

Article

Exploring the Awareness and Implementation of Data Journalism in Malaysian Online Newsrooms

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Received: 13 August 2024

Accepted: 30 September 2024

Abstract: This article is a study about the importance and significance of data journalism in the digital media. As the era of digital advancement takes over almost all industries, it could be seen that data is proliferating in the ways many jobs work. However, study shows that industries that heavily rely upon data, such as the online newsrooms, pay insufficient attention to data journalism. This research is aimed at studying and evaluating the surfeit awareness and practice of data journalism in online newsrooms in Malaysia. This paper employed convenience sampling, selecting five editors-in-chief from different online newsrooms in Malaysia for in-depth interviews. This method was carefully selected based on the accessibility of these individuals, given their high-ranking positions in their respective news organisations. Data was analysed using thematic analysis, identifying patterns from the interview transcripts to understand how data journalism is understood and implemented. The findings of this study show that some of these newsrooms see any story involving data as data journalism, while some perceive data journalism as more towards investigative journalism involving overhauling projects. This shows that even though these newsrooms recognize the existence of data journalism, their depth of understanding the principalities of data journalism varies. If anything, this study would potentially be a practical guide to implement data journalism in the Malaysian online newsrooms.

Keywords: Data; journalism; digital; media; newsrooms; online

Introduction

Among its numerous meanings, "data journalism" is defined as "a story told through data," According to Bahareh (2016), finding stories in data – stories that are of interest to the public – and presenting these stories in the most appropriate manner for public use and reuse. Future journalists must give primary attention to data journalism (Gray et al., 2012). Authors and contributors are confident that the media in the future would require journalists to know, understand or at least be aware of data journalism. Malaysia's diverse linguistic media landscape has seen an increase in the use of social media platforms such as Twitter, with 13.18% of Malaysians actively engaging on the platform as of 2019 (Statista, 2019). Moreover, a recent survey by the Reuters Institute Digital News Report (2020) indicates that 86% of Malaysians receive their news through online platforms, yet the adoption of data journalism remains inconsistent across newsrooms. Even with the proliferating global shift towards data-driven journalism, Malaysian online newsrooms struggle with its execution, largely due to a lack of training, resources, and understanding.

Data journalism became popular in the early 2000s when technology saw an upsurge. Data collection, visualization and analysis are demanding practices of data journalism in today's age. Distinct challenges consist of data quality, technical skills, accessibility, ethical concerns, resource constraints, and audience engagement. The practices of data journalism in Malaysia differ, with some online newsrooms religiously

using data to empower storytelling, while some others struggle due to limited resources and technical expertise. In order to fill the research gap, this study examines the use of data journalism and its awareness in Malaysian online newsrooms, with the goal of comprehending the obstacles and viewpoints of those involved. By interviewing editors-in-chief, the research provides insights and guidelines for effectively integrating data journalism in Malaysia's diverse media landscape. According to Hand and Adams (2015), data journalism is still quite cryptic and the level of awareness of it among the public especially online newsrooms is questionable.

The objective of this study is to identify the awareness and practice of data journalism in the online newsrooms in Malaysia. This study implores whether the online newsrooms in Malaysia are inculcating data journalism in their daily news practices. Another objective of the study is to determine the significance of data journalism to Malaysian online newsrooms. The third objective is to examine the challenges the selected online newsrooms in Malaysia face in data journalism. It requires great skills to scrape news from datasets and form that into a newsworthy story (Hand & Adams, 2014). Keeping these things in mind, this study hopes to point out the level of understanding and execution of data journalism among the online newsrooms in Malaysia.

The research objectives of this study are rooted in the need to assess the awareness, practice, and challenges of data journalism in Malaysian online newsrooms. As detailed out by Gray et al. (2012), data journalism is crucial in an era where public trust in media depends on factual reporting and transparency. Despite this, studies like Parasie (2015) reiterates that the rise in data journalism has not been evenly mirrored across all regions, with Malaysian newsrooms notably lagging in adopting data-driven practices. This study, therefore, seeks to evaluate whether Malaysian online newsrooms are incorporating data journalism in their daily practices, understanding its importance, and addressing the challenges they face, such as resource constraints and technical skill shortages, as highlighted by Heravi (2018). These objectives align with the current literature that emphasises the growing role of data journalism in enhancing the credibility, authenticity and integrity of news stories and filling the gap between international trends and the local context, where little scholarly work exists on the subject in Malaysia. By addressing these objectives, the study not only contributes to the understanding of data journalism within Malaysia but also provides a pedestal for future studies on the integration of digital tools in journalism, birthing the upsurge of data journalism. According to recent studies, the field of data journalism is still changing globally, and is becoming a crucial part of many newsrooms, with its discipline continues to evolve on a worldwide scale (Newman et al., 2023). Incorporating data journalism in Malaysian online newsrooms faces challenges like technical skills, ethical concerns and data accessibility. This study examines newsroom practices and provides recommendations to enhance data-driven reporting in Malaysia.

Literature Review

1. The Global Rise of Data Journalism

Traditional media such as the print played a role as the gatekeeper of everyday news, allowing only certain types of news to be covered on each print (Gray et al., 2012). On the contrary, it is a completely different game now. With the help of the internet, news is at the fingertips of each individual (Schulze, 2015). This has greatly influenced the consumption of data in journalism (Gray et al., 2012). The history of data journalism and the era in which it came into common use goes a long way back. Heravi (2018) and Uskali & Kuutti (2015), had stated in their studies that the history of data journalism goes deep and broad. Its recorded earliest use in journalism is in the 60s. In the 1960s, data journalism was known as Computer-assisted Reporting (CAR) that involved computerization of datasets to present a story. As sophisticated as it may sound, the journals also present a simpler term, precision journalism, that was coined by Professor Philip Meyer in the late 20th century, which also refers to data journalism in its broader sense (Siliconrepublic, 2016).

According to Uskali-and Kuutti (2015), data journalism is as simple as journalism with data. The authors simplified the term to a story that involves any form of data to propel the intended message. However, according to Heravi (2018), the term was coined not in the late 90s, and the work or discussion of the term has only surfaced in the last 10 years. The author believes that this notion, especially determining the earliest

use of data and its relativity to the current times, is a work in progress, which needs relentless compelling and intricate research. Data journalism has a bright future ahead of it and is predicted to play a big role in journalism. The demand for journalists with data abilities will rise as technology develops more. It is expected that narrative journalism and data journalism will coexist, offering a holistic method of news reporting.

2. Challenges in Implementing Data Journalism

The growth of data journalism and discussion on its work ethics and practices came by leaps and bounds slowly but surely (Ausserhofer et al., 2017). The rapid growth of this intended much scholarly work to be upheld to fill in the research gap and innovate more efficient data journalism work protocols. The authors have also stated in the research paper that the increase in the number of literatures on data journalism since the beginning of 2010 showed the importance of conventions and healthy discussions about data journalism. Healthy narratives around the topic data journalism in great volumes are the need of time. This study is hoped to fill that gap. For stories to remain real, transparent, and credible, data journalism is essential. Claims that are supported by evidence are more likely to be true and are therefore more difficult to refute.

Data visualisation, like infographics, effectively engages the audience and promotes openness by giving information that is easily understood and accessible. Incorporating data into journalism is perceived as a means of ensuring accuracy and legitimacy, prioritising facts above opinions (Gray et al., 2012, p. 4). Because of the ease of access and creativity of information available in the modern digital world, data journalism is becoming more and more relevant. Data journalism has grown dramatically as a result of the easy access to information provided by digital devices like smartphones and the internet, which has been made possible by technological progress and advancement. Uskali and Kuutti (2015) state that data journalism can be divided into at least two primary streams shining light on the many techniques and approaches applied in the area.

3. Data Journalism in Malaysia

According to a study by Mitchell et al. (2015), social media networks such as Twitter and Facebook now serve as a source of news more than the traditional media. The rise comes from more current users sharing and retweeting news coverage on these platforms rather than large increases in the user base overall (Mitchell et al., 2015). The proliferating use of social media for news consumption has greatly influenced data integration in news as data and social media are closely intertwined (Goldacre, 2008).

While the global relationship between social media and data journalism is well documented, its specific role in Malaysian journalism requires further emphasis. Studies such as the Reuters Institute Digital News Report (2020) reveal that 70% of Malaysians rely on social media for news consumption, positioning platforms like Facebook and Twitter as key sources of information. However, local research on the influence of social media in Malaysian journalism is limited. Pronounced exceptions include Kuang (n.d.) work on data journalism, which highlights the increasing potential for social media to magnify data-driven stories in Malaysia's multilingual media fraternity. This study aims to build on this foundation by exploring how online newsrooms in Malaysia integrate social media and data journalism, addressing a significant gap in the current literature. According to Heravi (2020), data journalism is constantly becoming significant, as newsrooms adapt to new technological advancements.

To amplify the importance of data journalism and social media networks, one has to first learn the total number of users of these platforms. For the sake of a case study, let us look at Twitter. It has 330 million users worldwide as of the first quarter of 2019, leading the United States as the biggest Twitter market worldwide (Statista, 2019). It is expected that the total number of Twitter users might reach 59.6 million in America alone by 2022 (Statista, 2019). In Malaysia alone, the statistics show that there are 1.5 million more users on Twitter now than 2014, summing up to 2.4 million users, which is about 13.18 percent of Malaysians are on Twitter. Mitchell et al. (2015) found that the number of social media users utilise social media platforms as the main source for news is increasing.

Methodology

The primary respondents of this study are online newsrooms in Malaysia such as *MalaysiaKini*, *Vanakkam Malaysia*, *Twentytwo13*, *Berita Harian*, and *The Star*. An in-depth interview with the respective editor-in-chief or co-founder of these enlisted newsrooms were undertaken. The informants have been represented in the following manner for the purposes of the study:

- i. Co-founder and Editor of Twentytwo13 (*Informant A*)
- ii. News Editor at Berita Harian (*Informant B*)
- iii. News Editor at Vanakkam Malaysia (*Informant C*)
- iv. Former Sub-editor at The Star, (*Informant D*)
- v. Co-founder and Editor-in-Chief of Malaysiakini (*Informant E*)

The candidacy for the interviews were structured on the basis of the positions and skills of the interviewees. These candidates are in the best position to speak on behalf of a wider community representing the journalists. This method of in-depth interviews was chosen due to the amount of clarification the candidates who are in the best position to speak for their newsrooms relating to the work protocols and their subordinates can produce in a conversation. This paper in particular uses the convenience sampling method for data collection. In-depth interviews were conducted to collect data for this research. Editor(s)-in-chief and or founder(s) of online news organizations in Malaysia were interviewed elaborately to understand their stand in data journalism in order to evaluate the awareness of people in position. The interviews helped understand the level of practice these organizations invest in inculcating data journalism in their daily journalistic practices.

According to Business Research Methodology (n.d.), this method is used to negotiate easy access to informants in a study. This method also allows the researcher to use his/her wisdom in selecting the informants. However, there is a problem using this method. According to this blog, the convenience sampling method does not represent the entire community. For instance, in this study, the five selected informants' opinions and comments do not necessarily speak for the larger community of journalists in the online newsrooms in Malaysia.

The study adopted convenience sampling mainly due to the accessibility challenges posed by the high-ranking positions of the Editors-in-Chief participated. While purposive sampling could have ensured a more targeted selection of participants with specific characteristics, convenience sampling was more viable due to the limited availability of Editors-in-Chief for in-depth interviews. The decision was driven by the difficulty of gaining access to top-level editorial staff, as many were often unavailable or unwilling to participate in the study. Convenience sampling allowed the researcher to engage with those who were most accessible at the time, ensuring that data collection could proceed without significant delays. Furthermore, as the Editors-in-Chief chosen were already highly knowledgeable about their newsrooms' operations, this method was deemed to provide meaningful insights into the practice of data journalism among the online newsrooms in Malaysia.

Thematic analysis was employed for the analysis of the data to systematically recognise patterns across the interview transcripts. The process started with familiarisation, where the interview recordings were transcribed and carefully reviewed. Right after that, coding was done, where relevant segments of the interviews were highlighted based on recurring practices or ideas related to data journalism. These codes were then grouped into broader themes that aligned with the research objectives. For instance, codes related to the challenges of executing data journalism were organised under a theme such as "challenges".

NVivo 12 software was used to facilitate the coding process, allowing for more structured and efficient organisation of the qualitative data. The software enabled the management of large amounts of text, making sure consistency in identifying and grouping codes. Themes were developed iteratively, with initial codes being refined and reviewed to ensure the accuracy of the represented data. This strategy ensured a thorough structure for comprehending the range of perspectives on data journalism across the participating online newsrooms.

Findings

The thematic analysis highlighted three major themes: data journalism awareness, practices, and challenges.

1. Awareness of Data Journalism Among Malaysian Online Newsrooms

The theme is about identifying the understanding level of online newsrooms about the practices of data journalism. The questions for the theme were carefully curated to help understand if the online newsrooms were aware of data journalism and its usage. They reflected that they, to the most part, understand and are aware of data journalism and its practices. Keeping in mind that the level of awareness about data journalism directly impacts the integration of data-driven storytelling of an organisation, the online newsrooms that are aware about it and its usage are gaining momentum and inspiration to provide readers with compelling stories with deeper insights and more evidence-based reporting. This theme explores the awareness level among journalists and editors, perpetuating insights into how data journalism is perceived.

“To be very honest, data journalism is journalism. It's as basic as that is just a fancy term used today. But we've been practicing data journalism for the longest time, as far as I'm concerned.”

(Informant A)

Informant A simplified the term data journalism to a story that involves any form of data to propel the intended message. He agrees that data journalism exists and is unequivocally pivotal.

“...Data journalism is something based on numbers and public opinion polls, which is mostly based on statistic-based reporting. Actually, we didn't have any demarcation of this data journalism because it's part of journalism altogether. So, only recently they separated this thing, and distinctively segregated it into different things...”

(Informant B)

Informant B resounds that data is essential for accuracy and incorporating data in daily news reporting has always and should be the way forward in journalism.

“...In my opinion, data journalism is a form of reporting using data, facts and figures. It is essential for the current technological era, especially online news channels. Why? Because the media has seen a dramatic growth in recent years. Media in yesteryears was about big stories, but now stories are presented in shorter forms for the convenience of the readers...”

(Informant C)

On the contrary, Informant C's opinion on the meaning of data journalism was quite mainstream. He referred to data as anything factual and numerical.

“...Data journalism, most say earlier, I would think, right to do with data, research work, or infographics that are made simple and conveyed to the public. So, it's easily understood like pies, charts, bars, infographics, as I said. Anything that is visually appealing to the public. Maybe print or any type of media...”

(Informant D)

Informant D stated that data journalism was a visual approach to a compelling story. This candidate was very concise in his answer that he said any visual attachment that helps a story stand out and speak to the target audiences effectively is data journalism.

“...It's like going through tons of data. In the old days, you would have to go through volumes of records, statistics and look through them to make a sense of it, pulling it out together to see if there is any connection. Data journalism is not new in that sense...”

(Informant E)

This informant agreed that infographics and other visuals help data journalism in formatting the message concisely and it does not sum up data journalism. An editor-in-chief and journalist for many years and a man of prominence in the field of data journalism, he explicitly unveiled the forms of data journalism and its definition in his opinion.

2. Practices in Daily Online Newsrooms

The theme seeks to gain insight into how online newsrooms in Malaysia integrate data journalism in their daily practices. Granted, online newsrooms use a myriad of techniques that embody both traditional norms and digital era changes on a daily basis, it is inevitable that these techniques directly impact how news pieces are picked, prepared, and distributed to an increasingly tech-savvy consumers. This theme is on the editorial decision-making procedures, workflows, and digital tools that are critical to the daily production of news using the syntax of data journalism.

"...Journalism is based on data. You know, without data, you can't write a report. Data has always been there. And data is the basis of journalism. Without data there's no journalism..."

(Informant A)

Informant A does not believe in the term data journalism from being separated from journalism. According to Informant A, data journalism is journalism and that they are no separate entities; they exist within themselves.

"...I can't speak on behalf of all the newsrooms but based on my observation. A complete newsroom today should also have podcasts. A complete newsroom today should also have videos..."

(Informant B)

This candidate knows what data journalism is and has a strong opinion on its definition. He comes across quite assertively on his perspective of data journalism and its work practices within his online newsrooms.

"...Our main goal here at our online newsroom is to produce news as accurately and as quickly as possible to the target audiences. Because there is a lot of competition among the online newsrooms in Malaysia..."

(Informant C)

This informant observed that he and his newsroom are aware of the existence of data journalism. For him, data journalism is no different to the 'normal' stories that they present every day using data for their online newsroom.

"...We incorporate data journalism in our news every day. There's infographics, there's pictures, to illustrate the point, to make things simple, especially like, if you use it in the budget. Budget visuals will help people to understand exactly what is in store for them in comparison to just reading about it. So visuals play a very, very important role to the reading public..."

(Informant D)

Informant D understands the visibility of data journalism. He is rest assured that his staff and the rest of the Malaysian online newsrooms have also jumped on the bandwagon who understand data journalism and its relevant work practices in their newsrooms.

"...We have a data journalist and I think MalaysiaKini is unique in that sense. We are one of the very first in Malaysia that was involved in data journalism. I think a lot of that is because of our work with ICIJ. That was like five six years ago. Somehow, we decided that this is the area that we should get into..."

(Informant E)

Informant E said the awareness of data journalism in his newsroom is far higher than any others in Malaysia, simply because of their involvement in heavy data journalism with the ICIJ.

3. Challenges Faced by Online Newsrooms to Adopt Data Journalism

Online newsrooms face several challenges despite its potential to enrich storytelling and improve news trustworthiness. Some newsrooms are not able to fully integrate data into their reporting due to these

constraints being both institutional and resource-based. Financial and technical constraints, limited access to data sources, and a scarcity of skilled data journalists are all major obstacles. This theme delves into the specific challenges that limit widespread adoption of data journalism, identifying the need of training, infrastructure investments, and organisational support in overcoming these barriers and enabling more data-informed journalism practices.

“... if you have the capabilities, if you have the manpower, and if it makes monetary sense for you to expand, and go into it, and so be it? Because for the newsrooms, that data that they harvested...you see, what happens is this, if I run a full-fledged newsroom, which is you know, I've got like, manpower of hundreds. My marketing team will come up to me and say that they can monetize the data that we just harvested. And we just put it out there. Because that's the monetization plan for the industry...”

(Informant A)

Informant A's answer to the advantages and disadvantages of data journalism is seen to be quite ambiguous.

“...The disadvantages like what I said can be manipulated, the results can be manipulated. Advantages are I mean, some people, you really don't know about government policies. They want to have a community centre, this and that centres and places, they generally make a policy at decision level and then on the ground, they wouldn't know about it. So this someone has to go and get the data from there to go down and get...”

(Informant B)

The answers of this candidate to the importance of data journalism were quite laconic. He kept reminding the readers that data journalism is no different to journalism.

“...The watchword of online newsrooms is accuracy and quickness. News must be produced keeping in mind those components. The difference with the print media is that they have time to produce a story. However, online media is privileged in the sense that there are so many developments within the media setting due to the development of technology...”

(Informant C)

According to this interviewee, data journalism is important to develop stories that are accurate and quick. He mentions that online newsrooms are constantly under pressure to publish swiftly without sacrificing factual accuracy, in contrast to traditional media, which permits more time for reporting process. According to him, data journalism helps journalists meet this need, expediting fact-checking and bolstering evidence-based reporting. The interviewee highlights that data journalism is not only useful but also important for creating timely articles that meet the audience's accuracy expectations.

“...It's very hard to break it up because it is a necessity to have it. It is, it's not whether I like ice cream or not, it is what it is, we need the info to be... It is a medium of a tool itself on its own. You know, it's, it's a, I would say that if you want to bring your story across, you must use it whether you like it or not...”

(Informant D)

This candidate is somewhat unique and has added value to this research. His point of views is quite eccentric and different to the rest of the candidates.

“...I am not too sure if there's any disadvantages. I mean there's a lot of advantages. I think data journalism is part and parcel of investigative journalism and we all know how important investigative journalism is. It is a way for us to pool massive data together to make sense out of it. Disadvantages I guess there's a lot of investment to get it through...”

(Informant E)

Informant E mentioned that the newsrooms in Malaysia must begin giving more attention and importance to data journalism since journalism is leaning more towards data journalism, in his opinion.

Discussion

The findings could be summarised that the online newsrooms are widely aware of data journalism and its practices in the Malaysian media landscape, the importance of integrating that in their daily news practices, and the challenges limiting them to expedite the pursuit. The theory of the study echoed the content of the finding. The informants' responses allowed a horizon of perspectives. Their multifaceted discussions and opinions allowed for an open-ended takeaway. It could be seen to aid us view the status of data journalism among the Malaysian online newsrooms through a sophisticated lens. Their perspectives may have differed throughout the interviews, however, all six (6) informants shared a common ground in exhibiting their understanding towards data journalism. Despite their communal differences in terms of conspicuous perspectives, one stand they all took sternly was that the online newsrooms in Malaysia do understand data journalism and that they do their best to practise it in their newsrooms.

It was found that the informants were definitely aware of the existence of data journalism. The questions asked to the informants during the interview in tandem with this theme were the definition of data journalism and if the informants' online newsrooms practise data journalism. The informants had varying answers to the definition of data journalism. Informants A and B mentioned in their in-depth interviews that data journalism has existed for as long as journalism existed. Their points came across assertively that journalism and data journalism are just two different terms that were coined recently and that it does not make any difference to its syntax within the regime. According to informant A, data journalism is part of journalism and it is only fair to say journalism as a whole for both the practices as they are not distinctive to each other. He mentioned that there is no need to build hype at the word data journalism as it has been in practice for as long as journalism and reporting have existed and it might have just gotten an appreciation in the recent times, but that does not change the syntax of it.

Informant A's response to his opinion on the definition of data journalism was that it is no different to journalism and the syntax of data journalism is parallel to the niche pedagogy of journalism. He mentioned that journalism and data journalism cannot be separated into two distinctive entities. The both interesting and intriguing part of that interview with Informant A was that his arguments and points came across quite assertively. To my follow up question from his answer above, *"But you just spoke about methods of disseminating the messages. Can you please explain more about that? Like, what do you mean by different methods, as opposed to normal data, normal journalism?"* received a thought-provoking response that resonated with Howard (2014)'s take on data journalism. His response was that, *"Again, there is no such thing as it is only journalism in my book in my dictionary, there's only journalism."*

The second finding is identifying the level of importance online newsrooms in Malaysia give to data journalism. It could be observed through the interviews and findings that the informants as a representative of their respective newsrooms spoke on behalf of the wider community comprising journalists, editors, editors-in-chief, consumers, public and many more that they understand the importance of data journalism, hence, they inculcate it in their news productions. In a nutshell, the informants were confident that they inculcate data journalism in their news practices as they understand its importance. This goes to show that the informants agreed to the notion that data journalism is important, especially in the current media fraternity.

The challenges put forth by the informants during the interviews were mostly about lack of training and resources, while some disregarded the question as they said that data journalism is no different to journalism. Their ideology was that if data journalism is hard and if journalists are taking a step back to doing it then it should not be a specific problem pointed towards data journalism alone but journalism as a whole. They highlighted the fact that most of the journalists in their respective online newsrooms were short of training and resources that have caused them to slack in pursuing data journalism. For an example, Steven Gan, Co-founder and Editor-in-Chief of Malaysiakini, said that inadequate training and resources are the main reasons for the journalists to be less confident when it comes to practicing data journalism. However, he has also mentioned that he has a distinguished department of data journalism in his newsroom that is run by two data journalists who have pursued their tertiary education in data journalism in the United Kingdom. On the contrary, one of the other informants, Magendran Rajagopal, News Editor at Berita Harian, said that data journalism is otherwise a part of journalism and since he does not consider data journalism as a separate

subject or entity apart from journalism, he sees challenges related to data journalism a direct trajectory towards journalism as a whole.

In terms of practices of data journalism in their respective newsrooms, it could be seen that the informants understood the importance of data journalism and its timely adoption into the current online newsrooms. They were vocal that data is heavily and inevitably incorporated in online platforms. This means data journalism among online newsrooms is needed more now than ever. The informants were clear of the importance of data journalism especially in the era of digital advancement. Most of them could be seen practicing data journalism in their newsrooms. It could be seen that the informants are also aware of the challenges that come with data journalism. They are aware of the risks, advantages, and disadvantages of data journalism. Most of the informants reacted that there are more advantages than disadvantages of data journalism. Having said that, it could be seen through the interview that the informants are ready to overcome the challenges and adopt data journalism in their online newsrooms in a more expanded manner.

MalaysiaKini is one media in particular that has published an impressive investigative story based on data. Significant investigative reporting has been actively undertaken by this online newsroom; one example of this is their partnership with the ICIJ on the Panama Papers. This data-driven study demonstrated how data journalism can bring transparency to important problems by revealing sensitive information about prominent persons in Malaysia as well as offshore tax havens. By providing real-world instances of situations where data journalism has made a noticeable difference, such examples could support the conclusions made in the discussion.

According to the theory of technological determinism, advancements in technology influence society and lead to changes in a variety of industries, including data journalism. This notion is well supported by the interview responses. Informants emphasised repeatedly as to how newsrooms have adopted data journalism because of digital advancements. For example, Informant C talked about how the pressure of a competitive digital market has led online newsrooms to prioritise the timely production of reliable news. The assumption that new technologies are changing the way information is disseminated to the public is reinforced by Informant D's remark regarding the growing usage of infographics and visual data in reporting.

Nonetheless, certain aspects of the results cast doubt on technological determinism. Certain informants, such as Informant A, believed that data journalism was not essentially innovative, but rather an advancement of conventional journalism. This implies that while technology might improve journalistic methods, fact-checking, accuracy, and storytelling are still the cornerstones of journalism. Therefore, even though technology makes it easier to perform new kinds of reporting, it does not completely change what journalism is all about.

Conclusion

The study's most significant conclusion is that online newsrooms in Malaysia must invest in training and capacity building. Given the obvious challenges that exist within the online newsroom sector in Malaysia, especially with regard to technical expertise and resources, it is highly recommended that newsrooms collaborate with organisations and education institutions that provide training in data journalism. This can prepare the journalists with the skills to deal with huge datasets and perform data-driven investigations. These alliances may also result in workshops and internships that provide hands-on experience in data journalism. Furthermore, newsroom cooperation with international journalism networks, like the ICIJ, may improve Malaysia's data journalism environment. These collaborations offer technical support and the possibility of international investigative initiatives that might greatly boost the stature of data journalism in Malaysia. Data journalism has and will continue to grow dramatically, which significantly impacts the calibre and transparency of investigative reporting. Rahman (2021) emphasises that sensitive data must be handled ethically. Furthermore, Zulkifli (2020) discusses the significance of avoiding data bias to ensure honest storytelling.

Through an understanding of the ways in which a progressing media landscape such as Malaysia handles the potential and difficulties posed by data journalism, this study offers a viewpoint for other nations facing comparable difficulties. It also emphasises how some themes, such the necessity of tools, resources, and technological advances, are relevant to all forms of journalism worldwide. Furthermore, because the

results support the notion of technological determinism, this study highlights the value of theory-driven research in journalism. The advancement of data journalism in Malaysia, propelled by technological and digital tool developments, illustrates how changes in society are often a direct result of technical progress. Hence, this study adds to the continuing discussion on how technology will affect journalism in the future and how crucial it is to get online newsrooms ready for these changing needs.

To better integrate data journalism, Malaysian newsrooms should have dedicated teams that specialise in analysis, visualisation and data collecting. Investing in cutting-edge data tools and encouraging ethical practices can improve the accuracy and credibility of data-driven reporting. In the future, advances in AI and digital tools will streamline data operations, making data literacy essential for journalists.

Acknowledgement: Our appreciation goes to all the informants of the in-depth interviews responded to the data collection of this study, and anyone who is directly and indirectly involved in this study.

Informed Consent Statement: Informed consent was obtained from all informants involved in the study.

Conflicts of Interest: I declare no potential conflicts of interest associated with this study.

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