

Study on Data Journalism in Tamilnadu & the Challenges Faced by Journalists

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Abstract:- When Digital technology brought online journalism and new practices into newsrooms that made a huge impact on Indian newsrooms articles that lead to different perspective stories which gave a lot of space for creativity, this allowed every citizen to become online journalist that was a great milestone in digital evolution. But, when the news credibility in online journalism gradually fell, many journalist and publishers worried that admired principles of news reporting, experience and intuition might decline or even disappear. On the other hand, they fail to realise that this will empower journalists to use numbers to tell stories with fewer anecdotes, more reliability and to cover challenging invisible stories.

Journalism has always involved numbers and data analysis was also a part of it. Then a new practice, “Data journalism” sparked in the newsroom that involves data to find a story and create visualizations which are not a very easy process in the newsroom. Howard (2014) in his study mentioned that 21st century was a change for mobile computing that lead to increases in online connectivity, access, speed and an explosion in data creation that completely changed the landscape for computer-assisted reporting. Another study by Parasié and Dagiral (2012) argued that data journalism comes into light because of hacker culture, initially, the hackers deal with the open-source and open government with some political values, which injects a new culture into the newsrooms.

When we look at the national context there are many challenges to adapt in India newsrooms and confusion about its role and importance in the field of journalism. The major focus of this research is to find the complications faced by journalists while incorporating data into their news organization. The sample consisted of data journalists from various parts of India. The journalists who belong to the age group of 18 – 50 from different media houses and with different designations were chosen for the study. The selection of the media house is based on how frequently the media house produces data articles. To analyses the newsroom challenges faced by a journalist concerning data journalism, a preliminary survey was conducted among 53 journalists who keenly work on data articles and in-depth interviews with the chief editors of media houses were conducted.

Keywords:- Data journalism, Newsroom, Data, Journalists.

I. INTRODUCTION

Data journalism is not a new technique in journalism. Fundamentally, Journalism always involved numbers; it combines the traditional nose for news and tells a complex story in a simple manner along with reliable visual representation (Paul Bradshaw, 2011) ⁱ 21st century created a change in computing, that created N number of opportunities for the combination of data into investigations that transformed the practice of journalism into the new term called data journalism.

By using data, the journalist can analyze the dynamics of a complex situation such as protest, population, debate and expose misconceptions with a piece of authentic information in the form of data they can apply computer-assisted reporting and social science to investigative journalism, journalists are now creating new apps and interactive features that help people understand data, explore it, and act upon the insights derived from it.

Journalists around the world are dealing with the excitement and the challenge of telling compelling stories by connecting the vast quantity of data, to present the story in good data form journalist need to train themselves with good software language skills to find the connections between thousands of documents which they need to deal in gathering and combining information from the open data or form the local government. In the meantime, this process requires a large amount of time and skill. The practice of data journalism is massive, the drawbacks and challenges to its adoption throughout the media are similarly important, from digital literacy to competition for uncommon resources in newsrooms.

➤ *Aim of the Study*

The main aim of this study is to address What are the Challenges faced by the India journalists while incorporating data in newsroom

➤ *Objectives of the Study*

To investigate the aim of the research, pose the following research questions:

- To study, What types of main stories are produced using data
- To review What kind of data are most frequently searched by the journalist
- To analyses How effectively data journalism used in the different media

- To probe the newsroom challenges faced by journalist with respect to data journalism

Once these questions are answered that will help us to achieve our main objective of the research will be obtained

➤ *Need For The Study*

When Digital technology brought online journalism and new practices into newsrooms that made a huge impact on Indian newsrooms articles, As a result there are different perspective stories lot and lot of creativity every citizen become online Journalist, That was great milestone in digital evolution, But,when the news credibility in online journalism gradually fell, many journalist and publishers worried that admired principles of news reporting, experience, and intuition might decline or even disappear that empowers journalists to use numbers to tell stories in less anecdotally, more reliable, and to uncover invisible stories. That the new practice, "Data journalism" become Sparked in the newsroom. Data journalism is not a new technique in journalism .Data journalism is the use of data in journalistic analysis and reporting. It is a best digital storytelling format which is very much rich in content when it delivered in the online environment enables readers to explore the story interactively and the practice of using data such as statistics and infographics are being used by journalists in their stories many years ago.

Thus this Research will address the newsroom challenges faced by journalists with respect to data journalism .

II. REVIEW OF LITERATURE

A. *Data Journalism Definition*

Meyer (2002) ⁱⁱreported that the computer-assisted reporting (CAR) as “precision journalism, which included the sound practice for data collection and sampling, careful analysis and clear presentation of the results. He argues that journalists should use a scientific approach to analyzing data, preferably using social science research methods.

Bounegru (2012)ⁱⁱⁱ's definition for data journalism it is the use of mass democratization of resources, tools, practise and methodologies previously used only by specialists, including investigative reporters. In addition, she describes CAR as a technique for gathering and analyzing data to enhance investigative reporting, while data journalism instead pays attention to the way data sits in the whole journalistic workflow.

B. *Data Journalism in Media*

(Brant Houston,2012) ^{iv}claims that the practice of CAR has changed over time as the tool and environment in the digital world has changed, He says that CAR tends to be an umbrella term, that includes the precision journalism and data-driven journalism and any methodology that make sense of data.

In the 21st century (Howard,2014)^v, a revolution in mobile computing; increases in online connectivity, access, and speed; an explosion in data creation completely changed the landscape for computer-assisted reporting that lead to the ability to show actual data and let the people look through themselves It's now made possible, through interaction design, to help people navigate their way through a data set just as, through good narrative writing .

Parasie and Dagiral (2012)^{vi} have studied data journalists in newsrooms in Chicago and discuss several currently controversial issues in data journalism. They argue, that integrating programmers into newsrooms can be seen as technology-driven innovation, and the programmers believe that technological work of art holds great promise both for news organizations and democracy. However, according to Parasie and Dagiral, as part of the hacker culture, the programmers come with political values about open source and open government, which introduces a new culture into the newsrooms.

(Howard,2014)^{vii}, claims that the embraces of open source software and agile development practices, coupled with a growing open data movement, have breathed new life into traditional computer-assisted reporting.

According to Cohen(2011)^{viii} Access to open data and the involvement of activists are critical factors for the development of data journalism in many countries, for example in Finland Aitamurto, Sirkkunen, and Lehtonen.

C. *Newsroom Analytics*

Gynnild (2013)^{ix} has investigated journalistic blogs, such as the Data blog at the Guardian UK and the listserv of the National Institute of Computer Assisted Reporting. She further investigate the other crucial factors that define the data journalism as “computational journalism”. She found that, in the first phase is the innovation, and the next phase is focused investment in human resources by news media organizations. These factors are also indirectly reported by Royal's (2010)^x study of the New York Times Interactive News Technology Department, where the leader of the group, Aron Pilhofer, was found to be one of the driving forces for the department's success, combined with dedicated resources from the other newspaper company.

Another study by Cohen et al. (2011)^{xi} stand as a pioneering example of how innovative data journalism strategy can be created at an editorial department in cooperation with other organizations. By the development of the “Document Cloud” tool, which uses cloud technology, was developed by New York Times and the non-profit news organization called ProPublica. The purpose of the document tool is to help journalists process and publish documents containing unstructured data.

D. Newsroom Challenges

Powerful Web-based tools for scraping, cleaning, analyzing, storing, and visualizing data have transformed the newsrooms. Lawrence Pintak and Jeremy Ginges(2009)^{xii} alleged bias and lack of professionalism in the Arab media. The study results implement that Arab journalist admires the professionalism of their US counterparts, but give them low marks for fairness and lack of independence in the Arab news organizations.

Jan Lauren Boyles, Eric Meyer (2017)^{xiii} paper is similar to prior cycles of newsroom specialization, news organizations must integrate the expertise of data journalists. Based upon 18 in-depth interviews with data journalism leaders within American newspapers, the research identifies four “critical junctures” by which newspapers expand data journalism operations. The interviews establish the expanding a paper’s commitment to data journalism requires reorganizing the newsroom with new layers of structural complexity.

Porlezza, Colin (2016)^{xiv} European Journalism Observatory compared two European published papers Alfred Hermida and Lynn Young from the University of British Columbia and Eddy Borges-Rey from the University of Stirling analyses these two paper talks about the problem from different angles. In the end, the two papers show not only that some news organisations are still struggling to find the right use and place for data journalism, which translates into enduring structural problems. It was highlighted by the European Journalism Centre in 2011 (Lorenz 2011)^{xv} revealed that major challenges faced by data journalist is lack of knowledge in working with the tool and procedures. The survey argued that a future journalist should be a researcher, programmer and designer and want to hold three university degrees in one. Significant training is required to meet the demand for these skills. These factors are also completely supported by bharesh heravi in an interview with (silicaon republic 2016)^{xvi} most of the journalists are not equipped with data skills and few afraid of data. She quoted major challenges in adopting data journalism in newsrooms is the lack of resources and money.

E. Usage of Data in Media

Uskali & Kuutti(2015)^{xvii}, resulted in the three different organizational structures for data journalism & streams that incorporate in today newsroom. The first organization structure is the traditional data desk model, the second is the flexible data projects model, and the third is the entrepreneur model. It also discovered Investigative data journalism (IDJ) and General data journalism (GDJ) are the two main types of data journalism streams in the newsroom and the weak stream among them is Real-time data journalism. IDJ is the most important stream because it consumes a lot of time along with the advanced coding skills. where the other two streams can be implemented as a common practice in newsrooms. This was supported by the (Bounegru et al. 2012)^{xviii} that paper concluded that data journalism practices, especially the use of minimal number of data sets, could be used in many newsrooms. Andreas

veglis, Charalampos bratsas(2017)^{xix} discusses the issue of taxonomies of data journalism projects. Based on the results of the survey the majority of the data journalism projects tend to include some kind of visualization and three out of four visualizations are static. Lastly, when interactive visualizations are employed there is no clear preference to a certain type of interactivity, but the number of an article which included interactive visualizations was quite limited. Thus Uskali & Kuutti(2015)^{xx}, created pressures and challenges for data journalism education, both in the newsrooms and journalism schools.

F. Open Data & Free Data Tool

The use of open source and free tool are chosen by data journalists is depend on the needs of a given project, available resources, expertise, training, and time. The process of data journalism process is broadly divided into five categories: data collection, cleaning, analysis, presentation, and publishing. Cleaning data “is often the most time-consuming part of the data journalism process,” said Jonathan Stray, an instructor at Columbia Journalism School, (Howard,2014)^{xxiii}

(Debarros 2010)^{xxiv} The common tools used for computer-assisted reporting ran on desktops and servers, spreadsheets, databases, text editors, and statistics software. After spreadsheets, the second most common tool applied in the field is database software are, Microsoft Access, MySQL, PostgreSQL, or SQLite. A text editor, like TextMate or BBEdit, and statistics software, like SPSS Statistics, and when we look into free Web-based tools such as Open Refine, Google.

Fusion Tables, and Tableau. They’re also working with modern programming languages, like Python, Ruby, and JavaScript, as well as d3, D3.js for reusable interactive graphs tied to updated data sets round out the basic suite of tools that have been used in data journalism (Howard,2014)^{xxv}

The rapid expansion in the amount of unstructured OPEN data, S. Lohr,(2012)^{xxvi} lead to the increased context and need for more data tools. When the Guardian’s data team was making sense of the Wikileaks cables, it took months to work through them. J.webb (2011)^{xxvii}

The stories just as likely come from the unstructured information that comes from documents, audio and video, tweets, other social media from government and non-government sources. Making sense of all of that data is both a huge opportunity and an immense challenge for newsrooms. (Howard,2014)^{xxviii}

The PANDA Project^{xxix}, which tries to make research easier in the newsroom with a set of open source, (J. Ellis,2011)^{xxx} Web-based tools oriented at making it easier for journalists to use and analyze data, and The Overview Project^{xxxi}, which helps journalists find stories by cleaning, visualizing, and interactively exploring large documents and data sets, acting as a kind of Editorial search engine (Jonathan Stray,2011)^{xxxii} describes both PANDA and

Overview are squarely aimed at bread-and-butter issues for newsrooms struggling to manage data. As of March 2014, PANDA has been installed in 25 newsrooms around the United States. People could be doing better reporting if they knew where the data was available. Thus Howard,2014)^{xxxiii} suggest data source should be visible privately.”

That made the Open source tools popular and playing a pivotal role in the practice of data journalism (M.Sill, 2011)^{xxxiv} says many news developers are agnostic with respect to which tools they use to get a job done, the people who are building and sharing tools for data journalism are often doing it with open source code. Where Andersen, who co-authored a landmark report on post-industrial journalism with Emily Bell and Clay Shirky, C. Andersen, E. Bell, and C. Shirky, 2012,^{xxxv} said that a tradition of open government which increasingly includes efforts to open data is probably the biggest factor in the success of data journalism in developing countries. “Data journalists have a very hard time existing in countries where there isn’t open data,” he said. “For instance, there’s a huge difference between Germany and the United States. where Germany don’t have the culture of not sharing.” By contrast, The United States, has a tradition of openness and government disclosure, said Andersen. Their research suggests that data journalism cannot exist in a given country without open government laws and policies.

The issue of data journalism’s potential inflictions came up when Wikileaks released data from the U.S. Department of Defense and Department of State to multiple news organizations in 2010 and 2011. (Jacob Harris,2010)^{xxxvi} a data journalist he helped out with the Wikileaks War Logs reporting, at the New York Times. He built an internal news app for the reporters to search the reports, see them on a map, and tag the most interesting ones. One of the unique things he figured out was how to extract MGRS [Military Grid References System] coordinates from within the reports to geocode the locations inside of them. From this, distinguish of various locations of various homicides within Baghdad more finely than the geocoding for the reports. Finally creates the best data journalism story. The same thing was not applicable to the free data tool like Manyeyes (Bootlabs,2015)^{xxxvii} it simply can’t deal with complex data. Big data usually need designers and developers to create a unique visualization. You can even have an interactive visualization. Uskali & Kuutti(2015)^{xxxviii}, find that the currently there are a large variety of data visualization tools with different aesthetics are developing but the new problem seems to be finding insufficient time to explore all the new applications and their possibilities. That leads to the new phase form of having a scarcity of data, and data tools, to an abundance of both.

G. Implication of the Literature Review

- The use of statistics and data analysis is not new to the journalist, the increased availability of large datasets have slowly changed the newsroom to report the issues in new and more powerful in the data format.
- To present the available data in the right storytelling format the major challenges faced by the journalist is lack of knowledge in working with the tool and procedures(Lorenz 2011)^{xxxix}
- Uskali & Kuutti(2015)^{xl}, resulted in the three different organizational structures &three streams of data journalism that incorporate in today newsroom. The data journalism is more implemented in the investigation stream which consumes a lot of coding skills and time.
- Uskali & Kuutti(2015)^{xli}, findings pressuring new phase and challenges for data journalism instruction , both in the newsrooms and also in journalism schools.
- Open data initiatives it varies from country to country depend on their internal law and policies.
- To overcome the challenge in the newsroom and to give better visualization they are the ample number of free and easy accessible data tools are available but the problem is there lack in knowledge & insufficient time to explore all the available tools.

➤ Problem Definition

From the Review of literature, we understand that there is a problem in implementing data in the news room around the world, Taking this into account, this paper will deal with the detail analyses of what are challenges faced by India journalist while incorporating data in the newsroom.

III. METHODS

The particular way of studying something to discover new information about it or understand it better is known as research. The process used to collect data to make decisions is known as the research method.

For our research about the newsroom challenges faced by journalists concerning data journalism, quantitative research using the survey method and qualitative research using a narrative approach -depth interview method is used to obtain results.

A. Research Design: -

The primary research design is to examine the relationship in a single group that is among the data journalist thus to the study the challenges faced by India data journalist while incorporating data in newsroom .This research will make use of correlational research design which helps to evaluate the results of the research survey and depth interview.

B. Sample

It is the act or method of selecting a suitable sample; (i.e.) the process of selecting a symbolic part of a population to determine parameters of the whole population.

➤ Steps In Sampling Process

A sample of people among the age group between 18 - 50, who are aware of existence of Data journalism from various news media are chosen. This includes journalists from several news medium such as print, audio & visual and its also includes student who are indulged in data journalism. The questionnaire is prepared accordingly to fulfil the objectives of the study. The options are given with respect to the data to be collected for the research purpose.

First a preliminary survey is taken to analyse the whether Visual student and journalist are aware of data journalism. This survey included respondents from different categories. Then the results are analysed and the major types of stories are produced using data and how effectively data journalism used in the different medium are narrowed based on their popularity and viewership. Then the 2 part of survey is done. The questionnaire is made corresponding to those particular field data journalist in order to find out what are the challenges faced by the journalists while incorporating data in newsroom .The Preliminary questionnaire are made online and the link has been shared using social networking websites. The part 2 survey is depth interview with particular field data journalist . To obtain results from various age groups with different educational background, the link is circulated not only among Data journalist and data journalism students but also to the people who use data in their reporting.

Many student and reporters are also included in this research. Finally, the response was from 30 people through preliminary survey method and 12 response form through depth interview who involved voluntarily to answer their opinions honestly about their engagement with data journalism .

C. Theoretical Framework

➤ Two Step Flow Theory

Bernard Berelson, and Hazel Gaude State that, two-step flow theory, asserts the information from the mass media in two distinct way. First, individuals (opinion leaders) who pay close attention to the mass media and its messages. These Opinion leaders pass on their interpretations to the actual media content. This theory refined the ability to predict the influence of media messages on audience behaviour, and it helped explain why certain media campaigns may have failed to alter audience attitudes and behaviour. The two-step flow theory gave way to the multi-step flow theory of mass communication or diffusion of innovation theory.

IV. DATA ANALYSIS AND INTERPRETATION

➤ Interpretations of the Study

- Anyone who has access to smart phone and internet can easily access data anywhere. According to the study 86.8% of the journalist have heard about the data journalism earlier.
- The 45.3% of the survey respondents are from magazine medium and it followed by Newspaper medium which shows that the print medium are already into data journalism in India.
- According to the survey 100% of the journalist use raw data as the primary source
- Nearly 84.9% of the journalist use very frequently use raw data as the primary source.
- The 30.2% participants who use data journalism only for the professional curiosity
- Nearly 45% of the journalist frequently use data in their stories.
- From the survey, 86% of the journalist use data mainly for politics coverage
- About 85.6 % journalist face lack of resources as the main hurdles while incorporating data in newsroom.
- About 100% journalist says lack in the programming language knowledge are hindrance them to extract data from the particular resources.

V. FINDINGS AND CONCLUSION

A. Findings

- Every journalist who has the access to mobile phone and internet can easily access data by means of search engine.
- Especially journalist of age group between 18 to 25 often using data in their stories.
- Mostly journalist from the print medium are showing interest incorporating data in the newsroom.
- The 86.8% have already heard about the data journalism.
- Average 84.9% of the journalist use raw data as the primary source in the articles
- About 90% of the journalist use data in the stories only for the professional purpose and curiosity.
- Nearly 42% of the journalist use data very frequently in their story.
- At present 48.7 % journalist use data for the political content news.
- About 90 % journalist states that lack of resources is the main hurdles for incorporating data in newsroom.
- The data report help the readers to keep themselves updated.
- The 92% of the journalist use data for the story for giving more professional touch
- 80% of the survey stated that data journalism moderately improves the commercial value.
- The data are mainly used for the Politics content articles in the series which is a key factor which attracts the views.

B. Conclusions

As per the study, Best parameter to incorporate data journalism in newsroom can be done only when journalist have adequate knowledge on programming or simple app or tool need to be innovated in order to easily extract the data from the open huge source or from the government sources.

C. Suggestion

- In future, data journalism will become even more of a strategic resource for media.
- Better tools will soon discover for easy access to the data skills.
- Data journalism will be held as a higher standard for accuracy and corrections in a newsroom
- Data journalism news articles will bring more traffic to the audiences.
- Conflicts may arise on the analysis of public archives, data scraping.

D. Future Scope

From the background study, we understand that lack of skill and knowledge lead the journalist to lack in basic five broad processes of Data journalism such as collection, cleaning, interpretation, presentation, and Printing. The five major processes of data journalism vary according to the county laws and policies, data journalism cannot exist in a country where the open government laws and systems is forbidden. C. Andersen, E. Bell, and C. Shirky, 2012,^{xiv} To make the data journalism common and easy access to all country people, n number of free data tool and a few advanced web-based tools which run on python, ruby, d,j3 languages are used. while few, the free tool can't deal with complex data depend on the context to help in Wikileaks War Logs report, journalists (Jacob Harris,2010)^{xvi} innovate their own tool to integrate a story.

Finding tool according to the individual content was not possible for the all data journalist, in order to overcome this, my proposed solution is further studies will be done, or innovating some simple tool or App to extract data from the open data, Which will sort out the major five process of data journalism .

REFERENCES

- [1]. Paul bradshaw, 2011.” Introduction to data journalism” doi:https://datajournalismhandbook.org/handbook/one/introduction/what-is-data-journalism)
- [2]. Meyer, P. 2002. Precision Journalism: A Reporter’s Introduction to Social Science Methods. 4th ed. Oxford: Rowman & Littlefield Publishers
- [3]. Bounegru, L. 2012. “Data Journalism is about Mass Data Literacy” In The Data Journalism Handbook, edited by J. Gray, L. Chambers and L. Bounegru, 21–22. Sebastopol: O’Reilly Media
- [4]. Brant Houston. 2012 .” In the age of big data, data journalism has profound importance for society“ http://radar.oreilly.com/2012/03/rise-of-the-data-journalists.html
- [5]. Howard, A. 2014. “The Art and Science of Data-driven Journalism. New York”. https://academiccommons.columbia.edu/doi/10.7916/D8Q531V1.12(5)
- [6]. parasie, S., and E. Dagiral. 2012. “Data-Driven Journalism and the Public Good: “ComputerAssisted-Reporters” and “Programmer-Journalists” in Chicago.” New Media & Society 15 (6): https://journals.sagepub.com/doi/10.1177/1461444812463345).
- [7]. Howard, A. 2014. “The Art and Science of Data-driven Journalism. New York”. https://academiccommons.columbia.edu/doi/10.7916/D8Q531V1.12(5)
- [8]. Cohen, S., C. Li, J. Yang, and Y. Cong. 2011. “Computational Journalism: A Call to Arms to Database Researchers.” https://www.researchgate.net/publication/220988205_Computational_Journalism_A_Call_to_Arms_to_Data_base_Researchers
- [9]. Gynnild, Astrid. 2013. “Journalism Innovation Leads to Innovation Journalism: The Impact of Computational Exploration on Changing Mindsets.” https://journals.sagepub.com/doi/abs/10.1177/1464884913486393
- [10]. Royal, C. 2010, April. “The Journalist as Programmer: A Case Study of the New York times Interactive News Technology Department.” In Anais Do International Symposium in Online Journalism, 12–23. Austin, USA: The University of Texas at Austin http://www.cindyroyal.com/present/royal_isoj10.pdf
- [11]. Cohen, S., C. Li, J. Yang, and Y. Cong. 2011. “Computational Journalism: A Call to Arms to Database Researchers.” https://www.researchgate.net/publication/220988205_Computational_Journalism_A_Call_to_Arms_to_Database_Researchers
- [12]. Lawrence Pintak and Jeremy Ginges(2009):- “Inside the arab newsroom”. Doi :https://doi.org/10.1080/14616700802337800
- [13]. Jan Lauren Boyles, Eric Meyer (2017) “Newsrooms accommodate data-based news work” https://doi.org/10.1177/0739532917739870
- [14]. Porlezza, Colin. (2016).” How Data Journalism Is Changing Newsroom Slowly”. https://www.zora.uzh.ch/id/eprint/135143/
- [15]. Lorenz, M., 2011. “Training data driven journalism: Mind the gaps. DataDrivenJournalism.net”. http://datadrivenjournalism.net/news_and_analysis/training_data_driven_journalism_mind_the_gaps
- [16]. SiliconRepublic. 2016. “How Is Data Journalism Changing the Newsroom?” Q&A with Bahareh Heravi E. Burke, ed. Silicon Republic. https://www.siliconrepublic.com/innovation/datajournalism-media-newsroom
- [17]. Uskali & Kuutti(2015) “Models and streams of data journalism” http://www.journals.uio.no/index.php/TJMI/article/view/882

- [18]. Bounegru, L. 2012. "Data Journalism is about Mass Data Literacy" In *The Data Journalism Handbook*, edited by J. Gray, L. Chambers and L. Bounegru, 21–22. Sebastopol: O'Reilly Media
- [19]. Andreas veglis, charalampos bratsas .(2017) "Towards a taxonomy of data journalism" https://www.researchgate.net/publication/319707976_Towards_A_Taxonomy_of_Data_Journalism
- [20]. Uskali & Kuutti(2015) "Models and streams of data journalism" <http://www.journals.uio.no/index.php/TJMI/article/view/882>
- [21]. 4th ed. Oxford: Rowman & Littlefield Publishers Nguyen, A., and J. Lugo-Ocando. 2016. "The State of Data and Statistics in Journalism and Journalism Education: Issues and Debates." *Journalism* 17 (1): 3–17. <https://journals.sagepub.com/doi/10.1177/1464884915593234>
- [22]. Bahareh R. Heravi (2018):3WS of Data Journalism Education, Journalism Practice, <https://www.tandfonline.com/doi/abs/10.1080/17512786.2018.1463167>
- [23]. Howard, A. 2014. "The Art and Science of Data-driven Journalism. New York". [https://academiccommons.columbia.edu/doi/10.7916/D8Q531V1.12\(5\)](https://academiccommons.columbia.edu/doi/10.7916/D8Q531V1.12(5))
- [24]. DeBarros, 26 Nov. 2010 "Data Journalism and the Big Picture". <https://anthonydebarros.com/2010/11/26/data-journalism-the-big-picture/>
- [25]. Howard, A. 2014. "The Art and Science of Data-driven Journalism. New York". [https://academiccommons.columbia.edu/doi/10.7916/D8Q531V1.12\(5\)](https://academiccommons.columbia.edu/doi/10.7916/D8Q531V1.12(5))
- [26]. Lohr.S.12 feb 2012 "The Age of Big Data," *New York Times*, <http://www.nytimes.com/2012/02/12/sunday-review/big-datas-impact-in-the-world.html?pagewanted=all>
- [27]. Webb.J, 2 Mar. 2011, "Before You Interrogate Data, You Must Tame it," *Strata Blog*, O'Reilly Media, <http://radar.oreilly.com/2011/03/simon-rogers-guardian-wikileaks.html>
- [28]. Howard, A. 2014. "The Art and Science of Data-driven Journalism. New York". [https://academiccommons.columbia.edu/doi/10.7916/D8Q531V1.12\(5\)](https://academiccommons.columbia.edu/doi/10.7916/D8Q531V1.12(5))
- [29]. PANDA Project, <http://pandaproject.net/>
- [30]. Ellis.J ,2011 "The News Challenge-winning PANDA Project Aims to Make Research Easier in the Newsroom," <https://www.niemanlab.org/2011/06/the-news-challenge-winning-panda-project-aims-to-make-research-easier-in-the-newsroom/>
- [31]. Overview Project," Associated Press, <http://overview.ap.org/>
- [32]. Jonathan Stray, 26 Mar. 2011," The Editorial Search Engine" <http://jonathanstray.com/theeditorial-search-engine>
- [33]. Howard, A. 2014. "The Art and Science of Data-driven Journalism. New York". [https://academiccommons.columbia.edu/doi/10.7916/D8Q531V1.12\(5\)](https://academiccommons.columbia.edu/doi/10.7916/D8Q531V1.12(5))
- [34]. M. Sill, "The Case for Open Journalism Now," USC Annenberg School for Communication & Journalism, Dec. 2011, <http://www.melaniesill.com/wpcontent/uploads/2014/12/OpenJournalismNowPDF.pdf>
- [35]. Anderson, C. W.; Bell, Emily J.; Shirky, Clay , 2012," Post Industrial Journalism: Adapting to the Present <https://academiccommons.columbia.edu/doi/10.7916/D8N01JS7>
- [36]. J. Harris., et al., 24 oct 2010. "A Deadly Day In Baghdad," *New York Times*, <https://archive.nytimes.com/www.nytimes.com/interactive/2010/10/24/world/1024-surgegraphic.html>
- [37]. Bootlabs (2015) " Many Eyes ; IBM'S free online data visualization tool " <https://www.boostlabs.com/ibms-many-eyes-online-data-visualization-tool/>
- [38]. Uskali & Kuutti(2015) "Models and streams of data journalism" <http://www.journals.uio.no/index.php/TJMI/article/view/882>
- [39]. Lorenz, M., 2011. "Training data driven journalism: Mind the gaps. *DataDrivenJournalism.net*". http://datadrivenjournalism.net/news_and_analysis/training_data_driven_journalism_mind_the_gaps
- [40]. Uskali & Kuutti(2015) "Models and streams of data journalism" <http://www.journals.uio.no/index.php/TJMI/article/view/882>
- [41]. Uskali & Kuutti(2015) "Models and streams of data journalism" <http://www.journals.uio.no/index.php/TJMI/article/view/882>
- [42]. Bahareh R. Heravi (2018):3WS of Data Journalism Education, Journalism Practice, <https://www.tandfonline.com/doi/abs/10.1080/17512786.2018.1463167>
- [43]. Bahareh R. Heravi (2018):3WS of Data Journalism Education, Journalism Practice, <https://www.tandfonline.com/doi/abs/10.1080/17512786.2018.1463167>
- [44]. Bootlabs (2015) " Many Eyes ; IBM'S free online data visualization tool " <https://www.boostlabs.com/ibms-many-eyes-online-data-visualization-tool/>
- [45]. Anderson, C. W.; Bell, Emily J.; Shirky, Clay , 2012," Post Industrial Journalism: Adapting to the Present <https://academiccommons.columbia.edu/doi/10.7916/D8N01JS7>
- [46]. J. Harris., et al., 24 oct 2010. "A Deadly Day In Baghdad," *New York Times*, <https://archive.nytimes.com/www.nytimes.com/interactive/2010/10/24/world/1024-surgegraphic.html>