerapong Techatuttanon, Creative and Public Communication Affairs Manager, Thailand Development Research Institute (TDRI)

- Ms. Pattarawadee Thierler, Lecturer at the Department of Convergent Journalism, Faculty of Communication Arts, Panyapiwat Institute of Management; Lecturer in Data Journalism

- Mr. Puripant Ruchikachorn, Ph.D., Lecturer in the Department of Statistics, Faculty of Commerce and Accountancy, Chulalongkorn University; Co-Founder of Boonmee Lab; One of the co-authors of the work “Lottery: Who gets Rich?” which is the most complete Data Journalism news in Thailand; and a co-lecturer in courses about Data Journalism at Chulalongkorn University.

- Ms. Sarinee Achavanuntakul. Co-founder and Editorial Advisor of the online news agency “Thai Publica”

- Mrs. Sudarat Disayawattana Chantrawatanakul, Ph.D., Deputy Direct of Public Media Strategies, Thai Public Broadcasting Service (Thai PBS)

- Mr. Arthit Suriyawongkul, Coordinator at Thai Netizen Network, which is important in driving the use of open data in Thailand

#### **4.2.2.1 Definition of Data Journalism**

In the interviews, the definition of Data Journalism was not unanimously agreed upon but there was something that all interviewees agreed on in a broader sense, that is the meaning of a news reporting process that uses data. Asst. Prof. Pijitra Tsukamoto stated that Data Journalism is news reporting based on data.

"Data Journalism is news reporting on based on data. We use a news source that is a data source. The data here is qualitative and quantitative information. With digital influences, data can easily be sorted and retrieved in the digital platform."

(Pijitra Tsukamoto, Interview, January 11, 2018)

Mr. Tomorn Sookprecha mentioned that Data journalism is compiling sets of data and present its meaning.

"Data Journalism is not just that we have one set of data and then we convert it into an infographic. I personally think about compiling sets of data and then letting them produce some results."

(Tomorn Sookprecha, Interview, February 27, 2018)



When considering the definition, each interviewee would focus on different dimensions of Data Journalism. Ms. Sarinee Achavanuntakul said Data Journalism must be more than just news coverage. Intense statistics and analysis are also required.

" I think it's going to go beyond that, otherwise words will be meaningless. If you do not care about the data management process, it will be that any news that has data as a basis will become Data Journalism which is not the case. [...]

What I have not seen is the serious use of statistics and data management in analysis."

(Sarinee Achavanuntakul, Interview, December 6, 2017)

Mr. Jarun Ngamvirojcharoen focused on in-depth data.

"The general media can just ask questions or just interview. It's just a comment. With data, people start to play with it. They start to see other points of view that are in-depth. Then it gives people some insight. It develops things. It's a kind of social development."

(Jarun Ngamvirojcharoen, Interview, 22 February 2018)

Mr. Peerapong Techatuttanon said Data Journalism uses Data Science to help in the work process.

"I would like to say that Data Journalism started 200 years ago, but on the contrary, if you want me to cross a line as to when there was a technical tool (Data Science), I would say it was like 5 – 10 years ago only."

(Peerapong Techatuttanon, Interview, February 8, 2018)

Mr. Arthit Suriyawongkul emphasized the importance of enabling the audience to interpret and validate information.

"Data Journalism would offer at least two sets of data. It shows that It's trying to find some data to support something. The second one is that this data allows you, if you want to ask other questions with the same data, you can ask further."

(Arthit Suriyawongkul, Interview, February 25, 2018)

#### 4.2.2.2 Significance of Data Journalism

Interviewees spoke of the significance of Data Journalism to news organizations, to journalists, and to society, as follows:

##### 1) The importance to news organizations.

Some interviewees believed that Data Journalism is the solution to the digital media industry. The media no longer monopolize the presentation of data. This is a tool that will help news organizations differentiate themselves from other media in this era. Mr. Chavarong Limpattamapane said it may allow mainstream media to differentiate themselves from social media.

"Today, social media has come to dominate. It's as if the mainstream media could not live. I believe that the subject of Data Journalism is one way to make the mainstream media different from social media or personal media. It does not mean that the personal media cannot do it. Someone who is specialized might do even better. But as a professional media, we have more opportunity to access data."

(Chavarong Limpattamapane, Interview, February 17, 2018)

Mrs. Sudarat Disayawattana Chantrawatanakul, Ph.D. stated that even though Data Journalism is not necessary, it is important to the duty to function as quality media.

"Actually, if asked, whether Data Journalism is necessary or not, it's not necessary. It's natural for people to get used to what they always receive. However, if asked whether it's important in terms of quality media, to make professional media differ from other general media, it's important right away. [...]"

It's about the ultimate goal. I don't know whether it's beyond dreams. But If you're professional media, a professional media organization amid the intensity of the vast amounts of data, and everyone can be a media now, you may need to look for channels that will make you different. Then Data Journalism will be one of those things that will make you different from the general media."

(Sudarat Disayawattana Chantrawatanakul, Interview, February 15, 2018)

Mr. Puripant Ruchikachorn, Ph.D. commented that Data Journalism will help make the news more interesting.

"It would help make people become more interested in news. Like nowadays, if you read the news in general, such as a piece of news or an article, then you want to know more but there is no source provided. We don't know any other aspect in depth. But there are no sources that refer to it. We do not know how to say earthquakes here. Suppose I want to talk about how earthquakes happen here. People might want more information as to how many times it has happened. How severe each time? In general, you will not have data like this."

(Puripant Ruchikachorn, interview, January 12, 2018)

## 2) The significance to journalists.

Another interviewer believed that Data Journalism is an important skill. Ms. Sarinee Achavanuntakul stated that data analysis skills are useful for digital journalists, both in daily life and in functioning as mass media personnel.

"Data analysis skills though not taken to work, are still useful. Like other skills in life, understanding data is one skill that is helpful in becoming a journalist. At least when the sources say something, you can challenge it. You can verify it. It reduces dependence on others. "

(Sarinee Achavanuntakul, Interview, December 6, 2017)

In addition, Ms. Boonlarp Poosuwan mentioned that data from Data Journalism can be used as evidence to defend the work of the mass media in the courts.

"Another part is the matter of self-defense. [...]

[...] can be used as an evidence for court proceedings. If we are sued, it will protect us in doing our jobs."

(Boonlarp Poosuwan, Interview, November 6, 2017)

## 3) The significance to recipients and society

the other hand, most interviewees agreed that Data Journalism is a reliable process of producing news. It can be made part of solutions to structural problems.

Ms. Boonlarp Poosuwan mentioned that Data Journalism can deconstruct unfair societal structures, citing the example of “Lottery: who gets rich?”

"Like the lottery (the news “Lottery” who gets rich?” by Thai Publica), it is clear that it can deconstruct the structure of the quota that it was clustered with in some groups so that it is more distributed fairly. The public can book online. Actually, it is not finished yet, it must be further drilled. The fact that the public can book, is it just an illusion? We need to chase further that. Is there still an unfair allocation? It leads to structural change."

(Boonlarp Poosuwan, Interview, November 6, 2017)

Another interviewer believed that Data Journalism is a process that gives people access to data more equitably. This will promote the civil rights of citizens. Mr. Arthit Suriyawongkul mentioned that Data Journalism provides data to the public so that they have enough information to express opinions and participate in decision-making processes in society.

"People have to be able to voice their needs. In order to be able to participate in the decision-making process in society, it is important to have sufficient data. This leads to the issue of rights to access information.

[...] This type of data is the same data sought after in order to make Data Journalism works. Government documents and documents from the private sector used in decision-making for public projects should be disclosed. "

(Arthit Suriyawongkul, Interview, February 25, 2018)

Mr. Jarun Ngamvirojcharoen mentioned that Data Journalism will help the recipients to be aware of and understand the importance of data more.

"Data is around us. It is usable. It helps in making decisions. It is something that people can see. It helps people see some facts, instead of using emotions alone. I had a chance to co-work in Data Journalism, because I think in order to make people see the importance of data, the news media is the most important actor.

(Jarun Ngamvirojcharoen, Interview, 22 February 2018)

#### **4.2.2.3 Status of the Use of Data Journalism in Thailand**

In the interviews, most informants stated that the status of the use of Data Journalism in Thailand indicated that Thai media has been using data in news reporting for a long time, but the methodology of Data Science has not been used to gather, analyze or present data. Mr. Chavarong Limpattamapanee stated that Thairath has been using Data Journalism for a long time and the key players are the librarians at the data center.

"Actually, Thairath has used the process of Data Journalism for a long time. It's just that we do not call it Data Journalism. We have a data center, also known as a newspaper library, which has a huge database of news clippings, pictures, articles from books, magazines, and newspapers. The center has had digital data in use since 1995. And it was tested during the Thai election in 1995 and 2001. We used the data available to do news reporting about the election such as the number of MPs, the policy of each party, the movement of MPS among parties, etc.

[...] Librarians are the ones responsible for the news code, and they categorize it. They are with news every day already, so they will know where it is. In the past, the librarians helped categorize and keep the data and wait for people to come and use it. So I told them that they do not need to wait, if they see anything important they can offer the data to us right away."

(Chavarong Limpattamapanee, February 17, 2018)

However, some informants stated that In Thailand there are media organizations that adopt modern technology and Data Science methodology. Thai PBS cooperated with Thoth Zocial Company, using Socil Learning tools to collect and process the opinions of people through social media during the referendum on the draft constitution of Thailand, 2016, as per the account of Ms. Kanokporn Prasitphon.

"At the time of the referendum on the draft Constitution, it was similar to an election. At that time, we partnered with Thoth Zocial which is a company that provides social listening services, such as the feedback or comments of people in the social media world. It is possible to collect, store, comment, or ask any questions"

(Kanokporn Prasitphon, Interview, February 7, 2018)



Another example is the work of Thai Publica that partnered with Sertis Co., Ltd., which provides Data Sciences services to produce works regarding “The Royal speeches of His Majesty King Rama IX”. Mr. Jarun Ngamvirojcharoen said that intensive data management was used, but the work could not be published due to the permission issues of the Royal Household Bureau.

"Previously, there was another one that had been done but had to be pulled out. It is the royal speeches of King Rama IX. We complied what the King said over a period of more than 30 years. To do this we used the Data Science technique. We used matching learning. We brought data and taught the machine to group what King Rama IX said. It will come out as a graph that he talked about politics, education, economy etc. Each year, there is a graph that pops up where there is an increase and it says how much. It's just that, this research is about the King, so we need to seek approval from the Royal Household Bureau first, so we needed to pull out."

(Jarun Ngamvirojcharoen, Interview, February 22, 2018)

There were also other interesting cases, including TDRI's work, which, even though is not even a media organization, used intensive Data Journalism. Mr. Peerapong Techatuttanon gave an example of a TDRI project that used the Data Science to help in the work.

"Last year (2017) what TDRI did was a story of Data Revolution. We arranged a major seminar for TDRI, and asked a question about the government data. TDRI went to check and this time, it required someone who has the skills to dig up data (scrapes) to see how many cases of procurement were made in the previous year. To sum up, it was around 100,000 cases, which if people check manually for, it's impossible. But when we have data like this, and we teach a company to read and process, it kind of know how to do it..."

[...] This time when we went to check the data that the TDRI research team did, we could see that in the whole map of Thailand, if it is dark blue anywhere, that means that in that area there are only a few large vendors, so it's not so much competition."

(Peerapong Techatuttanon, Interview, February 8, 2018)

The interviewees also found that the key to facilitating the use of intensive Data Journalism is collaboration between media organizations and personnel or organizations providing Data Science services. Mr. Puripant Ruchikachorn, Ph.D. stated that joining Thai Publica was voluntary work without wages.

"There was a hackathon for visualization of news stories. I understand that there was one person who worked with Thai Publica but he could not make it into an actual interactive piece so finally he invited Boonmee Lab to do it."

(Puripant Ruchikachorn, Interview, January 12, 2018)

Mr. Jarun Ngamvirojcharoen stated that he volunteered to join the Data Science project with Thai Publica to raise awareness about the use of information in Thai society and also show the corporate social responsibility of Sertis.

"I'm trying to get people to know that Data is around us. We can benefit from it. It's similar to CSR. "

(Jarun Ngamvirojcharoen, Interview, 22 February 2018)

Both the media professional associations and media organizations plan to develop more Data Journalism. Mrs. Sudarat Disayawattana Chantrawatanakul, Ph.D. said that Thai PBS plans to make applications that facilitate Data Journalistic works.

"Next year (2019) we will have an application that will help with the issue of Data Journalism. It is called C-Site that PBS is developing as a link between people in different regions on the same issue. There will be both coming in and going out. Suppose we use C-Site application, when we log in we will be able to see what news issues Thai PBS is covering in a particular province. How many news pieces do we have in this area or location base? This is going "out". But coming "in" is , say, we are covering a flood issue, C-Site application will allow the citizen journalists in the audience's network to send the information in from their location to us. And then the app will plot a graph. For example, how severe the floods are over there. There is no flood here. We will do news coverage this way."

(Sudarat Disayawattana Chantrawatanakul, Interview, February 15, 2018)

Mr. Chavarong Limpattamapanee said the Thai Journalists Association is planning to develop in order to accommodate Data Journalism starting from providing training.

"The media should be more focused on Data Journalism, to differentiate themselves from personal media. For example, right now the Thai Journalists Association combines the news websites; this year, they have a plan to provide training. Other things are already available. Infographics are done. But Data Journalism is in the plan that we're going to add."

(Chavarong Limpattamapanee, February , 2018)

#### **4.2.2.4 The Use of Data Journalism in Thailand**

Thai media has been using Data Journalism for a long time, but intensive use of Data Journalism has not been much. This topic explores the process used by those involved in the use of intensive Data Journalism, which are: "Lottery: who gets rich?", where Thai Publica partnered with Boonmee Lab; "The Royal Speeches of King Rama IX", where Thai Public partnered with Sertis; and "The Results of Procurement Competitions of Government Agencies in Thailand", prepared by TDRI. The four steps are as follows.

##### **1) Planning**

Planning is a fundamental step that is essential for all types of news, including Data journalism, and it usually starts with determining the issue. Mr. Peerapong Techatuttanon said that the process of Data Journalism has its origin from a question that needs data to be answered.

"Last year, what TDRI did was about Data Revolution. We arranged a major seminar of TDRI, and asked a question regarding data of government sectors."

(Peerapong Techatuttanon, Interview, February 8, 2018)

But in the case of data journalists and scientists, they never worked together before. Mr. Jarun Ngamvirojcharoen mentioned that it is important to understand the scope and potential of the Data Scientific methodology, and then begin to define the issues.

"The story of the Royal Speech.... The beginning was that we had a conversation about it... (a scientist from the company) told us that Data Science has a way to do it. So we talked, and thought that if it's about texts, we might do something about Machine Learning so that, say, we input data into the system, it can group and read the data, and can match similar words that are close to each other. And at the time, I learned that Thai Publica also had this idea, and it was almost the King's 80th Birthday at the time, so we decided to do the King's Speech..."

(Jarun Ngamvirojcharoen, Interview, February 22, 2018)

After they have come up with a news issue, the working group will have a meeting and come up with a plan for the implementation. Ms. Boonlarp Poosuwan said that once the issue has been discussed, a meeting would be held to evaluate the possibility and assign the working group.

"Starting from the editorial conference first, what kind of Data we will use? For the number of people, it depends. It can be one issue, one person or 2-3 people, depending on who has a connection anywhere. Say, if this person is with this Ministry, they might have connection that can help follow up. While if another person does it, they might have to follow up and compile data by themselves."

(Boonlarp Poosuwan, Interview, November 6, 2017)

## 2) Collecting and Organizing Data

For "Lottery" who gets rich?" and "The Royal Speeches of King Rama IX", where Thai Publica partnered with a company that provides Data Science services, Ms. Boonlap Phupsuwan said Thai Publica would be responsible for contacting and requesting for information from relevant agencies.

"We must have an issue to cover first. If we want to do something, where can we find the data? Who would have the data to support? Who do we know? We need to have a discussion and we need check whether we will get the data and if the data we get is like what we wanted or not..."

[...] for example, the lottery quota, it uses the Act (Official Information Act, 1997). We requested data from the Government Lottery Office to see how the quota was allocated, until it led to a reconstruction of the lottery quota. At first, they did not

provide information. So, we went to the Appeals Court. So then they gave it to us, but in PDF file (Portable Document Format), so we needed to sit back and re-enter the data."

(Boonlap Phupsuwan, Interview, November 6, 2017)

For the competition in governmental procurement in Thailand, Mr. Peerapong Techatuttanon identified a method of Data Science which is called Data Scraping, which is used to retrieve large amounts of data in the online world.

"TDRI tried to dig data. This time, it required people with skills to dig information, which is called Scraping. This is to pick out the data to see how many procurement lists have been done last year. The summary is around 100,000 items

(Peerapong Techatuttanon, Interview, February 8, 2018)

### 3) Analyzing

The analysis of all three works used Data Predicting methods to find relationships, then described the characteristics of the data by via survey. For example, for "Lottery: who gets rich?" and "The Royal Speeches of King Rama IX", where Thai Publica partnered with a company that provides Data Science services, the company will be responsible in this step. As Mr. Jarun Ngamvirojcharoen stated a programming skill was used to help extract the meaning of the texts to understand the King's Speech in each year.

"We have the King's Speech dated back 30 years in PDF format, so we converted them into text. Then we input the texts into model program and tried to group the texts together....

It's like we're trying to showcase ourselves a little bit that we can take text data and make an insight out of it, that something that King Rama IX said was focusing on what matter. It was quite an advanced technique."

(Jarun Ngamvirojcharoen, Interview, February 22, 2018)

Mr. Puripant Ruchikachorn, Ph.D. mentioned that he has used programming skills to help manage large data to classify the people who received the lottery quota.

"The Data size was quite large. You must know how to write a program to be able to group the data and know how each group is like; for example, this quota is for



the disabled, this quota is for private companies, this quota is for organizations, etc. I mean they didn't categorize the data for you. They just mentioned how much quota was given to whom. So, you needed to group them by yourself....

at that time, we used mixed methods. We used OpenRefine to organize information, we used the scripts to segment the data, we used Java Scripts a bit. The visualization was by Java Script. "

(Puripant Ruchikachorn, Interview, January 12, 2018)

While the work of TDRI is similar, Mr. Peerapong Techatuttanon said that he utilized people with programming skills in this step, to identify the levels of competition in each procurement area.

"We need to see how many procurement cases have been done last year. The summary was around 100,000 cases. If people manually do it, it's impossible, but when we teach a computer to do it, it kind of knows.

[...] this time when we went to check the data that the TDRI research team did, we could see that in the whole map of Thailand, if it is dark blue anywhere, that means in that area there are only a few large vendors, so it's not so much competition."

(Peerapong Techatuttanon, Interview, February 8, 2018)

#### 4) Processing

Ms. Boonlarp Poosuwan stated that for "Lottery: who gets rich?" and "The Royal Speeches of King Rama IV, where Thai Publica partnered with a company that provides Data Science services, the company will provide the services and make the data into interactive visualizations.

"The reporters themselves did not know how to do it. Need cooperation between journalists and programmers....

[...] the criteria on what format to process depends on the appropriateness of the data, how we can present it. If the data are very good, we will decide to invest a lot. But for the lottery case, it was a project that they wanted to do together."

(Boonlarp Poosuwan, Interview, November 6, 2017)

Mr. Jarun Ngamvirojcharoen shared that Data Scientists from Sertis Co., Ltd, were responsible for visualization, while Thai Publica was the validator of data communication.

"We use a technique to create visualization. Then Thai Publica helped with the validation. It's like the computer editor detected that the King mentioned economic issues a lot in a particular year, the Thai Publica staff need to validate and check for the accuracy. If it's not right, we need to see what happened. Were the topics wrongly labeled?"

(Jarun Ngamvirojcharoen, Interview, February 22, 2018)

In terms of the competition in procurement of Government agencies in Thailand, Mr. Peerapong Techatuttanon specified that the presentation was primarily an infographic map.

"There is a competition for procurement in Thailand. We must show what Thailand looks like as a map. What color represents high competition. What color represents no competition. This attempt is a kind of Data Journalism already.

[...]when we went to check the data that the TDRI research team did, we could see that in the whole map of Thailand, if it is dark blue anywhere, that means in that area there are only a few large vendors, so it's not so much competition "

(Peerapong Techatuttanon, Interview, February 8, 2018)

#### **4.2.2.5 Feedback from the Use of Data Journalism**

In terms of the results of the use of Data Journalism, most informants indicated that results were likely to be better, but it is still the trial stage so it was not possible to use Data journalism to the fullest potential. In the case of Thai PBS, that used the social listening tool during the referendum on the draft constitution of Thailand in 2016, Ms. Kanokporn Prasitphon said that it was not as expected. The referendum result came out in contrast to what the social listening tool had predicted, but it also had the advantage of being new and different.

"The concrete result was wrongly anticipated. The result from the social listening tool said that it was going to be a NO. But when the actual result came out, actually, it was a YES. In terms of having data, in terms of being new and different

using data, yes it was, because other news organizations did not use a tool like this at all. At that time, it was rather exclusive. We were among the first who used a listening tool. It might be because of innovation or it might be because of our effort to try to come up with a new way of presentation.”

(Kanokporn Prasitphon, Interview, February 7, 2018)

Consistent with what Mr. Peerapong Techatuttanon stated that the case with TDRI was not so successful, but there was a tendency for good development.

"TDRI has been doing Data Journalism for 3-5 years. If you ask me whether it's been successful, I'm so-so. I don't feel that it's a huge success, but it's been continuous learning. And I believe that along this journey of continuous learning, we have made more friends, and have exchanged knowledge with them.”

(Peerapong Techatuttanon, Interview, February 8, 2018)

Ms. Boonlarp Poosuwan said that the popularity among the recipients depended more on the issue presented, rather than the production process. Moreover, Thai Publica had not used popularity as the main indicator, because the sponsors focused more on creating better social changes.

"It was clear that investigative news reporting is a niche market, not a mass market where you can cover any kind of news. When it's a niche market, it's a group. The group of people who really want to use the data will come here, except for some issues that are in the trend and really hit everyone like the lottery. It's not that data news will receive more attention than normal news; it depends more the topic or the issue whether it has a huge impact on the lives of the general public....

[...] not measured from the view counts, but measured from how the data is used or the impact on the society really. We wanted to offer a variety of easy-to-understand formats, even though sometimes it doesn't get a lot of view counts, but at least it's easy to access data and easy to use the data. The view counts are just by-products. It's okay if it's not a lot. But the data is on the website, and you can search and use it any time. At Thai Publica, view counts do not affect income. Impact is more important. The credibility is more important.

[...] Our sponsors consider the benefits that the society will get from the existence of Thai Publica. They support us as a spokesperson, covering topics that are related to the society. They support us without looking at the view counts as a main indicator. "

(Boonlarp Poosuwan, Interview, November 6, 2560)

#### 4.2.2.6 Teaching and Learning

In interviews with instructors of Data Journalism in Thailand, it was found that all teaching and learning focused on doing projects. Ms. Pattarawadee Thielier talked about the teaching at Panyapiwat Institute of Management, which is the first institution to offer courses in Data Journalism, saying that it focused on doing projects according to students' interests.

"P anyapiwat Institute of Management teaches Data Journalism as a subject matter of searching data mainly. The main focus is the technique. Then we convert data into graphs, infographics, motion graphics. Making complex things simple...

[...] it is a peer project. For example, some students are interested in Cyber Bullying. I let the students research on what counts as Cyber Bullying and then let them do a content analysis. In other words, I let them sit and monitor data. The results that come out can tell what kind of Cyber Bullying is found the most. It's like a small research. Students who wish to enroll in this course need to be able to do a research project. They must be curious and can find answers by themselves, no matter how, they must prove it by themselves... "

(Pattarawadee Thielier, Interview, January 8, 2018)

Asst. Prof. Pijitra Tsukamoto mentioned the use of projects in courses related to Data Journalism at Chulalongkorn University saying students are allowed to select the topics they are interested in, and develop those topics with mentors from the professions of Data Science and Mass Media.

"When creating the courses, I tried to make them project-based ....

[...] then last year, we stepped up our game by partnering with Work Point to do Data Journalism projects. Students can do whatever topics they are interested in. They can set a topic that they wish to know. It doesn't have to be a heavy topic. Some

students mentioned about the colors of the cars, some mentioned about Taylor Swift and her boyfriends and popularity. Then we borrowed staff from TDRI who helped us prepare visualizations. We borrowed staff from Sertis to help with Data Science. We borrowed staff from Work Point to help shape the topics. Work Point committed with us that they will be a platform in distributing the projects...”

(Pijitra Tsukamoto, Interview, January 11, 2018)

Mr. Jarun Ngamvirojcharoen, Chief Data Scientist from Sertis Co., Ltd., who was invited as a special lecturer in the field of Data Journalism, emphasized the importance of practice that when studying Data Journalism. Students need to get their hands on a project in order to learn by doing.

“This is not a lecture class, students cannot just sit and learn, they need to really do a project. Because the process of playing with data will help you come up with questions and then you will be able to come up more questions....

[...] It must be something that is project-based, working as a team, so that students will exchange ideas, exchange points of view. Sometimes this process helps teach you how to think... ”

(Jarun Ngamvirojcharoen, Interview, February 22, 2018)

When considering the contents taught, it was found that the teaching of the researching, collecting, verifying, and analyzing steps are similar at both Panyapiwat and Chulalongkorn University, The content is about critical thinking, the use of data tables, the link between data relationships and basic statistics, as per the interviews with the lecturers at both institutes.

"The data collection is to see the secondary data reported, such as the top shared, the highest likes, not a questionnaire, because it is slow. Or like the Taylor Swift topic, students need to go see what criteria they can use to measure her popularity level. Is it the money she makes? Is it the number of likes on her Facebook or Instagram pages? Her boyfriend makes her even more famous? Students need to research on those and calculate and see...”

(Pijitra Tsukamoto, Interview, January 11, 2018)



"Doing a project doesn't use anything complicated. Just let the students find the average. Ensure that they know which aspect to choose. There are a lot of data, they need to know how to choose. For example, if he's interested in one topic and there are a lot of data, and he doesn't know which to use, I will let him go see if there is anything wrong. If you check and you can't find anything interesting, maybe it means that you're not really interested in that topic..."

(Pattarawadee Thielier, Interview, January 8, 2018)

For teaching and learning in the process of data processing, it was noted that the courses at Panyapiwat Institute of Management allow the students of Communication Arts to have a hands-on experience more than at Chulalongkorn University. The courses of the Panyapiwat Institute of Management will cover the concepts of design and application programs for design, too, as Ms. Pattarawadee Thielier, the lecturer of the courses, mentioned.

"For Batch 3 (the latest batch), we will add motion graphics to the courses, telling the students that anyone who can do news reporting with motion graphics will receive special scores..."

(Pattarawadee Thielier, Interview, January 8, 2018)

At Chulalongkorn University, the Faculty of Communication Arts will cooperate with the Department of Statistics, Faculty of Commerce and Accountancy, to support the projects of the students majoring in Journalism at the Faculty of Communication Arts.

"At first, the Comm Arts students submitted plain normal reports. So, I told them to submit them an Excel file, and share it on Google Sheets. We edited the file there. About visualization, we used HTML and Java, didn't use anything 3D or fancy..."

(Puripant Ruchikachorn, Interview, January 12, 2018)

In addition, Mr. Puripant Ruchikachorn, Ph.D. stated that, in the next semester, he will be teaching together with Asst. Prof. Pijitra Tsukamoto.

" We're going to start this semester (Academic Year 1/2561), but it is not all that collaborative. It's just that this semester I'm teaching Information Visualization, and the Faculty of Communication Arts happens to have a course on Data Journalism, so I will invite Asst. Prof. Pijitra Tsukamoto to teach here one period. And I would like to borrow the projects that the students under Asst. Prof. Pijitra Tsukamoto would do. I will see if my students could do something further about it to take it further to a next step."

(Puripant Ruchikachorn, Interview, January 12, 2018)

#### **4.2.2.7 Problems and Obstacles of Data Journalism in Thailand**

The interviews revealed that there were four problems with and obstacles to Data Journalism in Thailand, as follows:

##### **1) News people still lack skills and understanding about Data Journalism.**

Most interviewees stated in the same way that news people in Thailand still lack the skills and understanding of Data Journalism. As Mr. Peerapong Techatuttanon mentioned, some media people still do not understand the definition of Data Journalism and lack information technology skills which are important for Data Journalism works.

"I've talked to many people. Many people still confuse Data Journalism with Investigative Journalism..."

[...] today, Data Journalism is about Big Data, AI technology, Machine Learning etc. All these allow for a lot of data to be visualized more easily. Personally, I think, even today, many media organizations, professional associations, or even Faculties of Communication Arts at many universities are still the same... they are people who do not know IT.... "

(Peerapong Techatuttanon, Interview, February 8, 2018)

Ms. Kanokporn Prasitphon, mentioned that people in the Thai media were active with using data in news reporting, but still lack skills and understanding of Data Journalism.

"Not only at Thai PBS, everywhere else is trying use more data. But it comes back to the question pf do they know what Data Journalism is? What it can do? What

are the key words about data? It's all around already, but I feel that people at the news desks of organizations do not know about it much...."

[...] another skill missing here that is an obstacle for Data Journalism is the skill to read data or to see a story out of a set of data. It's like students who major in Science vs Arts. It's a vision of reading data and being able to compare it with many other things. You have to have statistics skills...."

(Kanokporn Prasitphon, Interview, February 7, 2018)

## 2) Public data in Thailand is low and difficult to access.

The next issue that most interviewees mentioned about is the access to data, which is at the heart of Data Journalism. As Ms. Boonlarp Poosuwan mentioned, even though Thailand has the Official Information Act BE 2540 (1997), there are no official bodies to supervise this.

"The main factor is data access. Because sometimes you set a topic, but it is not possible to find data. For example, the project of Thai Spending Watch to dig deep into the national budgets in large projects to let the public participate in the verification of how efficiently the budgets are used. But that project is impossible to do because there is no access to the data. Another example is the high-speed train. We wanted to see the entire contract, so that we could get all the data and feed it into our platform set. Even when we have the law in place saying that they need to disclose the medium price, TOR, and the contract, until today, even if the law says so, there is no official body to supervise this. So, when we requested them to disclose, they said it's a secret. End of story. We don't know where to request for the data. So we cannot go on with the project because we don't have. The government sector needs to disclose more. When there is a law, but there is no one to supervise it, it's difficult."

(Boonlarp Poosuwan, Interview, November 6, 2560)

In addition, some informants have identified the causes of low public data and difficult access in Thailand. Mrs. Sudarat Disayawattana Chantrawatanakul, Ph.D. stated this is because each organization does not have efficient management of data, even media organizations.

"The network is not perfectly linked. Therefore, each organization takes care of its own database. Thai PBS Library maintains one database. News organizations maintain one database. Office of the Prime Minister maintains one database. It is not connected systematically so it's unusable. The phase that we are in is to connect all these databases, so that it's complete and ready to use. And we plan to send out data, too, meaning to store it somewhere so the public can come and search."

(Sudarat Disayawattana Chantrawatanakul, Interview, February 15, 2018)

### 3) The budget allocation and operational guidelines of media organizations.

Some interviewees stated that the budget allocation and operational guidelines of media organizations are an important issues in the work of Data Journalism. Ms. Kanokporn Prasitphon mentioned Data Journalism has a higher cost in personnel and technology in the workplace than general news coverage.

"Cost is another reason that makes it difficult for Data Journalism to be successful, because before we could get a tool to do the Big Data, it used a lot of budget. And we don't even know if we invest the budget, our people will have enough skills to do it. We buy a million-baht tool, but if our people are not skilled enough to analyze the report, then it's not good."

(Kanokporn Prasitphon, Interview, February 7, 2018)

The same goes for Mr. Arthit Suriyawongkul,, who stated that actually in Thailand we already have people in the Data Science field, but they are often in the business sector, which provides high compensation. It is difficult for news organizations to invest in employment.

"We have people with the required skills in the market, I'm sure. But news organizations do not have enough money to hire these people, as it's very expensive. Data scientists are very expensive. Compared to big news organizations in other countries, they have the money to hire this kind of person. But for us, even a librarian, sometimes we don't have a budget to hire. Very few newspapers in Thailand practice Archive Data or have a librarian managing data properly. Very few. It's an expense that people don't see to generate income."

(Arthit Suriyawongkul, Interview, February 25, 2018)





#### 4) Data Science technology does not support Thai Language

In addition to the problems and obstacles mentioned above, Mr. Arthit Suriyawongkul, also mentioned the factor that Data Science technology that does not fully support Thai language, so we cannot reach the full potential of Data Journalism. "Language processing... we just talked about statistics data which is numbers, right?... but in computers anywhere in the world, numbers are numbers. However, data that is in Thai language, documents in Thai language, they need another way of processing. We cannot use ready-made software from other countries."

(Arthit Suriyawongkul, Interview, February 25, 2018)

#### 4.2.2.8 Summary of knowledge status and use of journalism in Thailand

Based on the study of knowledge status and the use of Data Journalism in Thailand through in-depth interviews, it can be concluded that the definition of Data Journalism was not unanimously agreed, but there as something that all interviewees agreed on in a broader sense ,that it is a process of news reporting that primality uses primality data. When considering the details of the definition, it was found that each interviewee would focus on the different dimensions of Data Journalism. Some interviewees focused on news reporting, using in-depth insights and analysis. It's not just the use of data. The technology involved can also be used as a measure to divide Data Journalism in the broad sense and the specific sense that uses Data Science to help in the work process.

In terms of the importance of Data Journalism, it was found that those who are related to Data Journalism in Thailand mentioned three aspects of the importance of Data Journalism as follows:

1) The importance for news organizations -- it is believed that Data Journalism is a tool that can help news organizations differentiate themselves from other media in this era.

2) The importance for journalists – because Data Journalism is an important skill in the digital age. Both in daily life and in the media. In addition, information from Data Journalism can be used as evidence to defend the work of the media in the courts.

3) The importance for the recipients and the society – Data Journalism is the process of producing reliable news content that can be part of a solution to structural problem. It is also a process that gives people access to information more equitably. This will promote the civil rights of citizens.

In terms of the status of the use of Data Journalism in Thailand, it was found that Thai media has been using data for news reporting for a long time, but just did not call it a Data Journalism process. The methodology of Data Science has not been applied much to the collection, analysis or presentation of data. The key factor contributing to the intensive use of Data Journalism is the collaboration between media organizations and the personnel or organizations providing Data Science services, while professional associations and media organizations are planning to develop more to accommodate Data Journalism as well.

For the use of Data Journalism in Thailand, those involved in the use of intensive Data Journalism, which has incorporated Data Science too, mentioned that there are four main steps, as follows:

1) Planning --- starting by having questions that require data to answer. However, in the case that data journalists and data scientists have never worked together, it is necessary to understand together the scope and potential of Data Science methodology, and then start thinking about issues or topics. After the topics, the working group will join a meeting and come up with a plan for the implementation, evaluate the feasibility, and assign the tasks.

2) Collecting and organizing data --- in general, journalists are responsible for contacting the relevant authorities. However, in some cases, it may lead to a method of Data Science called Data Scraping, used to extract large amounts of data in the online world.

3) Analyze --- here programming skills are used to do the Data Predicting to find the relationships in the data and then describe the characteristics of data via a data survey. Data scientists will be responsible for this part.

4) Processing --- mostly data scientists will process that data into an interactive visualization format, while the journalists will verify the accuracy of the data communication.

The response from using Data journalism data is that it tends to be good, but still in the trial stage, so it is not possible to use Data Journalism to the fullest potential. However, the popularity amount the recipients depends on the topic rather than the production process itself.

In terms of teaching and learning, it was found that teaching Data Journalism in Thailand focuses on doing projects. When considering the content of teaching, it was found that teaching the process of data collection, data verification, and data analysis involves critical thinking, using data tables, Linking of data relationship and basic statistics, while for data processing, some institutions cooperated with other faculties specializing in data processing more than faculty of communication arts.

The problems with and obstacles to Data Journalism in Thailand are as follows:

- 1) News people in Thailand still lack basic skills and understanding of Data Journalism.
- 2) Public data in Thailand is low and difficult to access. Although Thailand has the Official Information Act BE 2540 (1997), there are still no official bodies to supervise it.
- 3) The budget allocation and operational guidelines of media organizations are still an obstacle, because there is the cost of staffing and technology, and it takes more work than general news coverage.
- 4) Data Science technology does not fully support the Thai language, thus not reaching the full potential of Data Journalism.

### **4.3 Guidelines for the Development of Knowledge and the Promotion of the Use of Data Journalism in Thailand**

This section presents the results of the study on the development of knowledge and promotion of the use of Data Journalism in Thailand, using the data from in-depth interviews and group discussions.

#### **4.3.1. Suggestions from In-depth Interviews**

From the Interviews with those related to Data Journalism in Thailand, the researcher could compile the following suggestions.

##### **4.3.1.1 Suggestions to Journalists and Those Interested in Data Journalism**

All informants suggested that the development of knowledge and promotion of the use of Data Journalism in Thailand must begin with knowledge and understanding of Data Journalism. The details are as follows.

1) Adjust the thinking base for work

Ms. Sarinee Achavanuntakul suggested that news people need to adjust their minds in order to believe in themselves and believe more in the data.

"The thinking base for news reporting needs to change, too. I observe that Thai journalists, in general, they would think of "who" to ask..."

[...] You have to believe in the data. You have to reach a point where you can make some conclusions based on interesting data by yourself. And after that, asking people is just on top of what you have found. We must empower journalists first, they must believe in data..."

(Sarinee Achavanuntakul, Interview, December 6, 2017)

2) Enhance the knowledge and understanding of data.

Mr. Puripant Ruchikachorn, Ph.D. recommended that we must start from Computational Thinking which refers to the process of thinking for problem solving step by step. This is the most important basis of data management.

"Computational Thinking is knowing what the computer can do and what it cannot do, and then dividing the data into small chunks until it's small enough for you to work on, it's like systematic thinking=.

[...] Thai textbooks are not so much available. I recommend online courses like "Intro to Programming." It works. Because it is a practice course. You need to try by yourself. There is nothing specific. You can take a look at all the big online course websites like EdX or others, which teach programming. Not serious about language, It depends on what you want to use it for."

(Puripant Ruchikachorn, interview, January 12, 2018)

3) Create familiarity from what's around you

Mr. Jarun Ngamvirojcharoen recommended starting with the things around you; for example, the ready-made program for managing table data such as Microsoft Excel.

"Try playing with data on Excel and converting it into graphs. Try cutting this, and filtering that..."

[...] at the end, it's like using Excel. If you can use Excel very well and can change data into visualization on Excel, it's another development of skills. If you can do it, it will help you a lot."

(Jarun Ngamvirojcharoen, Interview, February 22, 2018)

#### 4) Enhance your digital security skills.

Mr. Arthit Suriyawongkul further suggested that skills for digital security are essential, both for the confidentiality of the topic and for the security of the news sources.

"In the past, there were people in the circle to tell about the peculiarity of the organization. They would meet up here and there, secretly giving you documents but now it's a file. They might have to send you a copy. They must send an email to you. If it's via e-mail, you can trace back who sent it. If you do not protect your news source well it's unethical as a reporter.

[...] So, in the digital age, in the information age, you have to have the skills and ability to protect the data sources. You want to be a data journalist, right? Before that you have to have data. And what about the data sources? How do you protect them? Do you know how to encrypt when sending data? Do you know how to conceal your identity online?

(Arthit Suriyawongkul, Interview, February 25, 2018)

#### 5) English language skills are an important key.

There are also skills that may not be directly related to Data Journalism, but Mr. Jarun Ngamvirojcharoen identified them as the key to developing other related skills: English language skills.

"English may be something that people overlook, but it's very important. If you want see the works, read the process, the thinking base or work process of others, most of them are in other countries. The Guardian, the Washington Post. they have people who do Data Journalism. They have Data Journalism Awards that they hold



every year, which you can watch. And each work you take a look at, it's for learning. But if your English language is not good, you miss the opportunity."

(Jarun Ngamvirojcharoen, Interview, 22 February 2018)

#### **4.3.1.2 Proposals to the public and private sectors for disclosure.**

Most interviewees stated that if we want Data Journalism to grow, public data needs to be more disclosed than it is today. The details are as follows.

1) Public data is important to both the media and the development of the country.

Mr. Chavarong Limpattamapanee Indicated that public sector's data in Thailand is likely to improve. If the database is updated and the public can access the government data, it will improve Data Journalism too.

"The government is trying to improve the database system so that the public can access government data. If you can improve to the level that the PM said, it will make Data Journalism easier and livelier."

(Chavarong Limpattamapanee, Interview, February 17, 2018)

2) Look at the public data collection model in developed countries.

Mr. Tomorn Sookprecha advised to look at the public data management model of developed countries as an example so that public data storage is easily accessible to the public.

"See other countries as an example. Say, we look how Singapore keeps track of car or road users, how they store data in a system that others can use in the future. Now, in Thai society in terms of data collection, we collect separately. Bangkok has a lot of data on vendors, roads, everything, but they are in PDF format. And all the numbers are in PDF format. Millions of data sets are stored for many years, but in PDF. What for? So that we need to re-enter the data manually once again? I mean, when you receive data, especially in some topics, you need to think of your descendants, other people in the future..."

(Tomorn Sookprecha, Interview, February 27, 2018)

3) The state has the duty to produce, manage and facilitate the use of data.

Mr. Peerapong Techatuttanon said that the state is not only responsible for the production of data, it also has a duty to use the data and facilitate the use of data for the public too.

"The state is responsible for producing a lot of data, for example, when you have to enroll, when you have to register for work, you have to report income tax yearly. When you are not well, you go to the hospital, right? What kind of medical rights do you have? Social Security? Gold Card? Or are you a government officer? All there, the state is producing a lot of data like this every day. Not sure that they use all the data."

[...] the data management that the state is doing now doesn't allow for the public to go check that easily. Let me put it his way, the state is responsible for producing data, using data and also facilitating the use of the date too."

(Peerapong Techatuttanon, Interview, February 8, 2018)

4) Data that has an impact on many people must be publicly disclosed.

The suggestion by Mr. Arthit Suriyawongkul does not only suggest that public sector data needs to be publicly disclosed, but data of any project that has an impact on many people should also be disclosed as well.

"We need to find a way to allow access to public data. Right now they are fixing the Official Document Act 1997, saying that not only public sector data, but also any project that has an impact on many people, concerned with public projects, even if the private sector does it, we need to disclose the data, too. This way, we will have more data. At least, paper data we can find a way to convert it into digital. Or is it possible to have a law that enforces that for nowadays data before you print out on paper, you need to have it in a Word Document or something like that? If it's already digital in the first place, why don't you disclose it in the beginning? This way, we will have more digital data."

(Arthit Suriyawongkul, Interview, February 25, 2018).

#### 4.3.1.3 Recommendations to Media Organizations

Most interviewees stated that for the full use of Data Journalism in Thailand, media organizations need to change the way they operate.

1) Media organizations need to take the new process.

Ms. Sarinee Achavanuntakul sees that media organizations should come out of their comfort zone, especially large media organizations that are ready to open up new opportunities in the digital age.

"Media organizations with a budget should invest in these things more. It might become another model of income channel, just that you have never tried it. "

(Sarinee Achavanuntakul, Interview, December 6, 2017)

Ms. Pattarawadee Thielier commented in the same way that Data Journalism is an opportunity to make money for new media.

"I think Data Journalism should be something that makes money for media in the new era, if you're serious about it. We need to stop underestimating the recipients. They might want to see the data, too. If you're serious about it, it will be different and make profit."

(Pattarawadee Thielier, Interview, January 8, 2018)

Mr. Puripant Ruchikachorn, Ph.D. suggested that in the era of change no one knows the obvious solution. Media organizations should dare to try something new.

"They don't use advanced complex processes because they see that they don't have the budget. They see that they need to hire a programmer and train new skills for their staff, and it's a lot of money. And they see that the old way of news reporting can sell ads. But I see that we're in the changing period. All the media know very well that nobody can guess how long we will still survive. News channels that used to be successful might not be so successful in the future so they need to move and change. "

(Puripant Ruchikachorn, Interview, January 12, 2018)

2) Separate content and work groups of Data Journalism from from daily news.

Ms. Boonlarp Poosuwan suggested that we need to separate daily news from Data Journalism that focuses on heavy contents with social topics.

"The presentation can be separated. Whatever needs view counts, you can do it separately. For Data Journalism, you can do small parts first like 20%

[...] sometimes caring only about view counts doesn't always guarantee you income. We need to think of general interest of the public in the part that you think you can push. Everyone can do their own part. It will benefit us all, if we help each other..."

(Boonlarp Poosuwan, Interview, November 6, 2560)

Ms. Pattarawadee Thielier mentioned that the content of Data Journalism should be separated from normal content so that the team can spend more time on complex tasks.

"Journalism information takes a lot more time than usual. You will have to think that there must be a group who takes care of data and don't need to do other news. If you have to do daily news, you won't have time for Data Journalism. Think about the spotlight. Let the team do their work digging the topic they're doing."

(Pattarawadee Thielier, Interview, January 8, 2018)

Mrs. Sudarat Disayawattana Chantrawatanakul, Ph.D. suggested that media organizations should set up ad hoc teams that produce Data Journalism.

"It must be a Special Task Force. It must be a dedicated team who handles this particular topic. At the beginning, it may be composed of people who are not just Communication Arts people or not journalists. It may be other elements that can be made and it corresponds. It is impossible for an experienced worker who has worked for a long time to develop himself for a variety of skills. It may have limitations. We must mix seniors with juniors. The news is mixed with the characteristics of the people who are good with data and analysis."

(Sudarat Disayawattana Chantrawatanakul, Interview, February 15, 2018)

3) Media organizations should have their own database management system.

Mr. Jarun Ngamvirojcharoen suggested that media organizations can start from their own organizations with a systematic database management system. It can then be used to communicate in order to raise awareness of how to communicate in the style of Data Journalism.

"I think that works that the company whether they have internal or external communication, they have their own data. And it can be changed into a new coverage of Data Journalism. And it will help urge people to see that there are works like this, and people will start to be aware."

(Jarun Ngamvirojcharoen, Interview, 22 February 2018)

Asst. Prof. Pijitra Tsukamoto suggested that the management of databases would help media organizations to consolidate into new content.

"If they have archives of news pictures in their own news agency with a good arrangement, they can create a new format of news already...."

[...] for interested media, if you are old media, you can organize your old data. You might find at way to manage your archives, like, how to retrieve the voice files of the interviews in the past. This is what you should do. For new organizations, you should use secondary data from other sources. Old organizations have a better cost.

(Pijitra Tsukamoto, Interview, January 11, 2018)

#### 4) Create a collaborative network.

Mr. Puripant Ruchikachorn, Ph.D. proposed that media organizations should invest together in setting up a Data Science service. Center, to be able to support Data Journalism without investing too much.

"I would like news originations to set up a joint company or an agency. I think that each news organization does not have enough budget to hire 5 permanent programmers. It cost 100,000 THB per month already, or they might have budget, but they might not have continued work for the programmers to do, as they might want to do it once per month. I think that all the media can invest in a joint venture to hire 5 programmers and then they can share. "

(Puripant Ruchikachorn, Interview, January 12, 2018)



Mr. Arthit Suriyawongkul suggested that media organizations should use modern technology to create a collaborative network for people to contribute to the work of Data Journalism.

"Do not let technology do everything. But let technology help people get involved. I mean the work itself, we let people do, so that the data is open to the public."

(Arthi Suriyawongkul, Interview, February 25, 2018)

#### **4.3.1.4 Summary of the Recommendations from In-depth Interviews**

##### **1) Recommendations to journalists and those interested in Data Journalism**

The development of knowledge and promotion of the use of Data Journalism in Thailand must begin with the understanding of Data Journalism. The news people need to adjust their thinking base in work. They should believe in themselves and believe in data more. They may start with learning the concept of Computational Thinking to be able to understand the data system or can start from something close to them like a ready-made program for manipulating table data such as Microsoft Excel. In addition, digital security skills are essential in the use of Data journalism, both for the confidentiality of the topic and for the security of the news sources. The important key to developing relevant skills is English because most of the knowledge has not yet been translated into Thai.

##### **2) Suggestions to the public and private sectors for data disclosure**

Data Journalism is growing. It will be necessary to open more public data than today. We may look at the forms of data management from developed countries as examples to provide public data that is easily accessible to the public. The state does not have the sole purpose of producing data, it also has a duty to use data and facilitates for the use of the public. However, not only public sector data must be more disclosed, the data of any projects that have an impact on a lot of people should also be disclosed as well.

##### **3) Suggestions to the media organizations**

In terms of Data Journalism in Thailand, media organizations need to change their approach. They should come out of the safe zone, especially large media organizations who are ready to open up new opportunities in the digital age.

On the content side, the media organizations may separate teams of daily news that focus on popularity and Data Journalism teams that focus on social issues so that the working team can spend more time on complex tasks.

Media organizations should have a database management system, starting with their own organization, by systematically collecting data. That data can be used to communicate in order to raise awareness of how to communicate Data Journalism. Their own database management will enable media organizations to add new content. In the case of media organizations who are not ready to invest all by themselves, they may use collaborative networking, such as joint investment, to set up a Data Science center, to be able to support Data Journalism without investing too much. The use of modern technology creates a collaborative network for the people to contribute to the work of Data Journalism.

#### **4.3.2 Results of the Study of the Views of the Recipients**

The researcher had conversations with two groups, of Generation X (age 37-52) and Generation Y (age 17-36) respectively, which are the most important target groups for digital media. Each group was five people, mixed in age, sex and profession. The aim was to find out how to develop knowledge and promote the use of Data Journalism in Thailand. Their results are given below.

##### **4.3.2.1 Recipients' Behavior**

From group discussions, it was found that recipients from Generation X and Generation Y were unique in receiving news. They are both the same and different in many aspects, which can be summarized as follows.

##### **1) Channels they open for news**

Most Generation Y recipients are more receptive to new media than the Generation X recipients.

"Most of them watch online news, because they use Facebook and Twitter. The most updated is mostly Twitter, because popular news always hit the trends in Twitter."

(Weeraya, Female, 21, student)

While Generation X recipients are exposed to news from new media, most of them are exposed to the traditional media too.

"It is divided into two categories. General TV media will generally be a family time. It's time to go home and spend time together. Maybe you don't select the program because others in your family are already watching. Those who select programs, they do by habit what they are used to. They choose the news anchors whose faces are familiar for a long time. They are used to the news reading style. The other is online time. It will show up in the news feed. People share whatever news. Most of the time the news updates are from the pages that we like."

(Natthanan, male, 37, employee)

## 2) Factors influencing the selection of news

Generation X and Generation Y recipients have the same influencing factors. Most argue that content is more important than presentation. It is based on personal interest and trust.

"If I choose, most of the time, I see the topics or headlines first whether it's a matter I'm interested or not before I open it. But sometimes I choose from credibility of the media if I think their news has quality. Sometimes I come across Spam or Click Bait but the more I see them, the more I know."

(Raksak, male, 34, business owner)

The participants in the group discussion stated that in case they are not interested in any particular content, presentation format will be important.

"If I'm not interested in anything, news clips are the easiest. I will listen to them to get the gist. if I'm interested, I will find out more. If a piece of news comes with a lot of text, I can't read it. I tend to listen to the clips or live clips from TV. It's like I listen to them telling me the news first. If I'm interested, I will find more text by myself."

(Thawit, male, 38, employee)

## 3) Opinions on the role of Thai media in the present

Both Generation X and Generation Y recipients commented on the current Thai media's duty. Most of them see that the Thai media are competing to present colorful news and trying too hard to be popular until sometimes they lack useful content.

"I think that Thai media don't focus on the fact ratio. They are mostly led by the current trends. Whatever is popular at the time, they will cover it like the lottery case of Teacher Preecha...."

[..] I think they just follow the trends. And when they are looking for suggestions for solution, they ask from someone who is not relevant. And it's useless. Like when there is a car accident, they will try to find out if the driver is on drugs. Like the latest news on a coach accident, they covered that the driver was on drugs but no one talked about the condition of the roads. Because at this curb, accidents happen often. Why no one is offering a solution here? They always follow the trends of what the society cares about at the time.... "

(Pornphisit, male, 45, government officer)

"Today, the media is like marketing, based primarily on consumers, doing what the consumers want. Whatever the consumers want, they will do that. Sometimes the facts may be different."

(Siriporn, Female, 25, employee)

#### **4.3.2.2 Opinions on News from Data Journalism**

The sample group was exposed to Data Journalism and then grouped together. It was found that the majority of recipients from Generation X and Generation Y agreed that news from the Data Journalism process is credible and easy to understand. "Data Journalism is a model of what is digested and presented briefly, useful for news where we don't have backgrounds, or making it easy to understand."

(Soraluck, female, 43, employee)

"It contains a summary of the data like they have done their homework. It's a reliable part. It's not like they are speaking out of nowhere. It shows that they have done some preparation before. They researched here and there. It created credibility

even though we don't know for sure if it's true. But it feels reliable more than general news."

(Raksak, male, 34, business owner)

However, when considered in detail, there is a difference between the opinions of Generation X and Generation Y. Most Generation X recipients are concerned with the possible Impact of Data Journalism.

"It makes people feel convinced that this is true but what is scary about Data Journalism is social guidance. They want people to believe like this. They will pick only news that makes people think like that. Pick 3 – 5 pieces of news and organize them in a way that encourages people to think like that. You have to think like that. It's scary in this sense."

(Pornphisit, male, 45, government officer)

The majority of Generation Y look on the other side. They gave positive comments that news from the Data Journalism process is fresh and interesting.

"There is a lot of data today. We cannot follow all 1,000 events that happen. Of course, we must choose and filter. When we want to select someone, one thing is that, we see if it's like what we want. But another thing is that, does it shout out loud enough? Can it grab our attention?"

(Teethawat, male, 30, employee)

#### 4.3.2.3 Characteristics of Journalism Works

In the group discussion to find the characteristics of Data Journalism works that the recipients are satisfied with, the researcher played three samples of Data Journalism.

Table 4.16 Data Journalism Works in the Group Discussion

Work	Media	Size	Analysis	Presentation Format
1. Exploring featured characters in CH7	The Matter	Small	Not complex	Text with infographics



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2. Summary of luxury watch case of General Pravit	CSILA	Small	medium	Infographics
3. Lottery: who gets rich?	Thai Publica	Large	medium	Interactive Text

---

After the discussion of the three samples, the majority of recipients of Generation X and Y agreed that the outstanding characteristic of Data Journalism was the completeness of the data, and they all liked “Lottery: who gets rich?”

“I like the third one as I have no background and no knowledge of lotteries at all. And I don’t like numbers. So, what they presented here helps those who have no background like me to find that there is something hidden. The conciseness is good. I don’t have to research more or read a lot more. I can understand the complex matter easily.”

(Soraluck, female, 43, employee)

However, when considering the details, the difference is clearer. Even though the majority of Generation X recipients were fond of the third one, almost half of them claimed to favor the second.

“I like the news number 2. I like a summary in one page: easy to understand, concise, biased or not biased but okay I know that the content is about this. If I want to know more about it, I will search further.”

(Thawit, male, 38, employee)

Others said that they said they liked both the second sample and the third sample.

“The third one, if you ask me whether I like it, I do. If I have time, I will play more with the interactive part but if I don’t have time, just put everything in one page and provide some short texts, some infographics. So it turns out that the second one responds to my needs more in terms of speed and content. Even if it’s sarcastic, in terms of presentation I like the second one.”

(Sineenat, female, 41, freelancer)

Most Generation Y recipients commented in the same way that they liked the third piece because the presentation format is interactive. This creates a sense of participation, and allows the recipients to choose to explore points of interest.

"I like the third one because it's like having a little engagement. It makes me feel like I can choose what I want to access in each part. A little engagement makes me feel like I can choose to accept data."

(Natthaya, female, 22, student)

"I understand that the third one summarizes everything in one graph just like in the second one, but it allows people to explore more and more. There's some reaction between us and the data. And in the third one, there is less text. Less is more."

(Teethawat, male, 30, employee)

#### **4.3.2.4. Suggestions from the Perspective of the Recipients**

The suggestions from the perspective of the recipients can be summarized as follows.

##### **1) Increase transparency in work**

Most Generation X recipients see that Data Journalism is a reporting process that makes it more reliable than general news but they are concerned about the effects from the use of data. They proposed that the Data Journalism process be more transparent, with clear sources of information.

"I want to see a reference that is more academic. Come up with a citing guide. Who is writing? Who made the graphics? Who is behind the scenes? Who refers to the same news that has been said before and who said it? It allows people to trace back."

(Natthanan, 37, male, employee)

##### **2) Use Data Journalism when it fits the content**

Most Generation Y recipients agreed that Data Journalism is not suitable for all types of content reporting. It is recommended for news with a lot of data and stories that is valuable enough to present.

"This process depends more on content. It does not mean that I won't read anything that goes through this process. I think it's up to the content, and whether fits the process and presentation or not"

(Natthaya, female, 22, student)

"It depends on the news, whether it fits the process of Data Journalism or not. Like I said, if it's celebrity news, is it too much to do Data Journalism? It's not that necessary Some is just ordinary accident news. If you do Data Journalism on it, it might not help draw any attention."

(Raksak, male, 34, business owner)

### 3) Target the audience in the presentation

In addition to the suggestions mentioned above, what some Generation Y recipients recommended is to select the target audience for the presentation, because Data Journalism is not suitable for all audiences.

"There is no one-content-fits-all that catches everyone, both education- and society-wise. I mean, news organizations have many targets, right? So, when they want to present news, they need to select their target as appropriate too."

(Siriporn, female, 25, employee)

#### **4.3.2.5 Summary of Study Results from the Perspective of the Recipients**

Based on the group discussions, it can be concluded that the recipients of Generation X and Generation Y are unique in the same and different ways in their openness to news. The same part is the focus on content rather than presentation style. It is based on personal interest and trust. In case they are not interested in any content in particular, presentation format will be important. They see that Thai media is competing to present colorful news too hard until it lacks in content. For the different part, it is the channels that they expose themselves to. The majority of Generation Y recipients are more receptive to new media, while Generation X recipients are also exposed to news from the new media, but most of them are exposed to traditional media as well.

In terms of Data Journalism, it was found that both the majority of Generation X and Y agreed that news from the Data Journalism process is credible and easier to understand than general news. However, when considered in detail, there was a difference between the attitudes of Generation X and Generation Y. Most Generation X recipients were concerned with possible impacts of Data Journalism, while the majority of Generation Y looked on the other side. They gave positive comments that news from the Journalism Process is fresh and interesting.

In terms of the characteristics of Data Journalism, the majority of Generation X and Generation Y agreed that the major characteristic of Data Journalism is the completeness of the data. However, when considered in detail, the difference is clearer. Some of the Generation X recipients said that they like short, easy-to-understand, one-page works of Data Journalism, while most Generation Y recipients commented in the same way that they liked the third piece because the presentation format was interactive and it created a sense of participation, and allowed the audience to choose to explore into their points of interest.

Suggestions from the perspective of the recipients can be summarized in three ways.

1) Increase transparency in works --- Most Generation X recipients saw that Data Journalism is a reporting process that makes it more reliable than general news but were concerned about the effects that could occur by the use of data. They said the Data Journalism process needs to be more transparent, with clear sources of information.

2) Use Data Journalism when it fits the content --- Most Generation Y recipients agreed that Data Journalism may not be suitable for all types of content reporting. It is recommended to use Data Journalism for news with a lot of data and stories, and when it's valuable enough to present.

3) Target the audience in the presentation --- In addition to the suggestions mentioned above, there is another thing that Generation Y recipients recommended which is to select the target audience for the presentation as Data Journalism may not be suitable for all recipients.

Based on the results of this research, when comparing the findings on the status of knowledge and the use of Data Journalism in other countries with the

knowledge status and the use of Data Journalism in Thailand, we can see that it is still very far away. The knowledge of Data Journalism in other countries has been receiving serious attention from the academic community since 2009 and has grown rapidly since 2011, while for the Data Journalism in Thailand, there is only an attempt to gather basic knowledge.

In terms of the use of Data Journalism, although the Thai media has been using structured data for news coverage for a long time, which is widely used in Data Journalism in a broad sense (Data Journalism 1.0 and 2.0), the user does not call this process Data Journalism. Also Data Science has not been applied in the work process much. This is so far away from the use of Data Journalism in the leading news organizations in other countries.

When looking at Data Journalism works which are successful in other countries, most of them shared the same characteristic which is the use of large data, and they all provided data through interactives. Data Science was often used to support data also. When compared with the results of Data Journalism studies or similar works in Thailand, the difference is that most of the works of Thai media used small data and new data that they collected by themselves. Only a minority of the data was presented using interactives, which allowed recipients to interact with the content and most of them did not use Data Science to support their works.

It was also found that the case studies in the category of award-winning digital news in Thailand did not have structured data management, so it is not counted as Data Journalism according to the operational definition of this research.



## **CHAPTER 5**

### **SUMMARY, DISCUSSIONS, AND SUGGESTIONS**

The research on "Development of the Knowledge and Promotion of the Use of Data Journalism in Thailand" aims to: 1) study the knowledge and use of Data Journalism in other countries; 2) study the knowledge and use of Data Journalism in Thailand as well as the obstacles and problems in the development of knowledge and use of Data Journalism in Thailand; and 3) create guidelines for development of the knowledge and promotion of the use of Data Journalism in Thailand.

The research methodology used was qualitative research, using documentary research, case studies, in-depth interviews, and focus group discussions. This is to answer the research questions determined. The researcher has summarized the results into main issues as follows.

#### **5.1 Summary of Research Findings**

##### **5.1.1 Knowledge and Use of Data Journalism in other countries**

###### **5.1.1.1 Knowledge of Data Journalism in other countries**

From the research, it was found that knowledge of Data Journalism has been based on the use of Computer-Assisted Reporting (CAR), which has attracted academic attention since the 1960s, but most of the academic works on these issues before 2010 focused on a different point from Data Journalism. This research therefore begins with the first set of knowledge related to Data Journalism, which is the works of the American Journalism Research Group in 1996. From review of the online database covering 1996–2017, 64 Data Journalism works were found. Data Journalism has attracted serious attention from the academic field since 2009.

Considering the development of issues in academic works related to Data Journalism, the data shows that in the early stages, most of the knowledge focused

mainly on issues related to the work process of Data Journalism in media organizations. The studies of issues related to the content of Data Journalism began in 2010, and after 2015, began to explore a wider range of topics. When considering each issue closely, most works related to Data Journalism were focusing on issues related to the work process of Data Journalism in media organizations. Next were the studies of the content of Data Journalism, studies on teaching Data Journalism, studies on the definition of Data Journalism, and other issues that could not be categorized in the above-mentioned categories.

In terms of knowledge of the definition of Data Journalism, it was found that academic works related to the process of presenting facts with data as the core using structured data management methods. Before 2009, works would use the key words of Computer-Assisted Reporting. Later, in 2009-2014, a variety of keyword terms came to be used, such as Computational Journalism, Data Journalism, or Data-driven Journalism. After 2014, the term Data Journalism began to be used widely. However, although Data Journalism is clearly related to and influenced by the pre-existing concepts, when considered closely, the definitions of Data Journalism, Computer-Assisted Reporting, and Computational Journalism are different. The researcher chose to study about the issue of the definition of Data Journalism. However, up until now, a definition that thoroughly covers Data Journalism has not been agreed by all parties. In giving a definition to Data Journalism using the knowledge of its definitions, a few dimensions could be drawn to fit the goal of its actual use.

In terms of the knowledge of Data Journalism work process, it was found that it started in 1996 where the early works focused on the use of computer technology which was a new innovation at the time to help manage the data of newspaper organizations. This was the beginning stage of Data Journalism. From 2009 onwards, the academic community has become active on this topic, and there were more academic works on Data Journalism pointing out the advantages of using computer scientists to increase the work potential of journalists, and to study the key factors behind the success of the Data Journalism workforce in organizations. After 2012, when knowledge about Data Journalism began to become clearer, there started to be studies of the use of Data Journalism in many countries in specific areas, which gave a picture of the status of Data Journalism as a whole, the skills required for Data

Journalism, and the problems and obstacles in the use of Data Journalism. Moreover, there was the knowledge to identify the types of Data Journalism processes that occurred during this period as well.

In terms of the knowledge of the content of Data Journalism, there were studies on the successful works of Data Journalism, and the works of Data Journalism that were submitted for contests, which led to the understanding of the characteristics that were that common points of Data Journalism, which are: most of the content was about political issues; the main data used was financial and geographical data; data directly published by official sources were used; basic data analysis was often used, such as frequency, percentage, and mean, to compare differences or similarities between interesting variables; and data were presented through maps or interactive diagrams which allowed the recipients to tap into the details of their interest.

In terms of the knowledge of teaching Data Journalism, it was found that it began in 2015, when the leading media organizations had adopted Data Journalism as part of their work already. Most course instructors were in the higher education sector, while most media organizations did not offer training in Data Journalism to the public yet, but professional associations played an important role in training and educating in this field at the time. In the field of teaching in higher education, it was found that only 46% of higher education institutions in the United States offered courses in Data Journalism. The main reason for not offering them was that there were not enough instructors. For most institutions, it was still only at an elementary level. Teaching contents were usually composed of critical thinking, using data tables, linking data relationships, concepts of design, statistics, and concepts of programming, respectively.

In terms of other knowledge related to Data Journalism, it was found that there were studies on the influence of Data Journalism on the role of journalists, which indicated that in addition to the role of journalists of presenting data, they also played a role in gathering data, and being a middleperson to create engagement, too. There were also works that compiled knowledge from academic works on Data Journalism, which stated that academic knowledge in Data Journalism was likely to grow rapidly both in quality and quantity, and that there were still a lot of research gaps.

#### 5.1.1.2 Use of Data Journalism in other countries

From the study, it was found that most of the successful works using a Data Journalism process were done by private media organizations. There were working groups of 1-2 persons, focusing on heavy news like social, economic, or political issues, and the value of the news focused on impact and closeness.

In term of finding, collecting and organizing data of successful Data Journalism works in other countries, it was found that all cases used large data as the core of the news. Most of the data were from private organizations, and data from the government sector which had already been made public. Cross-sectional data were used, which came from a single collection from the same time only. Also, all of the data sources were transparently disclosed.

In terms of the interpretation analysis of the successful Data Journalism works in other countries, most cases of data analysis were data exploration, which used simple statistics to process basic data. The main goal of the analysis was to depict the characteristics of variables in the news, and to compare the difference between two or more variables.

In terms of data processing for the presentation of the successful Data Journalism works in other countries, it was found that most case studies used visualization to provide a large amount of data, for easier understanding and for attracting recipients. The most commonly used model among the case studies was the use of visualization together with text. When considering specifically the use of visualization, we could see that most case studies used interactive visualization, which allowed recipients to interact with the content.

In terms of the use of Data Science in the successful Data Journalism works in other countries, it was found that the successful Data Journalism works in other countries often used Data Science in the presentation stage, using programming skills as part of the Data Science to create interactive visualizations, as mentioned in the topic of Data Processing for Presentation. Second were the steps of searching for, gathering, organizing, and analyzing data, respectively.

### **5.1.2 Knowledge and Use of Data Journalism in Thailand**

#### **5.1.2.1 Use of Data Journalism in Thailand**

From the research, it was found that, in terms of the characteristics of the works from Data Journalism process or similar works in Thailand, all the case studies were the works of private media organizations. Most did not specify the size of the working groups who produced the works. The issues were both heavy news and light news, mostly related to economic issues, while for the value of the news on the proposed issues; it was found that most case studies focused primarily on closeness.

In terms of searching for, collecting and organizing data of Data Journalism works in Thailand, it was found that small data were mostly used. Often it was data from the government sector and a fresh collection of cross-sectional data. Also, most of the data sources were transparently used.

In terms of the analysis of the definition of Data Journalism in Thailand, it was found that both case studies from the award-winning category used summarizing and categorizing analysis. However, it was not structured data management, therefore, it was not counted as Data Journalism according to the operational definition of this research. For the case studies of popular Data Journalism, there were two types of data analysis: (1) Data Exploration, which is a simple statistical analysis of data; and (2) Data Predicting, to find the relationship, see the data link, and then describe the characteristics of the data via a survey.

In terms of data processing for the presentation of the Data Journalism works in Thailand, it was found that, the two Data Journalism works, in the most-popular type, were presented with text news along with visualization, while the two case studies of award-winning Data Journalism type, were presented in different formats depending on the type of award they received. Considering the use of visualization, it was found that, most case studies used visualization to support their presentation.

In terms of the use of Data Science in Data Journalism works in Thailand, it was found that most case studies have not used the Data Science yet. Only the work "Lottery" who gets rich? used Data Science skills to support large scale uncategorized data analysis, and to support the creation of interactive visualizations for presentation, as mentioned earlier in the topic of Data Processing for Presentation.



#### 5.1.2.2 Knowledge status and use of Data Journalism in Thailand

From the study, it was found that the definition of Data journalism has not been unanimously agreed on. However there was something that all the interviewees agreed on in a broader sense. It was that Data Journalism is a process of news reporting that uses data as a core. When considering the details of the definition, each interviewee would focus on the different dimensions of Data Journalism. Some interviewees focused on the dimension of news reporting using in-depth data and intensive analysis, not just the normal use of data. Also, we may use technology as a measure to divide into (1) Data Journalism in the broader sense and (2) in the specific sense that uses Data Science to help in the work process.

For the importance of Data Journalism, it was found that those related to Data Journalism in Thailand mentioned that it is important in three aspects, as follows:

- 1) The importance for news organizations --- it is believed that Data Journalism is a tool that can help news organization differentiate themselves from other media in this era.
- 2) The importance for journalists --- because Data Journalism is an important skill in the digital age, both in daily life and in functioning as a mass media agent. In addition, data from Data Journalism can be used as evidence to defend the works of the mass media in the courts.
- 3) The importance for the recipients and the society – Data Journalism is the process of producing reliable news contents, so it can be part of a solution to structural problems. Also, it is a process that helps people access data more equally, which will promote the civil rights of citizens.

In terms of the status of the use of Data Journalism in Thailand, it was found that the Thai media has been using Data Journalism for a long time. It's just that they did not call it a Data Journalism process. The methodology of Data Science has not been applied much to use in collecting, analyzing, or presenting data. The key factor contributing to the intensive use of Data Journalism is the collaboration between media organizations and personnel or organizations that provide Data Science services, while professional and media organizations have plans to develop themselves to accommodate more use of Data Journalism in the future, too.

In terms of the use of Data Journalism in Thailand, those involved in the intensive use of Data Journalism -- with the application of Data Science -- indicated that there are 4 main steps.

1) Planning – it all starts when there are questions that need to be answered with data. However in cases where journalists and data scientists have never worked together before, it is important to understand the scope and potential of Data Science methodology first, and then start thinking about topics. After topics have been identified, the working group will have a meeting to come up with a plan to implement, evaluate the feasibility, and assign a working group.

2) Collecting and organizing data -- in general, data journalists are responsible for contacting the relevant authorities to request for data, but in some cases, the method of Data Science called Data Scraping might be used to extract large amounts of data from the online world.

3) Analyzing --- programming skills are used here to help in data forecasting and in finding the data relationships, to see how they link to each other, then describe the data via a data survey. Data scientists will be responsible for this section.

4) Processing --- mostly data scientists will process data into an interactive visualization, while journalists will verify the accuracy of the data in the communication.

The responses to the use of Data Journalism tend to be good, but it is still in the trial stage, so it is not possible to use Data Journalism to its fullest potential. However, the popularity among the recipients depends on the topics more than the production process.

In terms of teaching and learning, it was found that teaching Data Journalism in Thailand focused on doing projects. When considering the teaching contents, it was found that, when teaching the process of data collection, verification, and analysis, it involves the topics of critical thinking, using data tables, data links, data relationships, and basic statistics. In the process of data processing for presentation, in some institutions there is a cooperation between the Faculty of Communication Arts and other faculties specializing in Data Processing.

Four problems and obstacles for Data Journalism in Thailand were found.

1) News personnel in Thailand lack basic skills and understanding of Data Journalism.

2) Public data in Thailand is low and difficult to access. Although Thailand has the Official Information Act BE 1997, there are still no official bodies to supervise it.

3) The budget allocation and operational guidelines of the media organizations themselves are obstacles, because there are costs of personnel and technology, and more time is spent on working than for general news reporting.

4) Data Science technology does not fully support the Thai language, thus it is not possible to reach the full potential of Data Journalism.

### **5.1.3 Suggestions for Development of the Knowledge and Promotion of the use of Data Journalism in Thailand**

#### **5.1.3.1 Suggestions from in-depth interviews**

The study found that those involved in Data Journalism in Thailand provided suggestions for developing the knowledge and promoting the use of Data Journalism in Thailand as follows.

#### **1) Suggestions to journalists and those interested in Data Journalism**

Development of the knowledge and promotion of the use of Data Journalism in Thailand must begin with the understanding of Data Journalism. The news people need to adjust their thinking base and mindset for work. They should believe in themselves and believe more in data. They may start with learning the concepts of Computational Thinking, to be able to understand the data system, or start from something so close to us like a program for manipulating table data such as Microsoft Excel. Apart from these, digital security skills are also essential in the use of Data Journalism, both for the confidentiality of the topics and the security of the news sources. The key to developing relevant skills of Data Journalism is English skills, because most of knowledge in this field has not been translated into Thai.

#### **2) Suggestions to the public and private sectors for data disclosure**

For Data journalism to be growing, it will be necessary to disclose more public data than is disclosed today. We may take a look at the forms of data management from the developed countries as an example, to provide public data that is easily

accessible. The state does not only have the duty of producing data, it also has a duty to use the data, and facilitate the use of data for the public. However, not only does more public sector data need to be disclosed, the data of any project that has an impact on a lot of people should also be disclosed as well.

### 3) Suggestions to media organizations

To implement the complete use of Data Journalism in Thailand, media organizations need to change their approach. They should come out of their comfort zone, especially large media organizations who are ready, to open up new opportunities in the digital age.

In terms of content, media organizations may divide it between daily news which requires popularity, and Data Journalism where the contents are heavy, aiming at pushing social issues, so that the working teams can spend more time with complex work.

Media organizations should have a database management system, starting using it with their own organization by systematically managing their data. This data management can then be used to communicate in order to raise awareness of how to use Data Journalism in communication. Their own database management will enable media organizations to develop further into new content.

In the case that news organizations are not ready to invest all by themselves, they may use collaborative networking, such as joint investment, to set up a Data Science center, to be able to support Data Journalism without investing too much. Alternatively, they can use modern technology to create a collaborative network for the people to come and contribute to the works of Data Journalism.

#### 5.1.3.2 Perspectives from the recipients

From the study, it was found that Generation X and Generation Y recipients were unique in their exposure to news, both in the same and different ways. The part that was the same was that they focused on content rather than presentation styles, which would be based on personal interests and trust. In case that they were not interested in any special content, presentation formats would then be important. Moreover, they saw that Thai media is competing to present the news that is colorful, trying too hard to cover popular news which sometimes is not useful in terms of content. The different part was the channels they exposed themselves to for news. The

majority of Generation Y recipients receive news via new media, while for Generation X recipients, though receiving news via new media too, they would still receive news from traditional media.

In terms of attitudes towards Data Journalism, it was found that the majority of both Generation X and Generation Y recipients agreed that news from the Journalism Process was more credible and easier to understand than general news. However, when considered in detail, there was a difference between the attitudes of the Generation X and Generation Y. Most Generation X recipients were concerned with the possible impacts of Data Journalism, while the majority of Generation Y recipients looked on the other side; they gave positive comments that news from the Data Journalism process was fresh and interesting.

In terms of the characteristics of Data Journalism works with which the recipients were satisfied, the majority of Generation X and Generation Y recipients agreed that the outstanding characteristic of Data Journalism was the completeness of the data. However, considering the details, the difference was clearer. Some of the Generation X recipients stated that they liked Data Journalism works because it's concise and it's all in one page, while the majority of Generation Y recipients commented in the same way that they liked the third piece because the presentation format was interactive, which created a sense of participation, and allowed the recipients to explore the point of their interest.

#### Suggestions from the perspective of the recipients

1) Increase transparency in work process --- most Generation X recipients saw that Data Journalism is a reporting process that makes it more reliable than general news, but they were concerned about the effects that could happen from the use of Data Journalism. They proposed that the Data Journalism process be more transparent, with clear sources of data.

2) Use Data journalism only when it fits the content --- most Generation Y agreed that Data Journalism may not be suitable for all types of content reporting. They recommended using Data Journalism with news with a lot of data and stories, and when it's valuable enough to present.

3) Target the audience of the presentation. --- In addition to the suggestions mentioned above, there was something that a group of Generation Y recipients



recommended: it is to select the target audience for the presentation. Data Journalism may not be suitable for all recipients.

## **5.2 Discussions on Research Results**

Based on the conclusions of the study of the knowledge and use of Data Journalism in both Thailand and other countries, to find out how to develop the knowledge and promote the use of Data Journalism in Thailand, the researcher found the following important points.

### **5.2.1 Standard Definition, Leveling, and Classification of Data Journalism**

The results of the study found that the definition of Data Journalism was not unanimously agreed on, even though the people involved would agree in a broader sense that it refers to a data-driven news reporting process. However, each of them was sensitive to the dimensions of Data Journalism. Some interviewees focused on news reporting using in-depth insights and analysis, while some suggested using technology as an indicator to divide Data Journalism into (1) the broader sense and (2) the specific sense that it uses Data Science to help in the work process.

This was probably due to the idea of Data Journalistic being multidisciplinary, combining pre-existing concepts such as concepts about Journalism and concepts of using a computer to help in news reporting, with contemporary concepts such as the concepts of the Information Society and Data Science. This is consistent with the work of Royal and Blasingame (2016) who found that the definition of Data Journalism is multidimensional, including: process dimension, result dimension, dimension of the integration of sciences, dimension of traditional Journalism, dimension of external influences and dimension of skills. Royal and Blasingame (2016) stated that the said definition and dimensions of Data Journalism might be too broad to be used for specific purposes. Therefore, the definition can only be drawn to a certain extent to fit the actual target use.

The researcher found that in order to facilitate the development of knowledge and to promote the use of Data Journalism, it is necessary to establish clear definitions, levels and categories, for the same correct understanding.

### 1) Standard Definition of Data Journalism

By compiling the findings from the research, including the relevant concepts, it could be concluded that the neutral definition of Data Journalism refers to the process of reporting facts using structured data as the core of storytelling, and managing it objectively.

There are three key characteristics that could be used as a measure to identify the state of being Data Journalism:

#### (1) It presents the facts on the basis of objectivity

Data Journalism is one type of Journalism process. It is a subject of fact reporting. Therefore, Data Journalism must be the process of conveying a story as it really is. The facts are conveyed on the basis of objectivity. That is, a belief that truth is a universal law that exists by itself and it does not depend on external context. People who know are separated from truths and are independent from each other. Therefore, interactions between people who know and truths will make the truths impure. For example, BuzzFeed News' Spies In The Skies, which used flight data website like Flightradar24 to disclose the operations of the US government using regular surveillance aircraft in cities. The news was a factual disclosure, revealing the source of data and how to manage the data clearly. These steps can be repeated. No matter who the analyst is, using the same raw data and using the same criteria will produce consistent results.

#### (2) Use data as the core of storytelling.

When done on the basis of objectivity, Data Journalism requires data as the core, without being tied to assumptions, feelings, or opinions of the data sources who are people or even of the journalists themselves. This does not mean that Data Journalism strictly forbids the use of news sources who are people or journalists themselves, but the content in that section must not be the core. It may be an assertion of support from the data processing. For example, The Panama Papers of the International Consortium of Investigative Journalists (ICIJ) disclosed data from over 11.5 million secret documents about concealment of property holdings and camouflage of financial paths of individuals and organizations from around the world. This piece of news used Data Journalism that focused on empirical evidence that could be counted and verified, so that the recipients could determine whether it was

true or not, rather than using opinions from interviews. If general news reporting methods were used to cover this news, there might be a risk of personal bias from the data sources who are people.

### (3) Use a structured data management method

As mentioned, Data Journalism requires data as the core of storytelling, the data here specifically means structured data. However, primarily the raw data used as a news source may be structured data from the beginning, such as data in the form of tables; or may be in the form of unstructured data, such as photographs, text, video clips etc. Then we can use Data Science methodology to process it into a structured data set.

In addition, structured data management methodology also includes searching for, gathering, monitoring, and organizing data; interpretation and analysis with statistics or algorithms; and data processing for presentations. For example, The Wall Street Journal's *The Rhymes Behind Hamilton* used Clustering to analyze the complex phonetics, to categorize the relationships of prosody behind the lyrics and the melody of the popular "Hamilton: The Musical". For this piece of news, if it was reported using general news reporting methods, it would still be difficult for recipients to understand it clearly, even if the experts who were the news source had been requested to help explain.

## 2) Leveling of Data Journalism

Although there is a standard definition of Data Journalism as mentioned above, when it comes to the actual use of Data Journalism, there are still a variety of dimensions and overlapping. Consequently, for the sake of clarity, the researcher used the indicators of the starting period, technology, and skills related as criteria for classification of Data Journalism, from level 1.0 to 3.0 as follows.

### (1) Data Journalism 1.0

Oftentimes there are discussions over how long Data Journalism has been around. If we use the broadest definition from the standard definition -- that is it is a process of reporting facts that uses structured data as its core --, the beginning of Data Journalism was in the early 1800s, with the introduction of structured data into news coverage, such as news coverage of students' educational expenses in the cities of Manchester and Salford, presented through the Manchester Guardian (The Guardian,

2011). The skills needed to report this feature were the use of a database and statistics. This Data Journalism 1.0 is still in use today, for example, in Thailand, about ‘the registration of a limited partnership by Pathompol Chan-o-cha’ in a military camp in Thailand -- reporting financial statements as having tools worth only 700,000 THB, where Isranews Agency used data management methodology to clarify and compare the current properties and the value of the construction contract, until it found irregularities, but they did not use complex calculation and did not use Data Science.

### (2) Data Journalism 2.0

The next level of Data Journalism is more specific. It is the use of computer-aided data reporting for news reporting that uses data as a core. It began around 1950 when there was the emergence of computer-aided technology that enhanced the capacity of human data analysis. The work that could be used as a milestone for this era is the work “Riot in Detroit” by Philip Meyer, which used quantitative research to collect data via questionnaires, then analyzed a lot of statistical data using a computer (Investigative Reporters and Editors, 2018). The skills required for this type of reporting are Social Research Methodology, and a computer. For example, in Thailand, the work of the “Ghosts of Thailand in ‘The Shock: Explore Thai Ghosts through Thriller Stories’” by The Matter was based on Social Science research to gather content data from The Shock program broadcast from 21-26 August 2560, and analyzed with basic statistics, and processed into infographics.

### (3) Data Journalism 3.0

The final level of Data Journalism is the most specific, and is the current definition of Data Journalism widely used nowadays in other countries. It is the use of Data Science to help report news that uses data as a core. It began around 2000, where there was the emergence of Data Science which is a process of managing and extracting insights from data. An example of work that can be counted as the beginning point of this Data Journalism is the “Afghan War Logs” by The Guardian (2010a), which used Data Science to help gather, organize, analyze, and present hidden stories in military-run war records in Afghanistan, from over ninety thousand pieces of data, until it received attention from around the world. The skills required for this type of reporting are: programming skills and the use of information technology to interact with recipients. In Thailand, for example, the work "Lottery:

who gets rich?” by Thai Publica, used Data Science skills to support the work of large and uncategorized data analysis and the support the work of creating interactive visualizations, which allow recipients to interact with the content.

It is evident that Data Journalism at all 3 levels is Data Journalism as defined by the standard definition. However, there are differences in the characteristics, as shown in Table 5.1

Table 5.1 Levels of Data Journalism

Level	1.0	2.0	3.0
<b>Beginning period</b>	≈ 1800	≈ 1950	≈ 2000
<b>Technology</b>	Structured Data	Computer	Data Science
<b>Related skills</b>	Database Statistics	Database Statistics Sociological Methodology Computer-Assisted Reporting (CAR)	Database Statistics Sociological Methodology Computer-Assisted Reporting (CAR) Programming Interaction with recipients

### 3) Types of Data Journalism

In addition to the definition and leveling of Data Journalism, classification is one more thing that will make it easier to understand Data Journalism. The key variables used in this study are as follows.

#### (1) Classification by function

This classification aims to resolve the confusion between the definitions of Data Journalism and investigative news reporting. Although Data Journalism is relevant to investigative news reporting in terms of development and work processes and Data Journalism can also support investigative news reporting to be more effective, Data Journalism is not required for investigative news reporting. The



researcher used the characteristic of work as criteria for classifying Data Journalism into two types.

#### (1.1) Investigative Data Journalism

This type of Data Journalism is the use of Data Journalism to do investigative news reporting. The aim is to expose the peculiarities associated with public interests. It is often used to search for hidden data, and often it takes advanced techniques to analyze complex data. The number of people and hours spent working are more than for general news. For example, the Panama Papers by The International Consortium of Investigative Journalists (ICIJ) disclosed more than 11.5 million secret documents about property holdings and the camouflage of the financial paths of individuals and organizations from many countries around the world, with the cooperation of over 370 journalists from 80 countries over a period of one year.

#### (1.2) General Data Journalism

This type of Data Journalism is the use of Data Journalism to provide general news coverage. Most does not need advanced techniques or time. An example is the work of “Thai ghosts” in the show “The Shock” by The Matter, which described the attributes of Thai ghosts in horror stories, reflecting thoughts and beliefs in Thai society.

### (2) Classification from the target of extracting meaning from the data

This kind of classification focuses on the interpretation of data, which is an important step that is at the heart of Data Journalism. It can be divided into 2 types.

#### (2.1) Data Journalism that describes characteristics

This type of Data Journalism aims at processing basic data characteristics using statistics or algorithms that are not very complex, such as “America's Broken Healthcare System” by the Guardian, which compared the use of public health budget with the average life expectancy of the population until it found out the irregularity that lies in the fact that the US has a high public health budget but the average life expectancy is clearly lower than other developed countries.

#### (2.2) Data Journalism that analyses data relationships

This type of Data Journalism aims at the processing of data links and needs to use statistics or algorithms related to the act of finding data relationships which are more complex than Data Journalism that describes characteristics. For example, “The

Rhymes Behind Hamilton” by The Wall Street Journal, which used Clustering to analyze complex phonetic structures, to categorize the relationship of prosody behind the melody and lyrics of hip-hop music.

### (3) Classification by presentation format

This approach focuses on data processing for presentation. This is the last step in Data Journalism that will help the recipients understand the data in a very convenient and fast way. It can be divided into two types.

#### (3.1) Data Journalism in the format of traditional presentation

This type of Data Journalism uses written communication, storytelling, and infographics that are still pictures or animation that is not interactive so there is no need for programming skills and it takes less time than Data Journalism that uses interactive presentations. For example, “How to Reduce Mass Shooting Deaths?” by The New York Times presented data through a matrix graph. Even if the graph was not interactive, it could communicate very well, simply, and clearly.

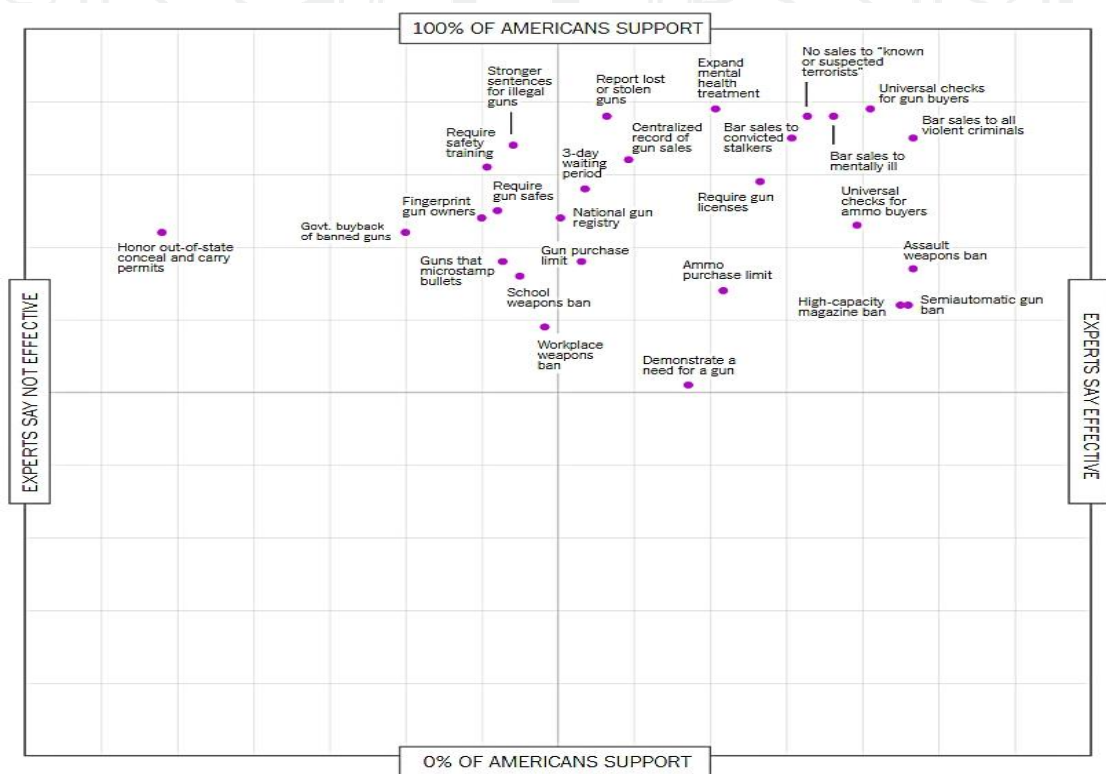
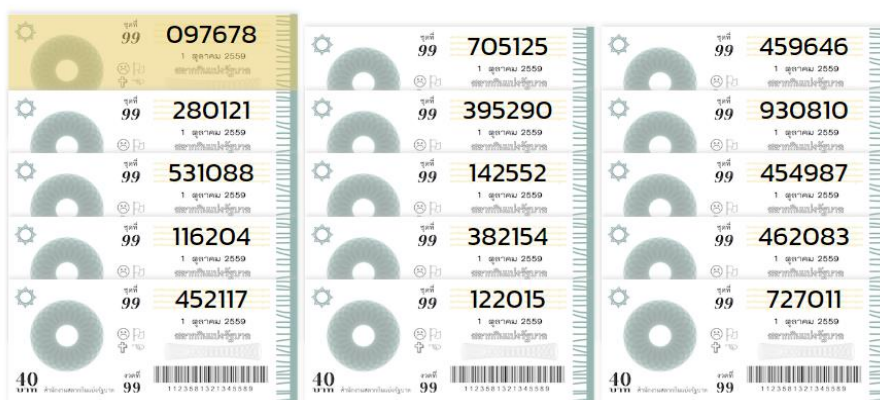


Figure 5.1 Matrix Graph in “How to Reduce Mass Shooting Deaths?”

### (3.2) Data Journalism in the format of interactives

This type of Data Journalism is communication and storytelling using applications with which recipients can interact, so there is a need to use programming skills to help create an interactive system, such as the work "Lottery" who gets rich? by Thai Publica, which used an interactive game which allowed recipients to interact with the content – pretending to buy a lottery, that is -- and interactive charts that allowed recipients to explore data of interest.

“วันนี้รวยจ้ะ! เลือกเบอร์ที่ชอบเลยจ้ะ ที่ใบนี้ก็ได้”  
(จำลองเหตุการณ์จริงที่แน่นอน)



เปลี่ยนเบอร์

ซื้อหวย ~(^▽^~)

วันนี้ดวงไม่ดี ซวยมาก

Figure 5.2 Interactive Game Presentation in the work "Lottery" Who gets rich?

อันที่จริงแล้ว **กลุ่มคนพิการ\*** ขายลอตเตอรี่เพียง  
แค่ 8,060,200 ฉบับ คิดเป็น 10.89% ของลอตเต  
เตอรี่ที่แจกจ่ายให้ผู้ขายทั่วประเทศ

\*เลือกเฉพาะที่แสดงแน่ชัดว่าเป็นองค์กรเกี่ยวกับคนพิการ ซึ่งคนทั่วไปก็  
อาจเป็นคนพิการได้เช่นกัน แต่ในที่นี้ไม่ได้รวมไว้ เพราะข้อมูลไม่เพียงพอ

● กลุ่มคนพิการ ● อื่น ๆ ○ ห้าแสนฉบับ  
○ หนึ่งแสนฉบับ

กลุ่มคนพิการ  
สมาคม คนพิการจังหวัด สุพรรณบุรี  
444,600 ฉบับ (10.60% จากทั้งหมด)

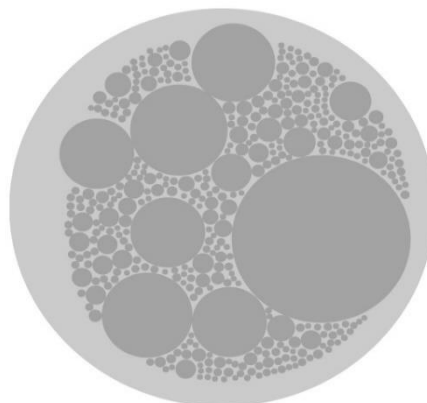
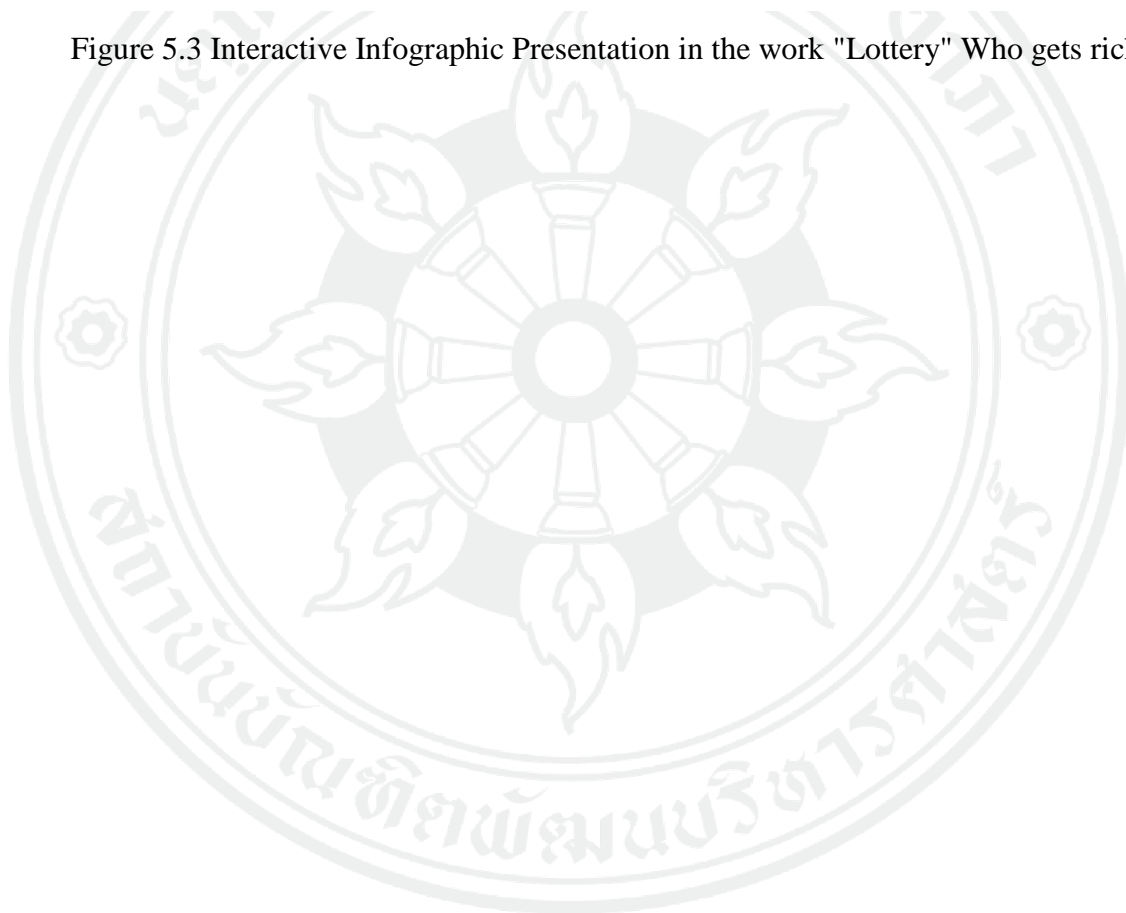


Figure 5.3 Interactive Infographic Presentation in the work "Lottery" Who gets rich?



### 5.2.2 The Significance and Value of Data Journalism

#### 1) The Significance for Media Organizations: Crisis Recovery, Self-Differentiation, and Opportunities for More Income

Today, media organizations must act in the midst of changing times and intense competition. A number of media organizations have turned their attention to popularity, which generates revenue, and neglected the ethical framework. This is a threat to the respect and faith of the recipients, as seen in the group discussions of this research, which indicated that the recipients see that Thai media today are competing too much to report on “colorful” news to gain popularity until they lack quality and reliability. At the same time, the media is receiving less public support resulting from the crisis of faith, which may lead to calls for state supervision, which in turn could lead to the risk of restricting media freedom. It is essential that the Thai media must recover from this crisis of faith, and restore the confidence of the people again.

When introducing the concept of innovation, it was found that Data Journalism is an innovation in the dimension of process (process innovation), which is a change in the production process of products or services, giving the organization a competitive advantage (Tidd and Bessant, 2009). From the group discussions, it was found that news from the Data Journalism process is more reliable than traditional news. This characteristic will be one solution to help improve the image of the media profession today.

The findings also showed that those involved, especially media executives who had used Data Journalism, believed that Data Journalism could help differentiate their news from general news of other media organizations or individuals, with the strengths in finding, collecting, analyzing, and interpreting huge data in a form that is easy to understand. It is a new way of earning money for media organizations, because it is a process of transforming raw data, which is everywhere in the digital era, into information that has more value. It is consistent with Gray et al. (2012), who compiled opinions of journalists in the book “The Data Journalism Handbook”. They all agreed that Data Journalism is one of the key factors that will help media organizations overcome the challenges of a changing world.

#### 2) The Significance to News People: Enhance Professional and Life skills in the 21st Century



The results of the research indicate that Data Journalism is an essential skill for journalists in the digital age overwhelmed by huge data. This statement is consistent with Berners-Lee (The Guardian, 2010b), who pioneered the World Wide Web, who stated that data analysis is the future of Journalism. The skills required for Data Journalism -- from gathering data, analyzing data with statistics, to programming skills -- are skills needed by the labor market in every industry, as shown in a survey about occupations conducted by Glassdoor (Forbes, 2018) in the United States, which found that data scientists were the most demanded in the job market out of a total of 1,700 occupations, with an average annual income about \$ 117,000. This research points out that even if they are not used for work, data skills are still important for everyday life in the digital age, consistent with what The Partnership for 21st Century Learning (2002) said, that data literacy is one of the skills needed for life and work for people in the 21st century.

### 3) Significance to Society: the Driving Force for a Data-Literate Society

Data skills are essential skills for 21st Century people. Although the Thai government is beginning to recognize this fact, and has announced courses related to Data Literacy as compulsory courses for the core curriculum of basic education in Thailand since the academic year of 2018, it is still considered slow when compared to other developed countries. Data Journalism is one of the options available to fulfill the skills in this field, as seen from the results of this research that found that Data Journalism is a process of producing news content that will help people realize and understand the importance of data. In addition, Data Journalism also supports equal access to data, too. This will promote the civil rights of citizens, and can be part of solving structural problems in the society. It goes with the mainstream concept of the Information Society, which believes that in the modern society which is rich in data, this data will play an important role in driving the society towards a better one; for example, political decentralization, improvement in the quality of human life, and environmental protection (Webster, 2014).

However, the other aspects of the results suggest that some recipients expressed concern about the potential impacts of the misuse of Data Journalism -- for example, by distorting data -- as Data Journalism possesses characteristics that look more reliable and easier to understand than general news. This can be explained by

those that deny the belief that the Information Society is better than the societies in the past. These people said that the Information Society would remain unequal, and there would continue to be the dominance of those in power, just as in the previous era. Herbert Schiller (cited in Rananand, 2002), said that the Information Society is still a capitalist society in that although there is a great deal of data, there is still a disparity in access to it, which resulted from social inequality. The development of information technology, therefore, is in the interests of those in power, not for the benefit of the public. So, for the recipients and the general public to fully benefit from Data Journalism, there is a need to promote Data Literacy so that everyone in the society can question, analyze, criticize, and evaluate data.

### **5.2.3 Gaps in Data Journalism in Thailand – Other Countries**

1) Knowledge of Data Journalism: Other Countries Have Gone Far, Thailand Has Just Started.

The study found that Data Journalism in other countries has been receiving serious attention from the academic community since 2009 and rapidly growing attention since 2011. It seems to have come from the case of WikiLeaks publishing secret documents about military operations in Afghanistan. In addition, the results of this study show that in the first stage, most knowledge focused on issues related to work processes of Data Journalism in media organizations. Since 2015, more and more topics have been explored. This is consistent with the works of Ausserhofer et al. (2017), who noted that studies about Data Journalism are gaining momentum in the field of Communication Arts, and there are plenty of research gaps.

However, the research found that the Journalism academic circle in Thailand has had attempts to gather basic knowledge only and there has not never been a translation of textbooks related to Data Journalism at all. This is probably due to the recession in the Thai higher education sector with fewer students enrolled, together with the crisis of the media industry facing changes so that some organizations needed to adjust themselves by reducing the size of their organization or reducing staffing. As a result, the field of Journalism has become less popular. As Journalism became less popular, the promotion of new knowledge in this field was lessened too, especially knowledge about new innovations such as Data Journalism.

## 2) Use of Data Journalism: Still Far Away from the Role Model, and Not So Different from Most other Countries

The study found that Thai media have been using structured data in news reporting -- which is Data Journalism (Data Journalism Level 1.0 and 2.0) in a broad sense -- for a long time. Only in the past, they did not call this process Data Journalism. Data Science has not been applied much in the work process. It is far from the use of Data Journalism in leading international media organizations, such as The Guardian or The New York Times. However, when considered in conjunction with the findings of this study on the works of Data journalism in various countries, it is evident that the use of Data Journalism in Thailand is not very different from that of other countries. Howard (2014) found that even in the United States, there are a lot of news people who have statistical and data processing skills who can convert data into tables and graphs (which is counted as Data Journalism level 1.0 - 2.0) but few news people who can apply Data Science in news reporting (which is counted as Data Journalism level 3.0). Appelgren and Nygren (2014) found that most of the operations level journalists working in Sweden have an understanding of Data Journalism at the beginner level only.

Considering the works of Data Journalism, the study found that most successful Data Journalism works in other countries (Best Practice) have the same characteristics of using big data, and using interactive presentations, while Data Science is often used to support the data. This is consistent with the work of Loosen, Reimer and Schmidt (2017) that analyzed the contents of Data Journalism works that were submitted to Data Journalism Awards from 2013 to 2016. However, Loosen et al. (2017) observed that Data Journalism works in the past four years have not seen any much development yet.

When using Data Journalism works that are successful in other countries as a standard to compare with the studies of Data Journalism works or similar works in Thailand, it can be seen that most of the works of Thai media used small data and used the data that they collected by themselves. Only a minority of the data is presented using interactives which allow recipients to interact with the content. Also, Data science has not been applied much to support the works. It was also found that the case studies in the category of award-winning digital news in Thailand do not

have structured data management, so they are not considered “Data Journalism” according to the operational definition of this research. This may indicate that the use of Data Journalism in Thailand is not widespread. This is due to several factors:

(1) Factor of Organization Policy

The media circle in Thailand is struggling to survive, so most media companies dare not invest in new innovations. The results of the study found that budget allocation and operational guidelines of media organizations in Thailand were problematic for Data Journalism due to the cost in personnel and technology, and the more time used in order to work on the news coverage. In addition, working under a traditional organizational structure was a barrier to Data Journalism, since the latter requires the integration of multiple skills.

(2) Factor of News

While data management expertise is becoming a basic skill that all news people need in the digital age. The results show that news people in Thailand lack the basic skills and understanding of Data Journalism both at the management level and at operational level. Fink and Anderson (2015) who studied the use of Data Journalism in the United States also mentioned that the lack of understanding of Data Journalism led to the lack of clarity in the role in the of the organizations, making it impossible for journalists to produce works at their full potential.

(3) Factor of Recipients

Consumers in Thailand may be unfamiliar with the use of Data information and still opt for news based on their original interests. The study found that popularity among the recipients depended on the topics rather than the production process, and the opt-in will depend on the individual's interests. This is consistent with Makesrithongkum and Bunnag (2013) who studied the news consumption behavior of people from different ages in Thailand. They found that all age groups in all regions in Thailand focused on consuming only news that they are interested in. In addition, from the study, it was also found that even though the recipients felt that Data Journalism was more reliable than other news, some recipients were concerned about the potential impact resulting from its characteristic of being reliable.

(4) Factor of Public Data

Public data in Thailand is still low and difficult to access. Although Thailand has the Official Information Act BE 1997, there are still no official bodies to supervise this. The work of Rodríguez (2016), in Uruguay, found that although the government was relatively transparent compared to other South American countries, it was still far from what it should be when compared to developed countries, as most organizations of the public sector still used secret policy to protect themselves. Fink and Anderson (2015) stated that what limits access to data in different countries is “freedom of media” and “transparency of government”.

#### (5) Factor of Technology in Data Management

In addition to the factors mentioned above, there is still another factor that, although external, is indirect and a major challenge; that is, technology constraints. Data Science does not fully support Thai language, making complex data analysis impossible to achieve at full potential, consistent with the work of Young et al. (2018) who found that even in other countries, technological constraints were a major factor in the quality of Data Journalism.

#### **5.2.4 Guidelines for Development of the Knowledge and Promotion of the Use of Data Journalism in Thailand**

It is evident that Data Journalism in Thailand is still far from other countries in terms of knowledge and application by media organizations due to several challenges. Therefore, the researcher compiled the findings from this study together with the related concepts, to propose guidelines for development of the knowledge and promotion of the use of Data Journalism in Thailand.



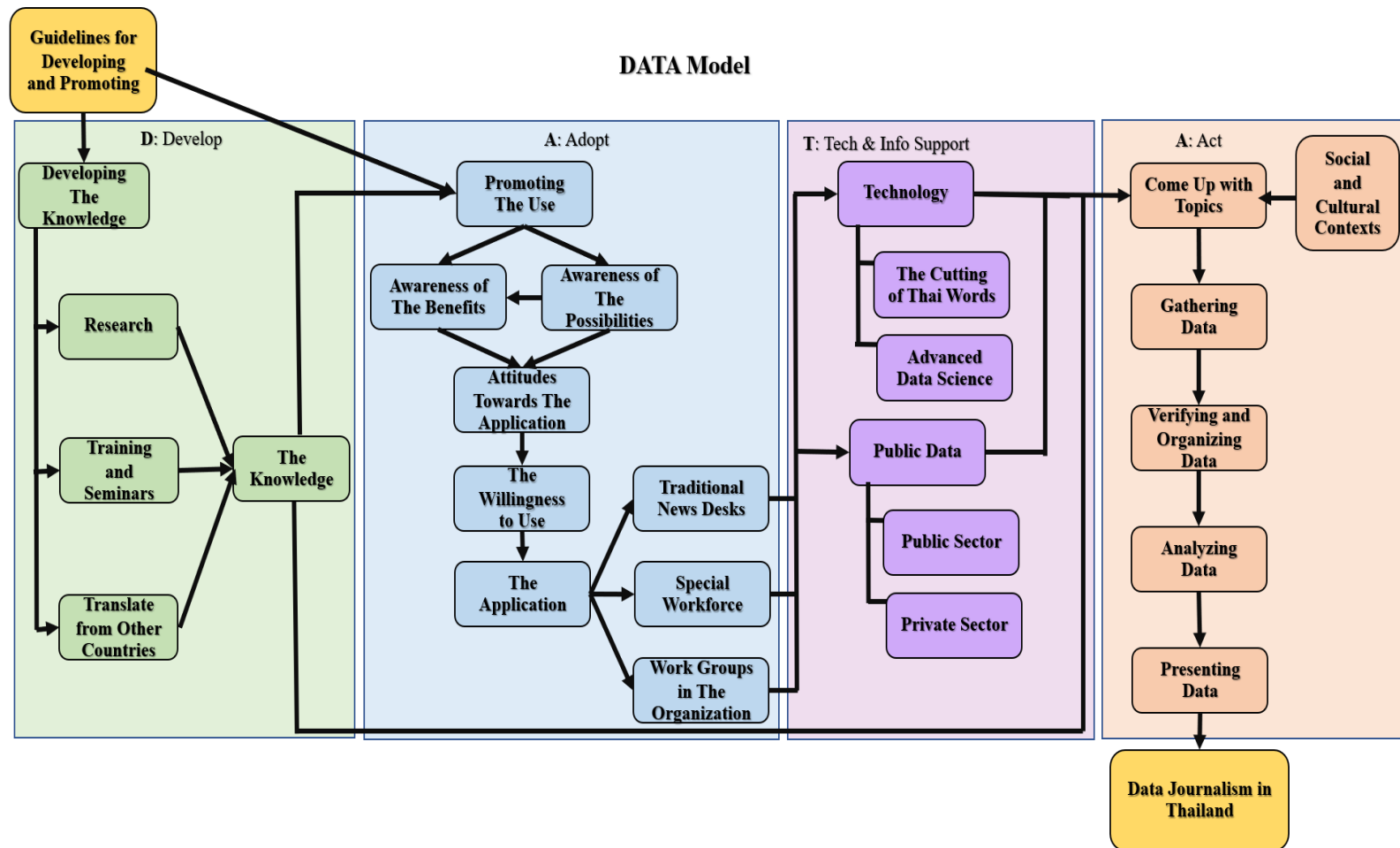


Figure 5.4 DATA Model: Guidelines for Developing the Knowledge and Promoting the Use of Data Journalism in Thailand

In Figure 5.4, the guidelines for development of the knowledge and promotion of the use of Data journalism in Thailand can be carried out following the DATA model as follows.

1) Develop the knowledge (D: Develop), Enhance the Necessary Basics, Focusing on Hands-on Activities

It was found that there is no concrete knowledge in Data Journalism in Thailand, but it has already been used in the working world in some parts. The development of the knowledge has to be studied from the knowledge in other countries and then it must be applied to real work along with the creation of knowledge in the country. This can be extended from the knowledge of this research, which includes standard definition, leveling, classification, importance and values of Data Journalism, comparison of Data Journalism in Thailand and other countries, applying Data Journalism in media organizations, development of skills and understanding, creation of Data Journalism works as well as the promoting supporting factors. The variables found in this research may be studied further in more specific ways. In addition, apart from developing knowledge through research, other academic activities, such as seminars for people involved in Data Journalism to exchange and learn from each other, or the translation of textbooks from other countries into Thai, are likely to support the development of basic knowledge of Data journalism in Thailand to be more widespread.

At the same time, in the field of skills and understanding development, from the study, there are only a few Journalism institutes in Thailand who offer Data Journalism courses directly, all of which are still at the introduction level. The same goes for the support from professional associations. Even though they are beginning to realize the importance of Data Journalism and basic training has been provided to journalists, they classes were not at the advanced level.

On the other hand, the development of Data Journalism skills in Thailand may not necessarily be based on foreign patterns, with different foundations and environmental factors. So, the researcher complied findings from this research into a framework for developing the skills and understanding of Data Journalism, which covers topics that are essential. It is divided into basic and advanced levels to suit the learners who may have different basic skills.

### (1) Basic Data Journalism Course

A course for the development and understanding of Data Journalism at basic level is suitable for beginners who do not have the basics of Data Journalism. The purpose is to provide students with an overall understanding of related concepts and for the students to be able to use Data Journalism at levels 1.0- 2.0, which is consistent with Berret and Phillips (2016) who suggested that in case one is not ready for complete Data Journalism, he or she may begin by studying the principles of computer use to help report news, which is considered Data Journalism in level 2.0 per the definition of this research. Then, one can go onto to programming skills and advanced Data Science in the next steps. The content of this level should include the meaning, importance, and basic concepts of Data Journalism, talking about how to come up with topics for Data Journalism, data searching, data collecting, data analyzing with basic statistics, and data presenting with simple visualization. In terms of programming skill, we can focus on familiarizing people with structured data from things around and near them like a ready-made program for managing table data such as Microsoft Excel, and then being topped up with a data management application like Google Refine and a Geographic Information System (GIS) like Google Fusion Tables.

### (2) Advanced Data Journalism Course

The course is designed to improve the skills and understanding of Data journalism at the advanced level, suitable for people who have a background in Data Journalism. The purpose is for the learners to understand the concepts of Data Science necessary for news reporting and to equip learners to have enough skills to use Data Journalism at level 3.0. The status of learners at the level will start to change from program users to developers of a program to manage data with Data Science methodology. The learners will be able to use an automatic control system to support the news reporting at the beginning level. The advanced level content should include advanced digital data collection, uncategorized big data management, concepts of advanced algorithms and statistics, recipient engagement, digital security, basic programming skills, and creating interactive visualization. The programming skills

will be newly developed by using the facilitating programs in writing computer languages such as R, Python, and JavaScript.

As mentioned above, Data journalism in Thailand is still in its early stages, so the basic course of Data Journalism should be prioritized. However, what the two courses have to focus on is learning from real things, or hands-on practical experience. Learners should learn in classes and at the same time have the opportunity to utilize skills in real life. They should also be allowed to do a Data journalism project on a topic of their interest. In addition, skills that will help those interested in Data Journalism to learn faster are English skills because most knowledge in this field has not been translated into Thai yet.

Table 5.2 Curriculum Structure to Develop Data Journalism Skills and Understanding

<b>Tops</b>	<b>Basic Level</b>	<b>Advanced Level</b>
<b>Aim</b>	Pave the way for understanding. Students can use Data Journalism at the level of 1.0-2.0.	Switch from user to developer for news Learn how to use Data Journalism at level 3.0.
<b>Theoretical content</b>	Meaning, importance and basic concepts. Basic Principles	The concepts of data science required for news work Digital Security Principles
<b>Skills in gathering and organizing data</b>	Traditional and digital data collection	Automatic data retrieval and organization.
<b>Skills in data analysis</b>	Basic Statistics and Algorithms	Advanced statistics and algorithms
<b>Presentation skills</b>	Basic Visualization	Interactive Visualization
<b>Tools</b>	Excel, Google Refine และ GIS	R, Python and JavaScript

## 2) Adopt Data Journalism into News Organizations (A: Adopt): Accepting Innovation, Starting from Inside, to External Cooperation

From the aforementioned challenges of policy in news organizations, the application of Data Journalism should be initiated by creating innovation acceptance at both management and operational levels. Fishbein and Ajzen (1975, cited in Lutz, 1991) said that innovation acceptance results from the attitude of the person towards things that they open up for. So, the researcher created a mock technology acceptance model from Davis (1989) that described that perceived usefulness and perceived ease of use in an innovation have an effect on the attitude toward using, which leads to behavioral intention to use, which results in an actual system use. The researcher adapted this to create guidelines for creating innovation acceptance in Data Journalism in news organizations in Thailand, as follows.

(1) Educating to raise awareness about the benefits of using Data Journalism -- it can start from a systematic data collection inside the organizations itself first, then use it as an example.

(2) Providing practical advice to build awareness of the feasibility of using Data Journalism -- experts may provide advice closely here.

(3) Adjust attitudes towards Data Journalism – may use positive reinforcement to those who accept innovation, such as rewarding them, so that others will follow the trend.

(4) Persuade with Personal Media - those who are opinion leaders in the organization can increase the willingness to use Data Journalism.

The researcher found that the guidelines for creating acceptance of Data Journalism innovations in media organizations, apart from using them with the Data Journalism process, may also be adapted to other innovations, too, which are a process dimension, in order to establish the acceptance of innovation in media organizations as shown in Figure 5.5.



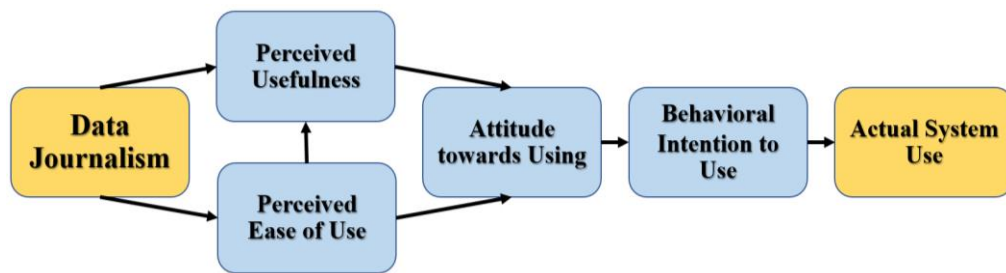


Figure 5.5 Guidelines in Creation Acceptance of Data Journalism Innovations in Media Organizations

In terms of structuring work process to accommodate Data Journalism, the study found that the key factor contributing to the intensive use of Data Journalism is the collaboration between journalists and Data Science professionals. This is consistent with the report by the International Center for Journalists (Zanchelli & Crucianelli, 2012) that mentioned that one of the key factors behind the success of the Data Journalism workforce was to encourage journalists and programmers to work together. In applying this observation, the researcher found that we could structure the work process so that journalists and data scientist can work together in three aspects, according to the suitability of each organization, as follows.

(1) Organizations with budget and personnel resources may use the traditional Data Journalism news desk model – assigning separate news workgroups to work on Data Journalism specifically, maybe using a clear command line as with other news desks.

(2) Organizations whose personnel have the skills to work in Data journalism, but do not have enough people and budget to assign a separate news desk on Data Journalism, may use a special workgroup as a network working in each news room as appropriate for each of the Data Journalism projects.

(3) If the media organizations are not ready to invest all by themselves, they may create a network of investment with other media organizations who are also interested in Data Journalism in order to create a working team of Data Journalism that can be shared. They can collaborate with Data Science companies or seek for supporting budgets from relevant agencies, to be able to create a prototype news organization that can work with an intensive Data Journalism process, which will be an alternative for data exposure for the public, without investing more than necessary.

Table 5.3 Organizational Structure for Data Journalism

<b>Format</b>	<b>Characteristics of Work</b>	<b>Characteristics of Organization</b>
<b>Traditional News Desk</b>	Creating a separate news desk to work on Data Journalism specifically	Ready in terms of budget and human resources
<b>Working Group</b>	Special workforce borrowing personnel from other news desks in the news room to work together as appropriate	Personnel have the skills required, but the number of the personnel is not enough to create a new news desk
<b>Committee Outside organization</b>	Investing with other news organizations to create a Data Journalism workforce outside organizations to use together	Personnel still lack skills required and limited budget

The findings from this research also point out that, in the case where media organizations are concerned about popularity, which may affect revenue from ad space sales, they may change and adapt gradually. There is no need for a new style to replace all old models. They can start from sparing a space in the contents for Data Journalism, and may begin to use Data Journalism on colourful issues that match the tastes of the target audience. It is not necessary that news from the Data Journalism process has to be a heavy matter. Then they can gradually intensify the complexity of the data so that it can maintain popularity among the recipients, along with raising the level of understanding of the data in society. Sirimanont (1986), one of the key journalists in Thailand, mentioned about the mass media industry that it is a business with specific social conditions and business conditions. That is, the business conditions of the media organization are like those of any general business that needs to produce products for profit. However, the products produced by media organizations are not a normal product like the general merchandise in the market.

Rather, it is a product that has the power to affect society as a whole. Such products must help promote the betterment and development of society.

### 3) Technology and Public Information Support (T: Tech & Info Support) -- Driving Public Information, and Developing Thai Technology

The results show that there are factors that may affect the development of knowledge and promote the use of Data Journalism in Thailand, which are, public information and Data Science. Therefore, these factors should be supported.

#### (1) Public information

Although Thailand has the Official Information Act BE 2540 (1997), there are no official bodies to supervise it. So, both the public and private sectors in Thailand should increase transparency. We should make data more open than it is today. We may look at the forms of data management from developed countries as examples, to provide public information that is easily accessible to the public, especially the government, which is not responsible for only producing data, but also has a duty to use the data and facilitate the use of information for the public following the concepts of Data-driven Economy under the Thailand 4.0 policy. Data disclosure should have three important features: availability and access; re-use and redistribution, and universal participation. (Digital Government Development Agency, 2012).

#### (2) Data Science Technology

Data Journalism level 3.0 requires the support of Data Science technology, especially in cases where we need to extract meaning from a lot of text, which requires us to teach the computer to understand the language of the messages, including the principles of consonants, vowels, word formation, and sentence arrangement, so that the computer can distinguish or cut the words in the sentences in order to translate the meanings of the words or the sentences. However, in the case of Thai language, the current Data Science technology doesn't fully support it yet, because of the Thai writing style in which all letters are adjacent, and the interpretation of the sentence also depends on the context. Therefore, the public and private sectors should collaborate in the research and development of Data Science technology in Thai language to create a more efficient and accurate modelling system. In addition to the development and use of Data Journalism, the collaboration will also increase the potential of data usage in the country as a whole, too.

#### 4) Act Upon the Creation of the Works (A: Act) – Focusing on Target groups, and Creating the Acceptance of New Ways of Presentations

The results of the research found that the popularity among recipients depends on the issue or topic rather than the production process and the opt-in will depend on the individual's interests. Katz and Blumler (1974) said that recipients play a role as senders and receivers that can satisfy their needs and preferences, resulting in each person having differences in news consumption. The creation of Data Journalism work should target the audience in a narrower and clearer way, in order to be able to change the content format to a specific identity that responds to the recipients' taste.

In another way, Data Journalism is an innovation in the process dimension for news people. Data Journalism works are also an innovation in the product dimension for the recipients. So, to make the recipients accept the works of the Data Journalism process, it is important to consider the attributes of innovation that affect acceptance per the concept by Rogers (2003) which are (1) relative advantage, (2) compatibility, (3) complexity, (4) trialability and (5) observability, which can be applied to adjust the characteristics of Data Journalism works to create acceptance among the recipients.

##### (1) Relative advantage

Targeted recipients perceive the relative advantage of Data Journalism as being more advantageous than general news, by emphasizing reliability, completeness, depth and transparency, such as BuzzFeed News's Spies In The Skies, which used flight data from a flight information website to identify geographic coordinates to make it clearer than the broader coverage of US government action. It also provided a clear source of information, and the data management to demonstrate transparency.

##### (2) Compatibility

Select target group for the presentations in a narrower and clearer way and try to make Data Journalistic works consistent with the tastes of the target audience, such as The Ghosts of Thailand in “The Shock: Explore Thai Ghosts through Thriller Stories” by The Matter, which attributed the characters of ghost beliefs in the horror stories, using bright colour visualization to target teenagers.

##### (3) Complexity

Lessen the complexity of the presentations, especially in the early stage, until the target audience becomes familiar with the concentration of data, such as The Guardian's America's Broken Healthcare System, which used statistical analysis like finding the averages between spending on public health and the life expectancy of the population, until it showed that The US had a high public health budget, but the average life expectancy was lower than other developed countries.

(4) Trialability

In the first phase, Data Journalism may be used as an add-on to the coverage of general issues, such as news coverage of Full results of Australia's vote for same-sex marriage by The Guardian, which used the Australian referendum data from the Australian Bureau of Statistics, along with reporting on the same issues in a regular manner.

(5) Observability

Focus on the characteristics that can be observed, by presenting data through visualizations that are interesting and enable recipients to understand more quickly than reading text, such as the "lottery"...who gets rich? News by Thai Publica covered the government's offering of lottery sales quotas, which contained a lot of information, making it impossible to see any irregularities from reading data alone. It must be presented with visualization in order to see the unusual clusters.

In terms of the adaptation of characteristics in innovation to create acceptance among recipients, the researchers found that, apart from using it with Data Journalism, it could also be applied to other innovations which are product dimension, to create acceptance of innovation among the recipients, as shown in Table 5.4

Table 5.4 Adjustment of the Characteristics of Data Journalism to Create Acceptance Among the Recipients

Characteristics	Adaptation
Relative advantage	Highlight the trustworthiness, thoroughness, in-depth details, and transparency
Compatibility	Make the Data Journalism works consistent with the tastes of the target group



Characteristics	Adaptation
Complexity	Reduce the complexity and hassle, especially in the early stages of presentation until the target recipients start to feel used to the intensity of the data
Trialability	In earlier stages, use Data Journalism as a support in filling data of general news issue so that the recipients can try and experiment
Observability	Use interesting visualization that enables the recipients to understand the message faster than reading from text

Based on findings from the research and the issues mentioned above, the researcher has compiled a guideline for creating Data Journalism works.

#### (1) The Topics / Issues

The process of Data Journalism begins with a topic or an issue. There are two ways, which are, (1) to start with the questions you want to answer or (2) to have a set of data that needs questions. The focus must be on the interests of the target audience, along with the public interest. It also has to adapt to the social and cultural contexts in Thailand. The results showed that consumers in Thailand are not familiar with the use of information, and select news based on their original interests. This is consistent with the work of Maksrithongkum and Bunnak (2013) that found that all age groups in all regions in Thailand focused on consuming only the news that they were interested in.

When compared to the culture of information use in different countries, in particular the leading countries in Data Journalism, such as the UK or the US, we could see that they have a long tradition of structured data, and it continues to be used intensively in everyday life. Therefore, to adapt the Data Journalism process into Thailand, we cannot use the same foreign formula as a standard because we need to consider the social and cultural contexts in Thailand, too. They can start from sparing a space in the contents for Data Journalism, and may begin to use Data Journalism on colourful issues that match the tastes of the target audience. Then they can gradually intensify the complexity of the data to create familiarity and provide the basic data for use by

the recipients. In addition, as Thai society is rich in network communications, it can use Data Journalism to create interactive systems that focus on horizontal communication, encouraging communication between recipients, and pulling public participation to support the news, using the existing strength to our benefits.

#### (2) Data Collection

In case the required data is public information that is accessible to the public, use it first. If the information is publicly available online but is in a form that cannot be retrieved, it may require the use of Data Science techniques to retrieve information, known as “scraping” or, in the case of confidential information, we may submit a request to the owner of the information by virtue of Official Information Act 2540 (1997) and if the required information is nowhere to be found or inaccessible within the specified time, we may need to compile a database by ourselves by means of social science research methods such as a survey by questionnaire.

#### (3) Verifying and Organizing Data

Once you have the information you need, go into the validation process, and organize and clean the data in a structured format so that it is ready for analysis in the next step. In the case that the data size is large or in a scattered state and cannot be managed by humans in a limited time, it may be necessary to rely on Data Science, such as programming to create an automated system, to work on this part.

#### (4) Data Analysis

In terms of data analysis, in the beginning, do not use complex analysis if it is not required, because the target audience in Thailand may not be familiar with intensive data. Data analysis can be used for data mining, which uses simple statistical techniques like frequency distribution, ratio calculation, and average value calculation, to describe the characteristics of two or more variables in the news. If it is necessary due to the characteristics of the news, data predicting may be used to find the relationships and links between data.

#### (5) Data Presentation

The final step is to transform the data to present it to the recipients. The most important thing is to choose the right way to present it, to be appropriate for both the type of data and the behavior of the target audience. In this area, many parties have wrongly understood that Data Journalism must be presented in infographics only. In

fact, the heart of news reporting from the Data Journalism process is not different from other news stories: that is, to tell the story. So, it may be in news formats like text, infographics, animations, interactives, or applications. Only in the case of huge amounts of quantitative data, will presentation through visualization will make it easier for the recipients to understand it more quickly.

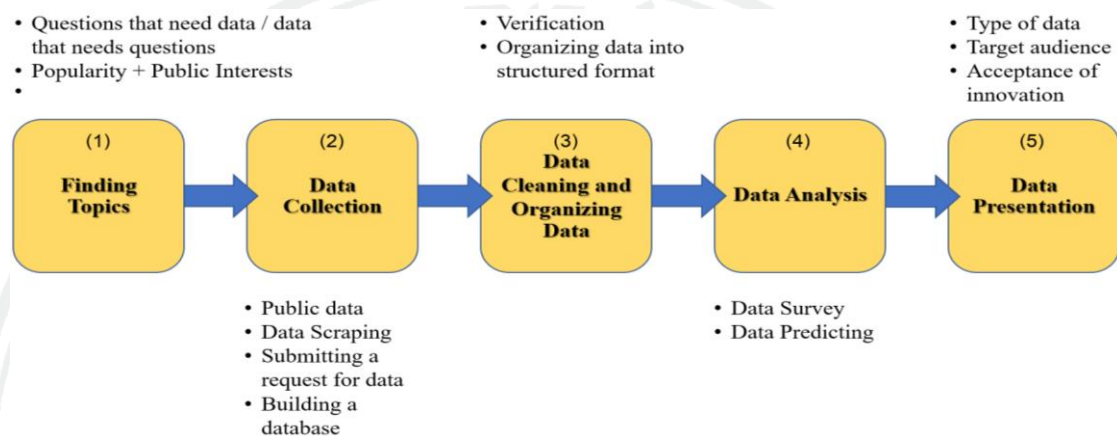


Figure 5.6 Guidelines for Creating Data Journalism Works

The guidelines for development of the knowledge and promotion of the use of Data Journalism in Thailand, based on the DATA model, consist of (1) development of the knowledge (D: Develop), (2) adaptation in media organizations (A: Adopt), (3) the use of technology and public information to support (T: Tech & Info Support), and (4) Act upon creating the works (A: Act). The researcher agrees that adaptation should be flexible and gradual. It should always be adapted to suit different environmental factors, focusing on thinking more than tools, because the limitation in using this model is that Data Journalism is a new innovation which is still in a rapid growth period, and the tools to work in Data Journalism are constantly evolving. In addition, it is important that those who apply these guidelines should understand that Data Journalism is not a one-size-fits-all magical tool to for news coverage for all topics, all media, or all recipients. Also it cannot change a bad news organization into a good one. Data Journalism can, however, help news organizations to work better than ever, and is one of the options that will enable news organizations to break through in the digital media revolution.

## 5.3 Suggestions

### 5.3.1 Recommendations for Implementation

1) Media professionals or those interested in Data Journalism can improve their knowledge and skills by adjusting their thinking base. They need to believe in themselves and believe more in data. The need to get familiar with the data from things close to us, such as the ready-made programs for managing table data, then, learn the concepts of computing to be able to understand the data systems, then the statistics, research methodology, programming skills and the advanced Data Science later on. Skills that will help those interested in Data Journalism to learn faster are English skills because most of this knowledge has not been translated into Thai yet.

2) The media professional associations should cooperate with educational institutes to provide training courses for media professionals to promote understanding of Data Journalism and increase the capacity of the media in Thailand, focusing on workshops and leveling the contents into (1) basic, which is suitable for those who do not have a background, and (2) advanced, which is suitable for those who have used Data Journalism level 1.0-2.0 and wish to develop to level 3.0. At the same time, the study found that although professional associations have developed plans to support the use of Data Journalism, journalism in Thailand is not very popular. Therefore, in addition to the training, the media profession should promote the use of Data Journalism by arranging awards and competitions to encourage development.

3) Media organizations should adjust their work approach so that new innovations such as Data Journalism can be applied. It starts with systematic internal data collection, which helps to realize the importance of using data internally. It can also be added as a contribution to the public. In the field of work, contents may be divided between daily news which focus on popularity and Data Journalism contents which focus on social issues, to help the working team to have more time on complex tasks. Media organizations should encourage journalists and programmers to work together. In the case that media organizations are not ready to invest to hire programmers themselves, they may build a collaborative joint network to set up a scientific data center, to be able to work on Data Journalism without having to invest

more than necessary. The use of modern technology creates a collaborative network for the people to contribute to the work of journalism, to open up new opportunities in the digital age, together with keeping the mission to the society. The findings from this research can also be applied to other innovations which are a process dimension to create an acceptance of innovations in the organization, and a product dimension to create acceptance of innovation among the recipients.

4) Those who use Data Journalism to present information should use Data Journalism for the topics or issues with a lot of data. Even though Data Journalism is a new alternative to news reporting, it is not necessarily suitable for all contents. Moreover, the results of the study also indicated that Data Journalism is not suitable for all audiences.

5) Institutions should improve their curricula to be consistent with the changes in the digital age, particularly the promotion of data skills. Faculties of Communication Arts that offer Journalism courses, should also insert this skill in other course subjects, too, because although the Thai government is beginning to recognize the importance of Data Journalism and has announced subjects related to the use of Data Journalism as compulsory subjects in the basic core curriculum from the academic year of 2018 onwards, we are still lagging behind other developed countries. In addition, the research indicates that there is a lack of knowledge about Data Journalism in Thailand. Educational institutions should focus on the production of knowledge in this field urgently.

6) Both the public and private sectors should have more open data than is currently available. They may look at the forms of data management from developed countries as examples, to provide public information that is easily accessible to the public. At the same time, civil society should also promote freedom of access to information that is truly beneficial to the public, to make Thailand transition to a technology-driven economy.

7) Those involved in Data Science -- academic institutions, the public sector, and the private sector -- should cooperate in the research and development of Data Science technology in the Thai language. The extraction of information from Thai language is very difficult because it is not a universal language. If there is more development of Data Science technology that supports Thai language, it will make the



field of Data Science as well as the use of Data Journalism in Thailand progress quickly.

8) Initially, we may need the support of relevant agencies, such as the Secure and Creative Media Development Fund to create a prototype news organization that can work with intensive Data Journalism and as an alternative to public information. There is no need to rely on capital trends, which will be a concrete example for other media organizations.

### **5.3.2 Suggestions for Future Research**

1) There are also many research gaps, such as, studies of the use of Data Journalism in small media organizations or in nonprofit media organizations, comparative studies of the use of Journalism in the media in each country, etc., while in Thailand, there is very little academic work on this topic. There should be more research on this topic.

2) Because this work collected data in the year 2017, when Data Journalism in Thailand was not very widespread, and because this work did not receive interview people from the editorial board of The Matter, who could use early-stage Data Journalism, there were limitations in interviewing media using the Data Journalism process. However, the researcher noted that since the beginning of 2018, media organizations in Thailand have become more interested in Data Journalism. Future research should be done by interviewing media using the Data Journalism process, and analyzing case studies, then comparing the new findings with the findings of this work to see the development of Data Journalism in Thailand more clearly.

3). This study investigated Generation X and Generation Y by using group discussions to find the basic explanations only. The next research may also examine other remaining generations, and magnify the results from the explanations received from this study by studying the factors influencing recipients receiving news from the qualitative Data Journalism process, which can be used to refer to all of the population.

4) The findings of this research can be used as a basis for developing a workshop and teaching to enhance Data Journalism skills. As a result, future research

could study further the research and development of Data Journalism courses to find ways to concretely improve Data Journalism skills.



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