

Scope of Data Journalism for Investigation Reporters in Pakistan

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Abstract: Data Journalist can be defined as Journalists who work with numbers "a method of optimizing analysis and news coverage through the use and review of information in order to offer a deeper understanding of a news story and to draw attention to pertinent facts. One trend in journalism's digital age has been to disseminate knowledge to the public through interactive web content created using data visualization tools such as tables, graphs, charts, infographics, microsites, and visual worlds. In-depth analysis of certain data sets may result in more detailed conclusions and assumptions about current hot topics. Additionally, data journalism will shed light on previously unrecognized topics that were ostensibly ignored by the news media. With the invention of knowledge and communication technologies, our ways of living and communicating, making decisions, and knowing reality have been revised. By adding a quantitative portion, the fundamental tenet of existence is altered. By incorporating computational thinking into newsrooms, the traditional logic of journalism has been fundamentally altered. Additionally, the linear narration was altered to provide a more engaging and enjoyable experience. Access to troves of open data enables one to understand, explain, and express reality in the digital era.

Numerous data journalism scholarships have been awarded in both the developed and emerging worlds. Nothing has been accomplished from the perspective of a developed country such as Pakistan. If data's use as a foundation for reporting and storytelling grows, it is critical to find responses to concerns about the use or misuse of data, the skills needed to do so, data journalism platforms and instruments, and potential newsroom changes. This essay aims to answer the concerns from Pakistan's perspective. Additionally, it addresses the intellectual turns that Big Data and data journalism take in collecting, processing, explaining, interpreting, and representing reality.

Keywords: 'Open Data'; Big Data; Digital Media; New Media; Reporting, Investigation.

1. INTRODUCTION

The way we make sense, appreciate and discover the environment around us has been profoundly changed by information and communication technology. Average citizens are faced with troves of scientifically validated evidence every day. Data-processing systems around the globe are becoming an essential part of the newsroom climate. To respond to new and ever-changing

content, connectivity, and media ecology, it is necessary to understand how data and computational journalism influence news norms, processes, and organizations. Placed, the quantitative type of journalism is data journalism. In media and journalism studies, it is one of the hottest phenomena and receives a lot of coverage in technical reporting activities and academics. Several books have been written, and data journalism articles are finding room in the world of scientific journals. Any of the works are carried out in the sense of the developed and developing world. From the view of a developing nation like Pakistan, nothing has been achieved. On the other side, several concerns emerge with the growth of scholarly journals, discussions, theorization, and data journalism practices: if the position of data expands as a foundation for reporting and narrative, then what are the skills required to do this? What will data be used to do? Why are newsrooms going to change? What are the necessary platforms and instruments to do this? The situation of the news media industry in Pakistan is no exception. As the position of data expands as a basis for reporting and narrative, it is essential to pursue answers to questions related to the usage or use of data, the expertise required to do so, data journalism platforms and instruments, future improvements in newsrooms. From Pakistan's viewpoint, this article attempts to address the queries. It also discusses the conceptual turns of Big Data and data journalism's lenses in considering the capture, retrieval, description, perception, and portrayal of truth. However, one of the difficulties in interpreting data journalism is that certain concepts are imprecise and rely exclusively on statistical tools for optimizing, analyzing, and visualizing data.

1.1 Big Data Trends in Media

In Latin, the term 'data' means 'giving' in the context of truth. A definition of anything that can be registered, examined, and remembered is referred to. It is possible to count something countable as details. Anything processed by a machine is knowledge. In a general sense, every set of numbers collected on a spreadsheet is 'information.' If it is massive in length, large in velocity, diverse in Scope, and reflects veracity, a data collection will be known as 'big data.' There are fresh frontiers of possibilities to grasp, evaluate, perceive, and reflect the truth at the core of the four Vs. Big data is more about discovering a trend in the course of behavior, challenges, incidents, and other societal structures at its heart. It's about seeking ties, relations with the individuals around us, and connections with people's conduct and effects. It is a reality regarding the actions of people regardless of their views. It's about the behavior of clients, workers, and opportunities for a new venture. Big data can come from items such as mobile phone location data or credit card punch and things people write on Facebook, check on Google, or update on Twitter. So, it's gradually more about people's actual actions. Scientists may say an incredible lot about an individual by examining the results. They will tell if the person can pay back bank loans, get some injury, or participate in illegal behavior. They can do this because their social history primarily determines their feelings, attitudes, and behavior. Suppose one element of the actions of a person is known. In that case, the others may be expected by observing and contrasting the participant in their social contacts to the individuals. And in the surrounding social fabric, individuals are so enmeshed that it defines the types of actions they believe are natural and what habits they can absorb from each other. Big data informs us of the ties that cause these

incidents. Big data offers us the ability to learn how these human and computer processes function and reliable. Our forms of life and communicating, making choices, and experiencing truth are updated with the advent of information and communication technology. By incorporating a quantitative layer to it, the fundamental element of life is altered, and big data is more about seeing and knowing interactions inside and between pieces of data. It involves utilizing data to create insightful insights into challenges, incidents, and the course of action. The way we perceive and organize culture has been changed. From industry and science to healthcare, economy, schooling, finance, arts, and every part of the culture, the field of big data shakes things up (). There is a revolution in the dynamics of companies, the economy, and culture. Big data is always chaotic, ranges inconsistency, and is spread globally through myriad servers. Accuracy allows data to be carefully selected. Numbers will talk for themselves with enough

details. Correctly interpreted data can help make sense and forecast the outbreak of pandemics, environmental disasters, or the likelihood of terrorist acts. Therefore, they can help avoid the spread of illnesses, the loss of resources, and the loss of life. In the era of datafication, we exist. The capacity to document knowledge is the highlighted area between modern civilizations and advanced societies. The volume of data stored is growing four times faster than the global economy. Facebook knows our likes now, and Amazon will propose the best books, Google can rank the most popular websites, LinkedIn determines who we know. More than 4.2 billion people globally use the Internet; Google currently processes an average of 3.9 billion requests every day; Snapchat users upload 602,672 images; users view 5,102,222 YouTube videos; 498,222 messages are shared on Twitter; Instagram users post 51,022 photos every minute; 1.7 billion people are posted on Facebook every day.

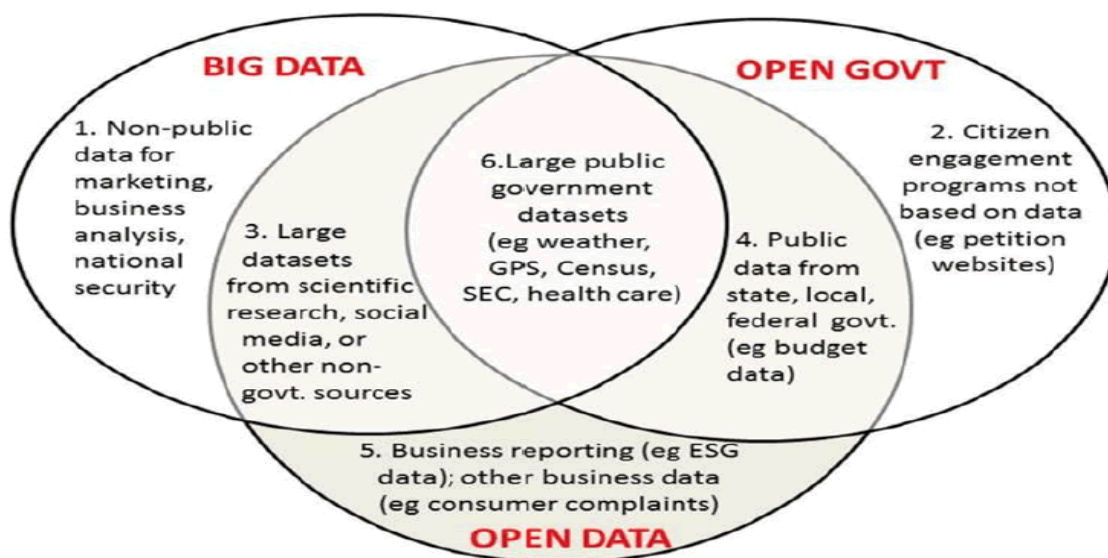


Figure 1. Model of data groups.

Fig-01, DOI: <https://www.hilarispublisher.com/open-access/the-issue-of-the-use-of-open-data-and-the-responsibility-of-modern-journalists-55922.html>

1.2 Methodological Framework:

This study is a systematic overview of the literature, and is a rather rigid method of meta-analysis. A systematic literature review should aim to "gain perspectives, crucial reflections, prospective study directions, and research questions" and should "contribute to the development of research paths and questions by offering a basis on which to draw on prior findings". Additionally, systematic literature reviews serve as a foundation and rationale for new study, as well as offer the "context for developing research synthesis" for more advanced fields of research. Systematic evaluations use a 'replicable, scientific, and open method [...] with the objective of minimizing prejudice'. Though they are founded on a 'positivist, quantitative, form-oriented content analysis approach for evaluating literature,' they often make extensive use of hermeneutic and interpretive approaches, especially when generating perspective and critique. In this sense, the object of criticism is to "oppose the predominance of taken-for-granted aims, concepts, philosophies, and discourses."

2. SCOPE OF DATA JOURNALISM

In conventional journalism, what 'phrase' implies, 'data' means data journalism. A tale is a real, meaningful, and important story to its audience in the conventional journalism style. Data journalism, though, is the modern approach to perceiving, viewing, and making sense of the universe by closely reviewing large quantities of data. That is the usage of facts as a medium to move closer to what is occurring in the world. It's all about journalists and computer scientists, statisticians, and graphic designers engaging and bridging the divide between statisticians and wordsmiths. Journalism is mostly about bringing together knowledge, evidence, views, quotations, and data in a conventional way to illustrate the

meaning of world events and their context to construct a story.

Meanwhile, data journalism is about combining data-driven perspectives with modern data richness and computational techniques. By diligent use of algorithms, calculation, and quantification, the insight is obtained. The data journalism method includes access to or creation of organized data sets, utilizing the data sets for story analysis, addressing the source of data/data in a written article, supplying readers with raw data along with the story. This means finding out how to get the details, comprehend them, and find the plot. However, there is a big difference between 'evidence' and 'plot.' A source of knowledge is data itself. A journalist must go through a procedure to collect details, typically first sweeping up messy formats, structuring and organizing the data into a readable structure until it can be visualized. The story is an immersive mode of communication in which data is placed into a sense that can be interpreted, recalled, shared, and told to others. To say tales, data reporters use massive libraries, infographics, data analysis, and virtual visualization. It is about uncovering the facts through the mining of knowledge that the public does not have enough resources and expertise to do itself, challenge it, analyze it, make sense of it and discuss it with the viewer. Data journalism is about searching for everything about a news subject that is categorizable, quantifiable, and comparative. It may also be interpreted as the media's effort to adjust and react to developments in our content climate, including increasingly immersive, multi-dimensional storytelling, empowering viewers to discover the sources behind the news, and engaging in the story production and appraisal phase. We live in a world steered by data. All about the human operation is knowledge,

including toilets. The most critical data is accessible from banks, telecommunications providers, drug companies, marketers, insurance companies, and national security agencies. Tectonic developments are taking place with the exponential growth in technology in facilities such as personal recommendations, password-free identification certification, private and public transit services, wellness, and so on. We leave digital traces each time we send a post, make a call, or complete a transaction. Surveillance, biometrics, automation, data are creeping, or customer behavior is profiling present news monitoring with possibilities and obstacles. Data will be used to give more in-depth perspectives about what is going on around us and how it might affect us. Data will allow journalists with the insight and data they need to make sense of the significant problems of the day by asking viewers what has occurred. It will give us unparalleled scope to consider our culture and enrich the way we live and operate if the data is used wisely and correctly. Data can strengthen a complicated narrative; it can enable journalism to speak the truth to authority. Data will help tell stories in more convincing and creative ways, coupled with conventional reporting methods, and provide actionable knowledge to people. A data journalist may allow his or her viewers to make sense of the government's policies, whether useful or struggling. Through analyzing the trend of low rates, child mortality, crime, shifts in GDP and other social indices, expenditure allocations, currency exchange rates, increase and decrease in crop production, etc., the reporter will tell stories. Areas covered by data journalism include:

1. Cybercrime reporting.
2. Computer assisted reporting and data-driven journalism, where journalists make use of large databases to produce stories.

3. Infographics, Data visualization and Interactive visualization.
4. Serious games, in the sense that they take interaction a step further.
5. Database journalism or structured journalism, an information management system where pieces of information are organized in a database (as opposed to a traditional story-centric organizational structure).

3. LITERATURE REVIEW AND HISTORICAL BACKGROUND

In media, the news is a 19th-century innovation. A crucial inquiry into the past and models of journalistic practices shows that two values are guided by epistemological journalism: the "story" ideal and the "information" ideal. The idea of saying the "story" is embedded in the narrative form and individual expertise, contextual. The theory of presenting "information" is focused on mathematical evidence, details, statistical research, associations, and trends that are quantitative. A revolution in the view of media, from qualitative to quantitative, has been taking place since the middle of the 20th century. Media is, from a qualitative standpoint, explanatory and interpretative. It tries to clarify the universe instead of weighing it. As human beings are programmed to look for explanations, the origin of the world's challenges and occurrences is found. It first constructs theories to pursue the facts or hits the truth, then gathers specific knowledge to explain it. It deals mainly with terms. Via evaluation and contact with individuals, journalists go to the field to collect knowledge. They log what they learn and then examine and interpret it to illustrate how the universe functions. Traditional media has traditionally been developed around two textual and visual components. In the meantime,

computer availability has made it possible to leverage vast volumes of data to open the door to new forms of thinking and discovering the planet. The promises that we trusted in are moving. A change occurs from a world driven by theories to a world driven by evidence—the universe shifts from cause to correlation. However, the use of data in telling tales is not new but is the extension of the ancient pursuit of the human race to quantify, document, and evaluate the environment. Computer-supported news (CAR) is currently what we now term computer journalism. In journalism, the usage of computers goes back to the 1950s. To forecast the presidential race results, the US media company CBS first used Automobile in 1952. It was the first structured and comprehensive method to gathering and processing data utilizing machines to report news stories.

Many journalists have studied public information collections utilizing scientific techniques since the 1960s. Philip Meyer invented the Automobile and the application of social and behavioural science analysis methodology to journalism. Donald Barlett, James Steele, Adrian Holovaty, and Oren Etzioni are the other Automobile pioneers. The word precision journalism was invented to characterize this method of news collection in the early 1970s. In the nineties of the last century, systematic analysis in data journalism started primarily in the USA. To explain the phenomena, researchers have invented several words. The words include data journalism, data-driven journalism, machine-assisted news, journalism in databases, organized journalism, computer journalism, journalism in databases, etc. Both comments have relatively comparable professional and epistemological origins, sharing stories in quantitative and technological type. Journalism's quantitative modes aim to uncover

trends and associations in the data with fresh and invaluable perspectives. The insights offer certainty as to what, not why. The encounters do not inform us precisely that this is going on, but they advise that it is going on. The origin of a phenomenon does not necessarily need to be known; therefore, we should let knowledge speak for itself.

4. DISCUSSION

Recent years have seen a surge in data journalism, with many journalists and news organisations seeing it as a means to improve the systemic, reliable, and trustworthy nature of journalism. This is especially critical in light of the concurrent decline in interest in journalism and media agencies, public attacks on journalists and news organisations, and increased adoption of the concept of objective plurality. Following highly publicized successes by data journalists such as Nate Silver and the launch of data-driven ventures by prominent news organizations such as The New York Times and The Washington Post, as well as digital-native outlets such as Vox, data journalism gained considerable discursive currency and reputational authority – but some of the euphoria has been dampened by highly publicized failures. Nonetheless, news companies continue to invest in (and demand talent for) data journalism, rendering it a rare field of innovation in a sector beleaguered by economic difficulties and attracting academic interest to its epistemological consequences. Though there has been an increase in scholarship on data journalism in recent years, the majority of literature is based on ethnographic case studies and interviews with data journalists. These works shed light on how data journalism is conceptualized and implemented, but only give a glimpse into the outputs of data journalism. This perspective is critical for determining whether data journalism

lives up to the potential celebrated by many academics and professionals, and, more specifically, whether it promotes the journalistic concept of openness and the immersive affordances of online journalism. Indeed, accountability and engagement – or, more precisely, the understanding of them by increased interactivity – has been praised as potential

alternatives to the decline of confidence in news media. Additionally, it is unknown whether data journalism has been more complex than its counterparts, and thus capable of exerting a greater influence on journalism's practice and goods, by dealing with more contextual fields and transcending niches.

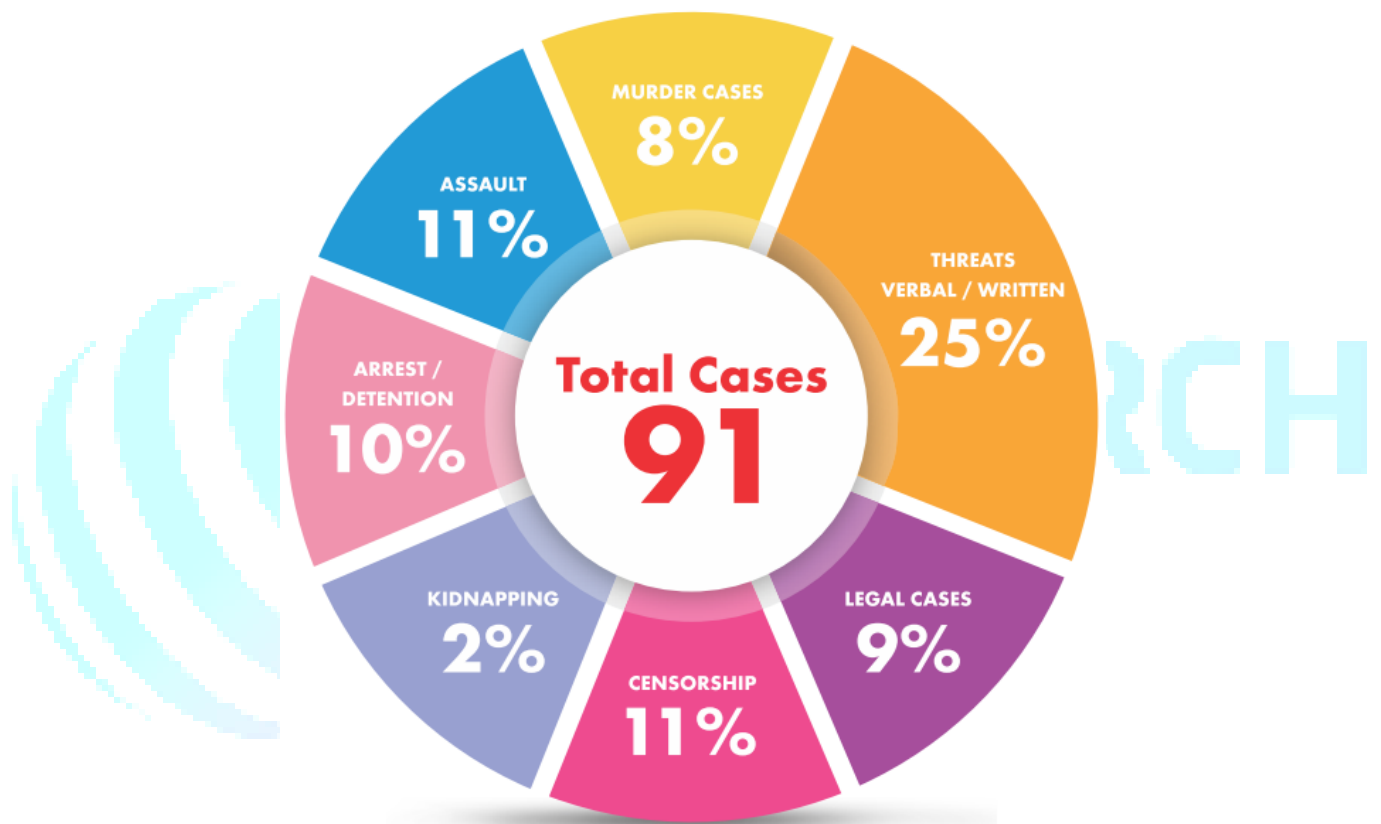


Fig-02, DOI: <https://www.dawn.com/news/1553468>

Furthermore, scholars have argued that data journalism can undermine long-term confidence and undermine the social contract of journalism by growing reliance on centralized sources through data subsidies (Cawley 2016; Tandoc and Oh 2017). If data journalism's ability as a leap forward and a bulwark against eroding confidence is to be fully realized, its manifestations must be carefully studied. Numerous researchers have recently examined data journalism material, but the majority of their study has centered on

submissions to award programs (e.g., Appelgren 2018; Loosen, Reimer, and De Silva-Schmidt 2017; Ojo and Heravi 2018; Young, Hermida, and Fulda 2018), which reflect ideal-types rather than the day-to-day work people are subjected to on a daily basis (Stalgh 2017; Wright and Doyle 2018). As a result, scholarly comprehension of what is referred to as "general data journalism" (Uskali and Kuutti 2015, 87) remains minimal, especially in the United States. This article fills the void in the literature by analyzing the characteristics of

more common, everyday data journalism provided by The New York Times and The Washington Post in the first half of 2017. It analyzes over 150 data journalism papers for story characteristics related to the principles of transparency, interactivity, diversity, and content provenance. In general, it concludes that contemporary data journalism is neither straightforward nor collaborative, though it is more complex than its nearest counterpart and perhaps more open to institutional channels and intelligence subsidies. As such, it has a long way to go until it can match the hope and idealization that mark the data turn in journalism in general.

4.1 Skills Required for Data Journalism

The abilities needed by employers to excel are evolving. The primary skill required for reporting today is making sense of big data, mostly unstructured data. In the growing quantity of digital information globally, a data journalist must be able to curate, check, interpret and synthesize the data set, have meaning, transparency, and locate the truth. It does not substitute traditional journalistic skills; however, it takes new skills to find, understand, and evaluate, visualize, and program data. Journalists today need an overlapping collection of competencies taken from multiple areas. They should have experience and information of social sciences' mathematical techniques, GIS mapping software, statistics, and graphic design simulation arts, and a variety of

computer scientists' talents that have their work requirements and promotion tracks: web creation, general-purpose computing, database management, device engineering, data mining (even, cryptography). So, today's journalist is a full kit of a statistician, a software engineer, a storyteller, and an infographic artist. Data is so easily accessible and so strategically relevant that information is the terrifying thing to derive insight from it. Overall, since gold may be mined, a goldmine is not worth much. Today, the secret to technical excellence in media is competence in information technology, computer analysis, analytics, and machine learning algorithms. A data journalist should be able to investigate news reports from datasets in making news, build a broader image by linking the datasets, look for trends in issues-events and behavior, examine data behind the stories, connect data to reports, contextualize stories, publish story datasets, and present graphic representation of knowledge in making news. Also, a data journalist should have the following skills: the ability to differentiate between 'data' and 'plot'; literacy in statistics and computation; the ability to recognize precisely how the quantification method works in society; the ability to mix technical and journalism skills; the ability to locate data to justify stories; the ability to find story suggestions by data analysis; the capacity to operate with complex datasets.

**MOST DANGEROUS REGIONS IN PAKISTAN FOR JOURNALISTS
(May 2019-April 2020)**

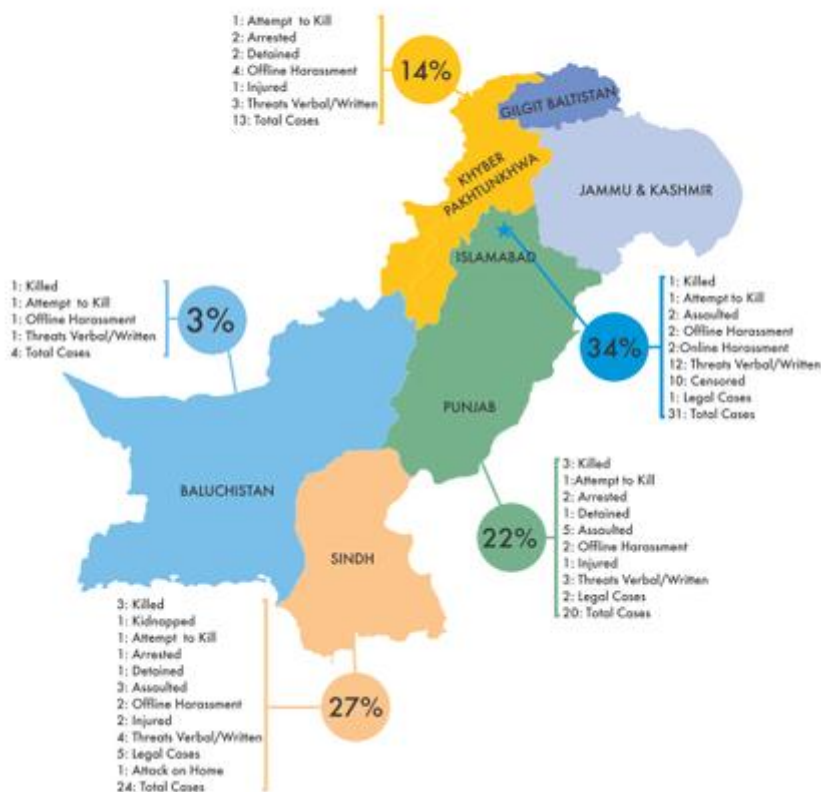


Fig-03, DOI: <https://www.dawn.com/news/1553468>

4.2 Locating Data Journalism in Pakistan

The key indicators for assessing the state of digital media and the journalistic machine field in a given country are changing news patterns, practices, and organizations. The conventions and practices vary according to the journalist's technical credentials and abilities, the tools and techniques used, and the organizational goals. Numerous informal in-depth experiments were conducted among mid-career and senior journalists based in Dhaka, Pakistan's capital. Additionally, it aided in the explanation of the phenomenon by an unstructured analysis of news stories published in Dhaka-based newspapers. In Pakistan, data journalism is still uncommon, as is the country's computer journalism market. Journalism of data is

in its infancy. Occasionally, though more often, the Pakistani media makes news contingent on outcomes. However, they are not investigating the environment in a focused manner. Also with meticulous data processing, though, there is no in-depth investigative reporting. In certain examples, Dhaka-based news organisations compile stories using data collected by international institutions such as the World Bank and the WHO. Numerous data-driven tales are told about business and economic issues, as well as sports storytelling. The Pakistan Treasury, the Pakistan Bureau of Statistics, and several other government agencies are important sources of data for the tales. However, efforts to correlate/combine data from

different datasets in order to create an interesting discovery are not evident in news accounts. Meanwhile, often evidence-based terms do not accurately describe what data journalism may be. Since data journalism is about more than crunching numbers and presenting them in interesting ways, the story is more important than data analysis and presentation alone. Access to

open and public data is critical for accurate data journalism. In Pakistan, access to free knowledge is extremely restricted. Data journalism practice in the country is often hampered by a lack of clear access laws, extremely confusing, chaotic, often poorly organized public records, and low information literacy.

MOST TARGETTED MEDIUMS IN PAKISTAN
 (May 2019-April 2020)

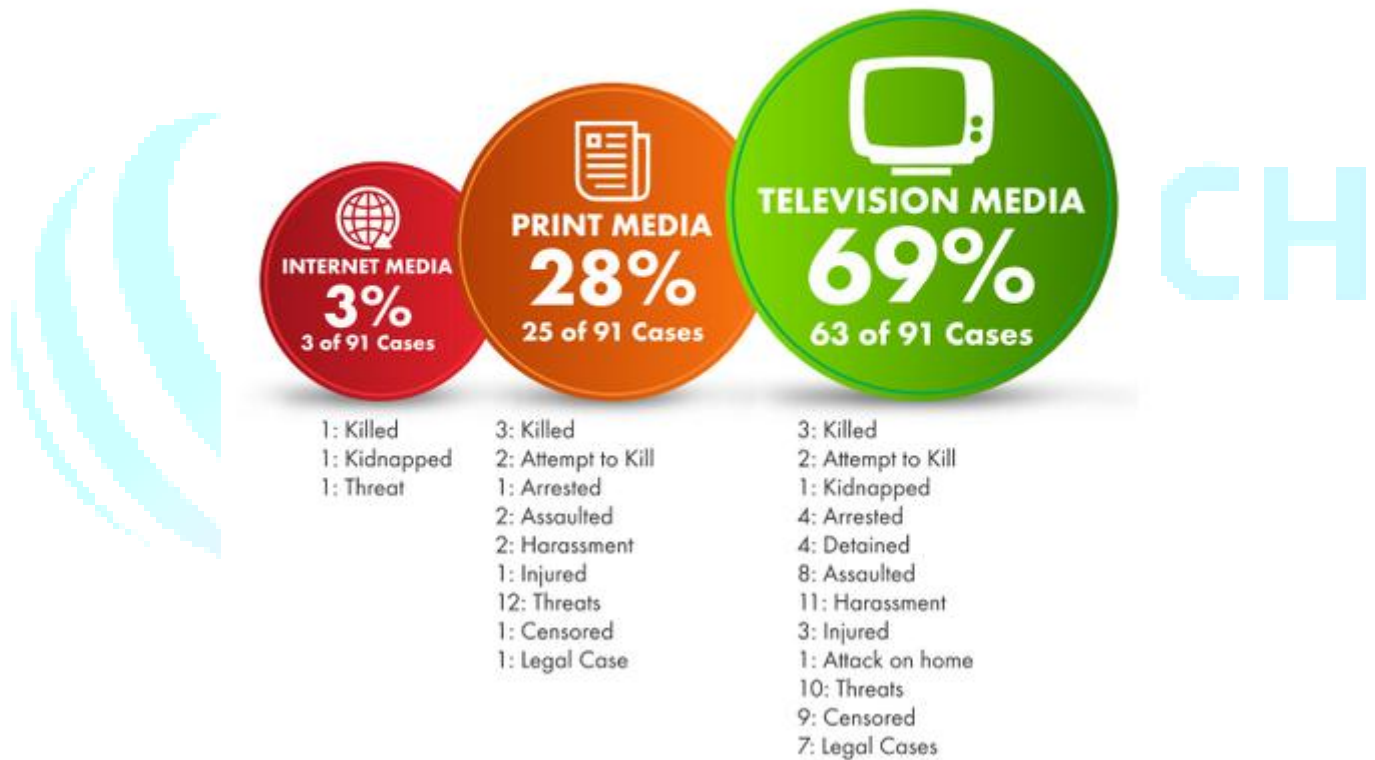


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Meanwhile, one of the major challenges facing data journalism in Pakistan is a climate of cynicism. Both government officials and the news media, there is mutual distrust. Journalists often suspect officials of concealing information and acting in a sensitive manner, whereas officials tend to regard journalists as unnecessarily

inexperienced while sharing facts and proof. On the other side, conventional media outlets seldom cover technology news and are yet to embrace data journalism. Numerous major news organizations believe that offering research and data is technically unsustainable. At the bottom of the perplexing analytical tables. It would add to

the process of uncovering stories by putting statistics into context and comparing them to findings. Journalists can study the tales behind the truth, how to view them, and how to use them. Interviews with journalists show that, when

confronted with a mountain of data, many are unsure how to translate it and transform it into a story. They face significant challenges such as a shortage of time and planning, as well as the rise of data journalism skills.

**THREAT ACTORS TARGETING JOURNALISTS IN PAKISTAN
 (May 2019-April 2020)**



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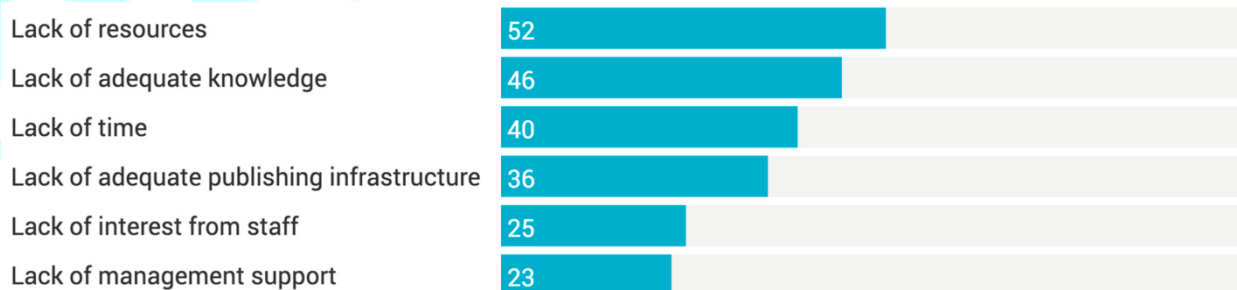
5. Conclusion

The ability to record information is one of the dividing lines between primitive and modern societies. Early civilizations used written language to quantify, record, and later recover reality, which facilitated data processing. The core principle of big data is a continuation of humanity's ancient task of quantifying, composing, and evaluating the earth. Tectonic advancement has occurred in the philosophical foundations of collecting and retrieving facts and

judging the universe's reality. The shifts are as follows: from causation to correlation, from a world governed by theory to one directed by fact, from the pursuit of causality to the pursuit of computation and quantification, and from reliance on normative judgments to reliance on empirical proof. Historically, we have sought to provide a foundation through the discovery and reflection of evidence. Although our minds, reasoning, and logical processes have been conditioned to seek out the cause of problems, events, and actions in

our environment. However, big data enables the identification of patterns and parallels of global phenomena. The parallels may not explain why this is occurring, however they do alert us to the fact that it is. Big data is concerned about the where, not the why. The root of a phenomenon is not always necessary; therefore, we can allow experience to speak for itself. Human decisions are based on restricted, accurate, and ad hoc abilities. The use of vast amounts of data enables different ways of understanding and exploring the world. Quantification, the process from which information is gathered, is the first step in revealing the changes and trends within a society that can then become a tale. Utilizing information implies that there would be less guesswork on the data. A combination of tools and a sensitive mindset has enabled a new kind of reality manipulation. "In comparison to what?" is the fundamental question at the heart of quantitative

thinking. Journalism is more like a craft than a science. It is the art of sifting through, filtering out, and translating information into a labyrinth of objects. The data is then described as the information upon which we may act. With the advent of new information and networking technologies, the world is moving toward an atmosphere of open data. In the context, there are closely connected bytes and snippets of knowledge that are convenient to recreate and recombine. There are many publishers, distributors, contributors, and maintainers, many of whom are geographically distributed and autonomous. Today, we live in a numerate universe, where concepts, places, and memories have been reduced to data. In Pakistan Data Journalism is still in an probationary stage. This might be due to various reasons. Some of the reasons are illustrated below:



DOI: <https://www.mdpi.com/2673-5172/1/1/3/htm>

Data journalism has upended the traditional logic of journalism by infusing computational thought into newsrooms. Linear narrative has been transformed into a more engaging and enjoyable way of imparting information. It is not assumed that mathematics and algebra have a framework for comprehending the cosmos. Access to troves of open data enables one to understand, explain, and express reality in the digital era. According to mainstream journalism, truth is described as evidence and quotations from official sources.

However, the Internet, multimedia storage, smart computers, and open source applications have radically altered the primary features of traditional ways of recording, filtering, and disseminating news, journalistic institutions, organizational processes, distribution networks, and audiences. Journalists in the developed world are now developing news apps with interactive functionality and reporting fascinating stories by harnessing the immense volume of knowledge that enables users to feel and focus on their world, learn more detail, and act on the ideas produced

by it. Three major shifts in attitude toward data journalism have occurred: first, the capacity to analyze vast amounts of data on a topic. Second, the capacity to recognize the messy nature of proof in the natural world rather than prioritizing continuity, and third, a growing respect for correlation rather than an endless search for elusive causality. The issue is with complex data filtering and analysis. To make reliable projections, it is not sufficient to collect data; the data must be contextualized empirically such that the audience may make sense of their environment. Data-driven judgments can enhance or supplant human judgment. Individuals are compelled to reconsider their intuition as statistical experiments are conducted. The data can reveal what individuals want to know rather than the instincts of experienced journalists. One of the more perplexing aspects of dealing with data is determining who owns and produces the details. Another major issue with big data is that it raises significant concerns regarding anonymity, data ownership, and data management, since this data is entirely about people. With careless treatment of big data, it is possible to establish erroneous associations. As a result, it is possible to state the evidence exactly, accurately representing the reality. Investigative data journalism is a subset of investigative reporting that incorporates data journalism with investigative reporting. The investigation of vast volumes of textual or financial data is an example of investigative data journalism. Additionally, investigative data journalism may be related to the area of big data analytics, which is concerned with the analysis of massive data sets.

References

1. Gray J, Bounegru L, Chambers L (2012) The data journalism handbook. Cambridge: O'Reilly.
2. Ausserhofer, J (2015) 'Die Methode liegt im Code': Routinen und digitale Methoden im Datenjournalismus. In: Maireder, A, Ausserhofer, J, Schumann, C, et al (eds) Digitale Methoden in der Kommunikationswissenschaft. Berlin: Digital Communication Research, pp. 87–111. Available at: <http://dx.doi.org/10.17174/dcr.v2.5>
3. Baack, S (2013) A new style of news reporting: Wikileaks and data-driven journalism. In: Rambatan, B, Johanssen, J (eds) Cyborg Subjects: Discourses on Digital Culture. CreateSpace Independent Publishing, pp. 113–122
4. Rogers S (2013) Facts are sacred. London: Faber and Faber.
5. Sato A (2014) Applied Data-Centric Social Sciences Concepts, Data, Computation, and Theory. Japan: Springer.
6. Shabbir, T., M Nadeemullah. (2020). Impact of 'Open Data' and its Effectiveness for Pakistan Social Issues: Learning from the UK Experience, 25(1), 253-272. Retrieved from <https://journal.psc.edu.pk/index.php/pp/article/view/395>
7. Herzog D (2015) Data literacy (1stedn), New York: SAGE Publications, Inc.
8. Hilbert M (2015) Big Data for Development: A Review of Promises and Challenges. Development Policy Review 34: 135-174.
9. Bhadani A, Jothimani D (2016) Big data: Challenges, opportunities and realities, In: Singh MK, Kumar DG (eds.) Effective Big Data Management and Opportunities for

- Implementation. Pennsylvania, USA, IGI Global, pp: 1-24.
10. Dumbill E (2013) Making Sense of Big Data. Big Data 1: 1-2.
11. Pentland AS (2014) Living Big Data.
12. Shmueli G (2016) Analyzing Behavioral Big Data: Methodological, Practical, Ethical, and Moral Issues. SSRN Electronic Journal.
13. Zwilling M (2018) What Can Big Data Ever Tell Us About Human Behavior?
14. Baez S, García A, Ibáñez A (2018) How Does Social Context Influence Our Brain and Behavior?. Frontiers For Young Minds.
15. Mayer-Schonberger V, Cukier K (2013) Big data: A revolution that will transform how we live, work, and think, London, John Murray.
16. Sinclair TM (2015) Economic Forecasts in the Age of Big Data.
17. Shabbir, T., Mohsin, & Auj E Kamal. (2020). Use of 'Open Data' in Urdu Literature Research and its Effectiveness. Liberal Arts and Social Sciences International Journal (LASSIJ), 4(1), 219-230. Retrieved from <http://journals.pu.edu.pk/journals/index.php/jms/article/viewFile/3734/1824>
18. Arsenault A (2017) The datafication of media: Big data and the media industries. International Journal Of Media & Cultural Politics 13: 7-24.
19. Lycett M (2013) 'Datafication': making sense of (big) data in a complex world. European Journal Of Information Systems 22: 381-386.
20. Mayer-Schonberger V, Cukier K (2013) Big Data: A Revolution That will Transform How We Live, Work, and Think, UK: John Murray (Publishers)
21. Shabbir, T., Abro.M. (2019). Impact of 'Open Data' on 'News Media' and its Effectiveness in Social and Political Development of Pakistan (A Case Study from UK Perspective). Dialogue, 14(3), 161-171. Retrieved from <https://ideapublishers.org/index.php/lassij/article/view/163/99>
22. Parasie S (2014) Data-Driven Revelation? Epistemological tensions in investigative journalism in the age of "big data". Digital Journalism 3: 364-380.
23. Hilbert M, Lopez P (2011) The World's Technological Capacity to Store, Communicate, and Compute information. Science 332: 60-65.
24. Marr B (2018) How Much Data Do We Create Every Day? The Mind-Blowing Stats Everyone Should Read.
25. Lewis S (2014) Journalism in an Era of Big Data: Cases, Concepts, and Critiques. Digital Journalism 3: 321-330.
26. Lewis S, Westlund O (2014) Big Data and Journalism. Digital Journalism 3: 447-466.
27. Meyer P (2002) Precision Journalism: A Reporter's Introduction to Social Science Methods. Lanham (Maryland): Rowman & Littlefield.
28. Lun K (2018) The Datafication of Everything - Even Toilets. Yearbook Of Medical Informatics 27: 234-236.
29. Fritsch K (2018) Towards an Emancipatory Understanding of Widespread Datafication. SSRN Electronic Journal.
30. Schudson M (1999) The New Journalism. In: David C, Paul H (eds.) Communication in History: Technology, Culture and Society, New York: Longman
31. Houston B (2003) Computer-Assisted Reporting: A Practical Guide. New York: Bedford/St. Martin's.
32. Meyer P (1991) The new precision journalism. Bloomington: Indiana University Press.

33. Appelgren E, Nygren G (2014) Data Journalism in Sweden. *Digital Journalism* 2: 394-405.
34. Anderson C (2012) Towards a sociology of computational and algorithmic journalism. *New Media & Society* 15: 1005-1021.
35. Vallance-Jones F, McKie D, Wolfe-Wylie W, McGregor G (2017) *The Data Journalist: Getting the Story* (1st ed.). Oxford: Oxford University Pres.
36. Shabbir, T., M Nadeemullah, & Saeed Memon. (2020). Uses and Impact of 'Open Data' Technology for Developing Social Sector in Pakistan. *Pakistan Journal of Multidisciplinary Research*, 1(1), 50-64. Retrieved from <https://www.pjmr.org/pjmr/article/view/24>
37. Porlezza C, Porlezza C (2018) How Data Journalism Is Changing Newsrooms... Slowly.
38. Hermida A (2010) Twittering the News - The Emergence of Ambient Journalism. *Journalism Practice* 4: 297-308.
39. Mai J (2016) Big data privacy: The datafication of personal information. *The Information Society* 32: 192-199.
40. McFarland D, McFarland H (2015) Big Data and the danger of being precisely inaccurate. *Big Data & Society* 2: 205395171560249.