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ARTICLE



Data journalists' perception and practice of transparency and interactivity in Indian newsrooms

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ABSTRACT

Data journalism research recorded exponential growth during the last decade. However, the extant literature lacks comparative perspectives from the Asian region as it has been focused on select geographies (mainly Europe and the US). In this backdrop, the present study examined data journalism practices in the Indian media industry by conducting intensive interviews with 11 data journalists to investigate their perception of transparency and interactivity which are two of the core aspects of data journalism practice. Further, a content analysis of data stories published by two Indian news organizations for two years was conducted to assess the status of transparency and interactivity options in these stories. The findings showed that Indian data journalists acknowledge the importance of transparency and interactivity, but exhibit a cautious approach in using them. There is general apathy in practicing transparency among journalists in legacy organizations, drawing a stark contrast with their counterparts in digitally-native organizations.

KEYWORDS

Data transparency; interactivity; India; data journalism; digital journalism

Introduction

Despite recent calls to bring more geographical diversity in studies about data journalism (Mutsvairo, 2019), a major corpus of data journalism research is still focused on certain geographies (like Europe and the US); select organizations (like The Guardian) and sophisticated forms of the practice, that is, data journalism stories produced by media organizations with a lot of resources at their disposal or those data stories which won prestigious awards as opposed to everyday data journalism projects carried out by smaller news organizations (Ausserhofer et al., 2017). This has raised concerns about the generalizability of the insights shared by the existing literature to understand data journalism practices in other parts of the world and media industries (Appelgren et al., 2019). Such an absence of studies from regions like Asia about the manner in which data journalism is being practiced may result in widening of the existing cultural divide (Mutsvairo, 2019).

In India, dailies and periodicals are published in 189 different languages with 144,520 registered publications as of 31 March 2021. Although the number of publications has been increasing year-on-year, the total circulation is dwindling. The combined circulation of Indian publications which was 488,089,490 copies per publishing day during 2016–2017 came down to 439,929,769 copies during 2019–2020 and plummeted to 386,482,373 copies per publishing day in 2020–21 (RNI, 2020–21).

Due to its diverse population, cultural practices and differing socio-political situations, different media systems exist across different Indian states (Ninan, 2007). However, there are general trends which are reflected across them, especially after globalization. There is a general consensus that commercialization has resulted in the de-politicization of news with critical views getting lesser and entertainment spilling over to the news realm (McDowell, 1997; Nair, 2003; Rao, 2009; Thussu, 2007).

With the coming of internet to India, scholars and some practitioners have looked forward to web as a potential space which can bring in new values in Indian news practice, especially informational choices given to readers (Vincent & Mahesh, 2007). This expectation was not converted to practice soon, especially with traditional, legacy media organizations dominating the early scene of online journalism in India, drawing the boundaries on news and news practice (Ninan, 2007; Saxena, 2007). Nonetheless, the web as a new platform has effectively altered certain practices like prime news selection among these legacy players as well (Ninan, 2007; Saxena, 2007).

Rao (2009, p. 480) observes that the liberalization of the Indian economy in the 1990s and the later influx of new technology to the media industry have made seminal changes in the way news work was practiced in India. Apart from production, it has initiated a hitherto unavailable element of interactivity between newsmakers and their audience. This can be seen as the juncture where interactivity as a new value entering the Indian media market. Several scholars (e.g. see Rao, 2009; Thussu, 1998;) argue that the global values and influences are appropriated by the journalists and organizations to fit the local, thus resulting in glocalized or hybrid practices. Rao (2009) argues that the Indian media often uses global formats but deals with specific local content.

These observations of a gradually changing media scenario were documented at a time when digital news practice was a novelty and not a major player in the Indian case (Ramaprasad et al., 2015). But lately, digital is gradually grabbing its space with advertising revenues increasing steadily (exchange4media, 2022). The growth of digital ad revenue and the increasing focus on the digital audience is accompanied by the rise of Indian entrepreneurial journalistic initiatives, most of them digitally native, aimed at tapping the newly emerging rural media audience facilitated by affordable smartphones and mobile data (Harlow & Chaddha, 2019; Nielsen & Sen, 2016). These digital media-start-ups, though not yet financially big players, are institutional forces which make considerable changes to the Indian media scenario – by introducing new revenue models, new approach to news work and audience strategies for web. These trends are in line with the global trends (Nielsen & Sen, 2016). While legacy organizations also imbibe new practices, there is a visible difference in the approach (Aneez et al., 2017). So in an attempt to understand the way transparency

and interactivity is adapted by the Indian media industry, we examined how they are reflected in data stories produced by a digitally-native organization and a legacy news organization in India.

In this context, this study examined the practices of data journalists in the Indian media industry. It investigated how Indian data journalists perceive and practice two major values of data journalism – transparency and interactivity. If employed properly, these two may help journalists in increasing the audience agency in the process of journalism and bring more credibility to the profession. Public's lack of trust in journalists and journalism as a profession in general is the biggest challenge faced by the Indian media practitioners. India ranked at 31st position in terms of audience trust on news media with only 38% of respondents from a country-specific sample from India expressing overall trust in news media (Newman et al., 2021). Transparency – a cherished journalistic ideal – manifests itself more dynamically in data journalism stories and may help journalists in dealing with increasing public skepticism toward the profession of journalism. Transparency may also lead to increased accountability on the part of journalists. Karlsson (2010) talked about “disclosure transparency” and “participatory transparency” which may help journalists in achieving objectivity in their projects. Interactivity is considered to be an enabler of participatory transparency. Integrating elements of interactivity in data based news stories augments audience agency and makes them feel a part of the news production process. It also gives some control to the audiences in the context of consumption of news content. Initially transparency and interactivity were looked at as ideal practices to improve the quality of journalism. However, journalists' enthusiasm toward these gradually began to dwindle owing to reasons such as pressure of deadlines, deep-rooted journalistic traditions of protection of sources, lack of training, etc. Bradshaw (2014) argued that inculcation of elements of transparency and interactivity reduce journalistic agency. This may be one of the reasons behind waning interests toward these affordances of data journalism as well. Various studies point to the fact that journalists have been reluctant to incorporate transparency and interactivity in their data stories to the desired extent (Karlsson, 2010; Zamith, 2019).

Intensive interviews with data journalists in seven Indian news organizations were held to examine their perceptions about practicing transparency and interactivity. Further, a content analysis of data stories from two Indian news organizations was carried out to examine the extent of transparency and interactivity choices reflected in the stories.

Review of literature

Data journalism has a fluid identity, mainly owing to its closeness to and differences with a set of other subspecialties like Computer Assisted Reporting (CAR), investigative journalism, computational journalism, automated journalism, and algorithmic journalism. Several typologies or conceptual frameworks map the contours that distinguish these subspecialties (Borges-Rey, 2017; Coddington, 2015, 2018; Gynnild, 2014; Parasie & Dagiral, 2013). These attempts and the general data journalism literature reflect certain recurring themes like the debate on the status of data journalism

as a continuance of CAR tradition and its similarity to practices like computational journalism. Its influence on and mutual interaction with open data culture and the associated integration of transparency as a core value has also been mentioned by several scholars (Lewis & Usher, 2013, pp. 607–608; Parasie & Dagiral, 2013, pp. 867–868). Similarly, data analysis techniques used, use of open source tools, use of big data, specific ways of storytelling using interactive visualizations have all been recurring themes in data journalism literature. Based on a discussion of the typologies developed by Coddington (2015, 2018) and other data journalism literature, this study intends to use visualization interactivity and practice of transparency as distinctive aspects of data journalism to examine data journalism practice in India.

Coddington (2015, pp. 340–341) points out the importance given to transparency and openness as a distinctive aspect in data journalism. He argues that transparency is both a process and a product in data journalism which makes it distinctive from CAR and computational journalism. This emphasis on transparency principle is part of data journalism's vision of the audience as active partners.

According to Parasie & Dagiral (2013, pp. 862–863), one of the epistemological propositions of data-driven journalism considers news as structured data. They point out how visualizations or interfaces and the associated interactivity are linked to other epistemological propositions of the practice. Interactive presentations aid transparency by revealing connections between datasets, especially when heterogeneous datasets are employed. Apart from offering transparency, interactivity enables the audience to use data visualizations as a “research tool” to identify issues of public importance. This proposition is in line with Coddington's (2015, pp. 342–343) view that data journalism considers the audience as active partners, enabling them to make sense of the data (Gray et al., 2012; Karlsen & Stavelin, 2014).

In a revisit to his typology, Coddington (2018) describes primacy of visualizations as a manifestation of storytelling practices in data journalism. In line with the argument of Parasie and Dagiral (2013), he outlines visualizations' close connection with transparency. Though he acknowledges that not all data journalism involves visualizations, he emphasizes the use of visualizations and interactivity to aid transparency as a unique characteristic of data journalism practice.

Transparency: an ascendant value

Transparency is a new professional value gaining importance in news work. While some scholars look at transparency as a strategy to demystify journalistic practices and values, others consider it as a choice provided to audience to “monitor, check, criticize and intervene” in journalistic process (Deuze, 2005, p. 455), including news production and editorial decision making (Karlsson, 2010, 2011). Transparency is counted as an integral element of ethical practice in emerging streams of journalistic practice like data journalism (Coddington, 2015). There are different forms of practicing transparency including explaining news selection & decisions, correction of errors, utilization of hyperlinks, and disclosure of the preferences and motifs of the media worker (Hayes et al., 2007; Karlsson, 2010; Karlsson et al., 2017). According to Karlsson (2011), journalists attributing information sources or disclosing ways of

producing the story constitute disclosure transparency. Hayes et al. (2007) identify evidentiary support as a form of transparency where the reader is given access to primary information sources and evidence to improve credibility. This is similar to the practice of sharing the underlying dataset with readers in data journalism (Coddington, 2015; Gray et al., 2012; Stalph, 2018). This form of disclosure transparency which has become a normative value in data journalism practice is associated with open source culture.

Many scholars associate the practice of transparency as a way to beget credibility (Plaisance & Deppa, 2009). However, there is limited empirical evidence to suggest this so far. Karlsson et al. (2014) found that transparency practices have no effect on source and message credibility. Corrections had a positive effect on audiences who already had trust in news media (Karlsson et al., 2017). Journalists and media managers do not find the practice of transparency as rewarding in terms of enhancing the credibility of journalistic processes and it may even negatively affect the routine functioning (Fisher, 2015; Gade et al., 2018; Koliska & Chadha, 2018). Some scholars warn against considering transparency as a panacea. Kayser-Bril (2017) argues that transparency need not improve trust, but rather erode it and may also have negative effects on audience's perception of credibility.

Coddington (2018) identifies transparency as a "key form of legitimation" for data journalists, offering accountability. The most common forms of transparency in data journalism practice are based on the disclosure transparency principle. It manifests in the form of sharing the underlying dataset/s through links. Scholars consider the transparency practice of sharing raw data as an outcome of internet audiences' preference to inspect raw information (Coddington, 2015, 2018). However, most often only the cleaned dataset is shared (Coddington, 2018; Young et al., 2018). Other forms of transparency in data journalism include mentioning the data source and disclosing methodology including the one used for data cleaning.

Zamith (2019) found that the majority of the journalists did not link their stories to the datasets in everyday data journalism. Limited number of stories mentioned the methodological details and made available the specific materials, besides providing hyperlinks. Several scholars found that only a smaller number of data stories offered backlinks to datasets or disclosed the method of data acquisition (Cushion et al., 2017; Loosen et al., 2017; Young et al., 2018). Generally, these studies have operationalized transparency in data journalism practice as linking to or mentioning the data source, sharing the data source or sharing the method of data acquisition as ways of measuring transparency.

Data visualizations and interactivity

The increased use of visualizations is linked to the need to disclose big data to audience and the rise of convergence in newsrooms (Smit et al., 2014), with diverse skill-sets and production workflows coming together (Dick, 2014; Smit et al., 2014).

The initial excitement about interactivity gradually waned in the industry and academia. Domingo (2008) found that interactivity had achieved the status of an uncomfortable myth as per its implementation in news rooms. Such concerns can be seen in

the recent data journalism scholarship. For instance, Appelgren (2018) examines interactivity in data stories as a transfer site of paternalistic elements from engineering and computer science to journalistic norms and reflexivity. However, most of the recent data journalism research consider interactivity as a favorable element and a benchmark to distinguish higher forms of data journalism performativity (Ojo & Heravi, 2018; Stalph, 2018; Young et al., 2018).

Several scholars found that the majority of the data stories offer minimal or no substantial interactivity in data visualizations (Appelgren, 2018; Knight, 2015; Stalph, 2018). Zoom functions, data on demand functionality, and filter functions were more prevalent forms of interactivity (Loosen et al., 2017; Young et al., 2018). Map visualizations were recorded as the major forms of interactive features offered in data stories (Stalph, 2018; Tabary et al., 2016; Young et al., 2018). Bars and line graphs were widely used, but offered minimal interactivity only (Stalph, 2018). Appelgren (2018) and Loosen et al. (2017) found that there is a shift from more sophisticated interactivity in data stories to more simplistic interactive forms which offer comparatively restricted options to users of data stories.

Despite this, several qualitative enquiries and conceptual studies have considered data visualizations and interactivity as major aspects of data journalism. Integrating visualizations and interactivity to storytelling requires a combination of visual thinking and journalistic skills (Smit et al., 2014) or shifting to computational thinking (Borges-Rey, 2016, 2017; Karlsen & Stavelin, 2014; Young & Hermida, 2015) and is often considered as a benchmark of quality by data journalists (De Maeyer et al., 2015). However, there are concerns over audience disinterest on complex forms of interactivity, which causes the use of less interactive storytelling among data journalists (Karlsen & Stavelin, 2014).

The value of transparency and the provision of interactivity through data visualizations have garnered the status of flagship values in data journalism practice. In this regard, in an attempt to explore data journalism practice in India from a comparative perspective derived from data journalism literature from other parts of the world, the study intends to examine how transparency and visualization interactivity are perceived and practiced by Indian data journalists and news organizations with the following research questions:

RQ1: How do Indian data journalists perceive transparency and interactivity in their data journalism practice?

RQ2: What are the factors which influence the practice of transparency and interactivity in Indian data journalism?

The present study further seeks to examine how the practice of transparency and interactivity in data journalism is adapted by different news organizations in the Indian media market.

The Indian media market is very diverse with media outlets catering to different language groups. Legacy organizations had a dominant presence in the Indian media market but the rise of digital media-start-ups in the last decade has changed the scenario considerably. These new players in the Indian media market aimed at tapping the newly emerging rural audience who are equipped with affordable smartphones and data packages (Harlow & Chaddha, 2019; Nielsen & Sen, 2016). These digital

media-start-ups, though not big players financially, are institutional forces which are bringing about considerable changes in the Indian media scenario by introducing new revenue models, new approach to news work and audience strategies for web. They are instrumental in the adoption of innovations like data journalism in the Indian media industry. While legacy organizations also imbibe such new practices, there is a visible difference in the approach (Bajpai, 2013). In this context, the study examined the difference between a digitally native and a legacy organization in the adoption of transparency and interactivity in data stories with the following research question.

RQ3: How do digitally-native organizations and legacy news organizations in India differ in terms of employing interactivity and transparency in their data stories?

By pursuing these research questions, the study seeks to contribute to the development of enriched comparative perspective to the growing corpus of data journalism research.

Method

Since the study aims at understanding data journalists' perception about transparency and interactivity and their use of these values in the data stories produced, the researchers opted for a mixed methods approach where both quantitative and qualitative methods are used for contextualizing the findings. Existing scholarship on data journalism has several examples of employing mixed method approaches, especially to examine the relation between perceptions and practices (Parasie & Dagiral, 2013; Tabary et al., 2016; Young & Hermida, 2015).

Semi-structured interviews with 11 data journalists (labeled as DJ1–DJ11) from seven news organizations in India were conducted. Eight male journalists and three female journalists were the respondents for the interviews. Most of them were data journalists with different designations such as program manager, senior reporter, senior editor, data visualizer, freelance data journalists, and chief of bureau in their respective organizations. At the time of conducting these interviews, the respondents were working with organizations such as the Indian Express, The Hindu, the Hindustan Times, the BBC, the IndiaSpend, and Rediff India. At least one journalist was a freelancer contributing to several organizations. Most of the respondents had 4–5 years of experience in journalism but were new to practicing data journalism. Some of them had more than 10 years of experience in journalism. Out of 11 journalists, four were from digitally-native news organizations and the rest were from legacy news organizations.

As part of the initial steps to the doctoral work of the first author, websites of Indian news organizations were surveyed to identify data stories. During these initial surveys, journalists were identified with the help of by-lines published in data stories. They were approached through LinkedIn, Facebook, etc. for their personal contacts. Once an initial contact was established with these journalists, they further referred to more data journalists. The interviews were conducted face to face, telephonically, and in a few instances through email. The availability of the reporters was the

determining factor whether the interview would be face to face or telephonically. All the interviews were conducted between 2016 and 2018.

Interview questions were mainly aimed at understanding individual respondent's opinions about interactivity and transparency. The first author and the third author coded the interview transcripts. The two coders inductively identified specific themes recurring in the interview transcripts based on the constant comparative method (Glaser & Strauss, 1967, pp. 105–106). To present interview data, we have largely followed the steps suggested by Tracy (2013, p. 279) trying to use the best, short, and representative quotes to share the context and themes identified in the interview data. The quoted excerpts here stand as a representative instance of the theme identified (Anderson, 2010).

For picking a sample for the content analysis, only those organizations which maintained a section entitled for data stories at the time of the study were included (Tabary et al., 2016). Among them, The Hindu, a national English daily published since 1878, was one of the earliest legacy media organizations to recognize data journalism practices by devoting an exclusive section for data stories on its website. The other, IndiaSpend, claims to be the first data Journalism initiative in India. Launched in 2011, it covers a range of issues like health, education and economy with the help of open data. The Hindu and IndiaSpend represent different extremes of the Indian news ecosystem – the traditional, commercially oriented, resourceful, legacy news organization, and the digitally native, non-profit, start-up with limited resources. The time frame of the sample taken is April 2015 to April 2017. All the stories published in The Hindu and stories published in IndiaSpend for the corresponding dates were included in the sample ($N = 438$).

A code book was generated after identifying relevant variables in data stories. Operationalization of the variables was done based on the extant literature and from the insights derived from an inductive coding session of a subset of the sample. The first author and the second author coded the stories in the sample for content analysis. Fifty stories (11% of the total sample – 25 from each organization) were coded by two coders. Krippendorff's α was calculated to measure intercoder reliability (Krippendorff, 2018).

Tandoc and Oh (2017) operationalized transparency as instances of linking to the original dataset while Young et al. (2018) relied on availability of the dataset and the formats for the same. An explorative coding revealed that user access to datasets differed in multiple ways despite the presence of links to datasets. Based on this, transparency choices were categorized to three types. In *Type A*, original data were easily accessible by the readers from the original source through a hyperlink. *Type B* represented stories which only mention the source of original data and readers had to find the dataset on their own. *Type C* represented instances where the source was only partially mentioned or the source of data was not clear. The variable reported satisfactory intercoder reliability (Krippendorff's $\alpha = 1.00$).

As an additional dimension, data transparency in visualizations was coded. Visualization data transparency was operationalized as *Data accessible to the readers from original source*; *Mentioning only source of data*; *Vague or partial information of data source*; *Link is accessible but data file not available at the original source*; and

Data Source Not mentioned (Krippendorff's $\alpha = 1.00$). An explorative coding and a general survey of the subset of the sample revealed that advanced forms of transparency like crowdsourcing, methodology sharing, etc. were largely absent. So, these dimensions of transparency were not included.

Interactivity was operationalized from the perspective of “control over content” (Koolstra & Bos, 2009). Taxonomic units of interaction suggested by Shneiderman (1996), Yi et al. (2007), and Boy et al. (2015) and approaches from academic literature on data journalism (Stalph, 2018; Young et al., 2018) were also examined for this purpose. The categories were formulated by grouping together taxonomic units discussed in these studies based on the benchmark of user agency and resources needed to cater to it. For instance, Boy et al. (2015, p. 1451) suggest taxonomic units “inspect” (where a user can utilize a tooltip to get more details) and “narrate” (where the user can move on to the next part of a story). The first has similarities with Shneiderman's (1996) idea of “details-on-demand” as an interactive task. From a user agency perspective, we formulated it as a lower form of interaction triggered by minimal information need and involvement from user and lesser production resources for the journalist to produce the interactive choices (coded as *low level of interactivity*). The available choices are also limited in this scenario. Interactive tasks suggested by Yi et al. (2007) like “connect,” “select,” and “elaborate,” as they have been operationalized by Young et al. (2018) require the user to have considerable interest and information needs. The user agency behind such actions is more advanced than that in the *low level of interactivity*. These actions are grouped together to formulate the *medium level of interactivity*. Other interactive tasks discussed by Yi et al. (2007) like “filter,” “explore,” and “reconfigure” are advanced actions which demand more user involvement and agency. For a journalist to produce such interactive choices, better resources and expertise are needed. Thus, it is grouped into *high level of interactivity*. This categorization was found to be reliable (Krippendorff's $\alpha = .74$).

Stories were coded for the presence of *Explanatory* and *Exploratory* visualizations based on Barlow's (2015) classification and in line with the operationalization by Young et al. (2018). Data visualizations meant to explain the perspective of the story were coded as *Explanatory* while those which enabled the user to explore and find more details were coded as *Exploratory*. The variable reported satisfactory coder agreement (Krippendorff's $\alpha = 1.00$). Similarly, visualizations were also coded for their *static* and *dynamic* nature (Krippendorff's $\alpha = 1.00$).

To identify the association between different elements in the data stories and the provision of interactivity and transparency in those stories, Pearson's Chi-square Test of Independence and Cramer's V as a strength statistic were applied (McHugh, 2013). Chi-square Test for Homogeneity was employed to examine the difference between digitally native and legacy organizations in the provision of transparency and interactivity in data stories.

Analysis & results

Transparency in data stories: perceptions of Indian data journalists

All respondents readily acknowledged transparency as preferable, in terms of providing datasets along with the story. Despite this acknowledgement, practicing

transparency was not easy for them. Several journalists mentioned lack of open data policy, hostile approach from government officials toward freedom of information requests (known as RTI requests in India), and the absence of clean data sources as a reason for not being able to ensure transparency in terms of underlying data sets used in their stories. In line with the theme expressed by several respondents, a data journalist working with The Hindu described the situation as follows:

India does not have an open data policy. Most of the data are hidden away in annual reports of ministries in inaccessible format. Even if accessible, sometimes, the quality of data is very poor. [DJ6]

He described data transparency as an unnecessary “nicety” for journalists who are working on tight deadlines.

I do not have time to do all these embellishments. Also, if I were to provide the data set in a clean form for the readers, I have to spend time and give proper column headers with explanation We don’t have time for these niceties. But we do give the source in full. [DJ6]

Like the respondent DJ6 from The Hindu, other journalists who are part of legacy organizations pointed to internal issues like absence of organizational policy, tight deadlines, technical infrastructure, and resources (like a compatible CMS, enough server space, centralized editorial control, etc.) as some of the major hindrances. For instance, another respondent (DJ11) from the same organization described the challenges raised by the lack of technical and institutional support as follows:

You need server space to park the data and you need the time to figure out this whole thing... If I was part of a data journalism team and the organization had a policy on providing the dataset, I am ok with it. If I have the time also. [DJ11]

On a comparative note, lack of time, institutional support, and resources have been cited as constraints to data journalism practice by journalists from US, Sweden, Norway, and Belgium in the past studies (De Maeyer et al., 2015; Fink & Anderson, 2015; Karlsen & Stavelin, 2014).

However, journalists from smaller, digitally-native organizations were more welcoming toward the idea of sharing datasets and they tried to overcome issues through short-cuts. For instance, a female data journalist from IndiaSpend who was functioning as a data journalist and program manager at the organization told us about how they solved the issue of making datasets transparent as follows:

There are stories where we have filed RTIs. In such cases, we have uploaded [the] acquired datasets on Google cloud and then have provided link to those datasets and scanned images. [DJ7]

Sophisticated data journalism practices can also scuttle data transparency, especially when the news organization does not have proper transparency policies or does not provide necessary technical resources. For instance, a senior journalist said that he uses JavaScript libraries or SVGs for visualizing data. This reduced the transparency of the stories as the policy of the organization he works with does not ensure datasets are shared with the stories. On the contrary, use of a Do-It-Yourself (DIY) tool would have ensured transparency, though at the expense of the visualization capabilities. Despite acknowledging transparency as a preferable value, he asserted

that a curious reader can always find the dataset as it is public and is clearly attributed.

Sharing the dataset is considered the obvious form of transparency in data journalism (Gray et al., 2012) but many respondents considered mere attribution to the source preferable. This perception was reflected in the response of journalists from legacy and digitally-native organizations both. A data journalist working with rediff.-com (DJ10) explained her stand as follows:

I don't provide the direct dataset. Instead, I provide the source of that data set. When we provide the dataset as such, it may be vague because we have already explained the same data. We give the source because people need to understand the credibility of the data. [DJ10]

Similar to Fink and Anderson's (2015) findings from the US, concerns about privacy breaches were expressed by some respondents. One among them (DJ4), working with the Hindustan Times, told us about how this concern stopped her from sharing certain datasets. According to her,

In the dowry story, I wanted to make the datasets available publicly for transparency, but then the personal details of the people, their phone numbers, addresses, etc. So, we didn't share the data. [DJ4]

There were concerns about the enigmatic "original" dataset as well, in cases where journalists produced a dataset ensemble by drawing input from different datasets. Though many Indian data journalists did not mention the need to share the methodology as a necessity, a couple of journalists felt that it is important if the story and method were "complex." A data journalist from the Hindustan Times responded with the following quote, which aptly represents similar views expressed by her counterparts in other organizations.

If we are doing something complicated then we share the methodology of doing that. Half of the people may not understand but there are people who understand it so they can check that thing. [DJ4]

However, data transparency did not surface as an ethical concern in the perception of the data journalists in India. The ethical challenges, for many of the respondent journalists, are only about ways of accessing data like scraping.

Data visualization production and approaches to interactivity

Respondents perceived visualizations as an integral element of data stories. Most of the respondents informed that visualizations are the results of collaborative efforts. Visualizers and coders are generally kept in loop before the visualization is finalized. Many journalists said that they do not depend on any visualizer and some said they do not create visualizations but write data stories. Some said that visualizations are not necessary in every data story. A senior journalist working with the Indian Express (DJ3) who also produces data stories, expressed his routine as follows:

Yes, visualization is part of story, so we ask our designers to add that thing. Of course, we took help from the designers, I also have some knowledge. It is not required in daily

basis stories and required only in few of the stories; there we can ask the people from graphics to prepare it. [DJ3]

According to several respondents, the provision of interactivity or its adoption in the production of data stories is influenced by many factors. One journalist said that the depth of data and quality affect the levels of interactivity.

We decide on interactive story only when there is depth in the data and what a static graphs/maps cannot say the interactive should say. If bar chart can represent the same then we will take that for a data story. [DJ8]

Interactivity in data stories is also affected by the kind of the story covered by the reporter. The respondents said that the level of interactivity needed for storytelling may differ across beats. For instance, one of our respondents, who produced data stories for BBC in New Delhi reflected this theme in his response as follows:

In cases of elections, we tend to keep interactive in the stories, because it has multiple layers ... but in case of normal stories, regardless of its data driven, it's important to put data upfront. Don't hide anything from the user, users don't like to put an effort in clicking or hovering on things. [DJ9]

Interactivity is also influenced by audience preference for smartphones. Visualizers give a lot of importance to this factor. A data journalist from The Hindu explained the preferences of his team as follows:

We have to design for the mobile first and then for the desktop. 60% of your audience is coming from phone. So, personally, I design first on phone because if it is working on phone then it will definitely work on desktop and then think what additional features can be added on desktop. [DJ4]

Some journalists acknowledged that interactivity in visualization may enhance readership in the case of niche audiences but complex visualization and interactivity options may repel the general audience. A senior data journalist from The Hindu, who was also the Chief of Bureau, expressed his concern as follows:

You have to think about it for each graphic ... each context and whether you want to go for engagement. Whether it is more important in embedding the data and making it more convenient to readers, making it more accessible. The other thing is that if you throw a lot of data on readers. They may be put off [DJ11]

Indian data journalists are dodging higher interactivity forms. There is lack of conviction in providing more interactive choices in data visualizations. Pessimism about interactivity can be easily traced in the responses. Respondents believe that traditional content is still the king. It is less likely that this perception is based on insights derived from data on audience interaction. Many journalists said that they do not have access to the traffic data. However, audience engagement data is accessible to journalists in some organizations. One data journalist explained about assessing usability based on event analytics on interactive charts.

We set-up events analytics on interactive charts, just to record how users have interacted with the graphics. If people aren't interacting with the chart, it's important to take notice what we have done wrong. ... We have to keep testing and checking the feedbacks through event tracker and accordingly, we work on our next steps. [DJ9]

Visualization production is largely an individual effort in Legacy organizations. On the contrary, digitally-native platforms have small teams. Data editors, data journalists, coders, and visualizers are involved at every level of data story generation in such cases. The perception and practice of transparency also depend on the type of organization. For instance, a data journalist who is part of a digitally-native organization said that the dominant print media culture in newsrooms is an obstacle in the adoption of transparency and interactivity.

Interactivity is an important factor. Those people from print background are not suitable because for the interactivity element and we have to retrain them for everything. [DJ7]

Respondents working with legacy organizations reflected a disregard for offering interactivity in data stories. A respondent who is producing data stories for a legacy organization expressed his disdain for interactivity as follows:

For me, interactivity is a waste of time. When users play around with data too much they lose focus of what we want to prove. ... We should try and avoid interactivity as much as possible and use it only when situation is hopeless without it. [DJ6]

Here interactivity options are perceived as choices of the journalist, not that of users.

Data transparency and visualization interactivity: content analysis results

Data stories produced by the digitally-native platform offered better transparency options as compared to those from the legacy organization. In IndiaSpend, original data were easily accessible by the readers from the original source through a hyperlink in 71% of the data stories, while it was 2% in The Hindu. Majority of the stories in The Hindu (82%) only mentioned the data source without linking to it, while 28% of stories in IndiaSpend followed suit. Stories with only vague mentions of data source were 16% in The Hindu and 1% in IndiaSpend.

In IndiaSpend, 90% of the visualizations had backlinks to data sources. In The Hindu, only 3% news stories had linked their visualization to data sources. About 72% of the news stories in The Hindu which had visualizations did not link them to data sources and for 25% of the stories in The Hindu; visualization transparency was not measured due to the absence or missing of visualizations.

RQ2 sought for the factors affecting interactivity in data stories. To explore this, different variables were tested to examine significant association. Pearson's Chi-square test of independence did not find statistically significant association between sources of data and transparency variables [$X^2(2, N=438) = 0.070, p > .05$; Cramer's $V = .013$]. There was significant association found between levels of data transparency and tools used for creating visualization [$X^2(10, N=438) = 69.093, p < .05$; Cramer's $V = .281$].

Chi-square test of independence showed significant association between methods of data acquisition [$X^2(6, N=438) = 18.861, p < .05$; Cramer's $V = .147$] and transparency types in data stories.

Tools used for creating visualization [$X^2(15, N=438) = 4.929E2a, p < .05$; Cramer's $V = .612$], *use of multiple sources* [$X^2(6, N=438) = 97.452, p < .05$; Cramer's $V = .334$], and were found to have significant association with *forms of interactivity*.

Comparing legacy and digitally-native organizations

Chi-square test of homogeneity was used to examine if levels of accessibility and types of transparency differ significantly between data stories produced by these organizations. Incidence of type of accessibility significantly differed in data stories produced by the organizations [$X^2(2, N=438) = 2.41, p < .05$]. Data stories produced by the digitally-native organization were found to be more transparent with 71% of them reporting Type A accessibility. In case of data stories produced by the legacy news organization, only 2% had Type A accessibility. A significant difference between these organizations was observed in forms of interactivity in data stories [$X^2(3, N=438) = 47.381, p < .05$]. More stories (68.9%) produced by the digitally-native news organization in the sample had higher forms of interactivity (higher level) compared to those from the legacy organization (31.1%).

Visualizations in the sampled data journalism stories were mostly explanatory in both digitally-native and legacy news organizations. Digitally-native organization provided more room for visualizations with exploratory data elements. In IndiaSpend, 36% stories had exploratory visualizations and 64% stories had visualizations with explanatory functions. In The Hindu, 11% stories had exploratory visualizations and 89% stories had explanatory visualizations. In most cases, drop-down lists were given as a major exploratory tool.

Maps and graphs were the most used visualization type. IndiaSpend used 64 maps (24 static and 40 dynamic) and 588 graphs (29 static and 457 dynamic) while The Hindu, used 23 maps (eight static and 15 dynamic) and 241 graphs (16 static and 225 dynamic).

Findings and discussion

In line with the past findings on transparency (Stalph, 2018; Young et al., 2018; Zamith, 2019), less stories in the sample (34%) linked back to the original dataset despite 90% of stories in the sample relying on open data. Despite acknowledging transparency as a positive value, many journalists were not practicing it. Factors like nature of data, method of data acquisition, tools used for visualizations were found to be associated with transparency in the stories. According to the interview respondents, the absence of policies at organizational level and occupational pressures obstructed the type of transparency that can be achieved in data stories.

These factors as reflected in the content analysis results of the samples from the two organizations and the themes in the interviews with data journalists from 11 different news organizations may be pointing to the Indian data journalists' strategic negotiation of transparency as a new professional value. In the organizations under the study, this negotiation manifested as the absence of efficient transparency policies and a lack of technical infrastructure (like compatible Content Management Systems,

server space and other resources) at the organization level. At an individual level, it took the form of journalists' habitual reliance on traditional performativity and professional values. Similar instances of reluctance were documented from Indian media in adapting to changes brought by convergence (Mishra, 2016).

Similarly, a measured approach can be seen in the adoption of interactivity in data stories. Incidence of interactivity and its differing levels were found to be significantly associated with the use of multiple data sources, tools used, and the type of organization. The use of multiple datasets in a single story often brings in the need to help the audience compare the patterns in the dataset. This calls for providing more exploratory interactive options. The interview responses and the content analysis data show that there is significant difference between the legacy organization and the digitally-native organization under this study in integrating interactive options in data stories. The print media training and culture tend to be less tuned toward interactive storytelling. Analysis of the interview data from data journalists across different news organizations showed that the traditional print media culture imbibed by the journalists is functioning as an obstacle to practicing interactivity in data stories.

Conclusion

The results help situate Indian data journalism practice and Indian media industry's adoption of journalism innovations. The significant association of visualization tools and use of multiple data sources with the provision of improved interactivity and transparency in data stories examined by this study show that the data journalists with these organizations used these new professional values to enable better user engagement in data stories. Their interview responses also reflect an understanding of visualization interactivity as an artifact to enable transparency and user participation, as conceptualized by Coddington (2018) and others. However, there is a difference in the approach toward interactive visualizations between journalists working for small, digitally-native organizations, and legacy organizations examined by this study. Journalist respondents who had years of experience in legacy organizations were more skeptical about interactivity as compared to their counterparts in digitally-native organizations. This may mean that legacy organizations in the Indian media industry and journalists trained in a predominant print media work culture are not very proactive toward the adoption of values of interactivity and transparency. Their response to these new professional values is often negating the idea of the audience as active participants. However, new entrants in the industry, the digitally-native news start-ups, are more receptive toward the adoption of these values and practices.

Limitations & scope for further research

This study's primary limitation comes from the fact that it is based only on two English news organizations – one legacy and one digitally-native. Since Indian media is quite diverse in terms of language and content, the results of the study cannot be generalized for the entire Indian media ecosystem. It shall be also noted that the organizations examined in this study represent two extremes of the Indian media

market. The innate differences due to these extreme positionalities should be considered while trying to contextualize the results of this study. Future researchers may include a wider spectrum of news organizations from different linguistic groups and regions of the country. Moreover, at the time of this study, only a handful of news organizations were diligently pursuing data journalism. Now the number has increased considerably. With data journalism practice getting more normalized and popular, it is possible that the journalists' perception about it also changes over a period of time. Future researchers may examine this aspect. Trying to assess data journalism practice by measuring only interactivity and transparency has limited this study's comparative capabilities. Data journalism extends multifarious affordances to the audiences and the journalists in terms of diversity; information provenance and collaborative news production which may be examined by future studies.

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