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Journal of Research & Reviews in Social Sciences Pakistan

Journal homepage: http://journal.kinnaird.edu.pk

INVESTIGATING THE FACTORS BEHIND DATA JOURNALISM ACCEPTANCE IN PAKISTAN: A CASE STUDY OF TWIN CITIES

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Abstract

As technology advances, data journalism is likely to become even more important, as journalists will need to be able to interpret and present data in new and innovative ways. Consequently, data journalism has become one of the most prominent journalistic practices, indicated by wider acceptance worldwide. This research also focused on data journalism acceptance among Pakistani journalists as a trending professional approach. The case study approach was applied, and the study is guided by directional hypotheses designed under the diffusion of innovation theory. Results showed that data journalism is accepted in Pakistan due to its distinctive characteristics, including relative advantage, compatibility with professional needs, observability indicating a transparent approach, and complexity as required skills and expertise to practice it in the best possible manner. Thus, the propositions by diffusion where innovation theory was affirmed, highlighting the applicability of the relevant theory to the data journalism acceptance-related studies. This study concluded that data journalism is not only a vital aspect of traditional journalistic practices but also represents the future of journalism itself, as it allows for more comprehensive and accurate reporting in an increasingly data-driven world. Finally, study limitations are highlighted accordingly.

Keywords

Data Journalism, Pakistan, Diffusion of Innovation Theory, Case Study, Survey Method

1. Introduction

Technology has revolutionized journalism practices in the context of digital media. With the advent of digital media technology, journalists have been able to produce and distribute news faster and to a larger audience than ever before (Beiler *et al*., 2020). According to Blut & Wang (2020), technology has enabled journalists to access an extensive range of information and resources. Besides, they can also approach a wider audience regardless of geographical restrictions. Further noted by Hofmann *et al*. (2020), digital technology has enabled journalists to produce and distribute

news stories more quickly and efficiently than ever before. With tools like laptops, smartphones, and digital recorders, journalists can gather, edit, and transmit news stories in real time (Tong & Zuo, 2021). Another critical factor is multimedia and storytelling, which enables journalists to tell stories in new and exciting ways using multimedia elements like photos, videos, and audio (Blut & Wang, 2020). Today, journalists may engage audiences and provide a more immersive experience for readers. Besides, these improved approaches have remarkably increased digital engagement as journalists interact with their audience in real-time through social media platforms, comment sections, and other online forums. Consequently, journalists and audiences have new opportunities for feedback, engagement, and community building (Desai *et al*., 2021). According to Niblock (2020), another important contribution of technology in journalism is remote reporting. In other words, it is assumed that technology has allowed journalists to report from anywhere in the world. With video conferencing and other remote communication tools, journalists can conduct interviews and report on events remotely. Similarly, the evolving technology in journalism has also introduced another major concept known as "Data Journalism". Notably, data journalism is not a new phenomenon however, it gained much popularity and acceptance during and after the Covid-19 pandemic (Hanusch, 2021). Due to several restrictions on social gatherings, and remote working patterns, the aim was to provide the audiences with the real-time, updated information by using the available online platforms. As a result, when digital media for journalistic purposes increased, the concept of data journalism became more trending and practical for the audiences (Thienthaworn, 2018). Talking about the techniques in data journalism, it involves analyzing and presenting data in new and compelling ways. According to Showkat and Baumer (2021), the simple explanation of data journalism is that it which involves using statistical analysis and visualization to uncover and tell stories. Mutsvairo (2019) argued that data journalism can take many forms, from analyzing government datasets to tracking social media trends. It is used to provide context to news stories, to identify patterns and trends, and to hold those in power accountable. According to Gondwe & White (2022), one of the prominent benefits of data journalism are that it can focus on cases that may need consideration. Still, they remain underrepresented, i.e., investigation of election interference sheds light on economic inequalities, human rights violations, child trafficking, and many others. Thus, like other regions, data journalism is also assumed to provide several opportunities to journalists in Pakistan. However, for data journalism to be effective in Pakistan, journalists and news organizations must be willing to embrace and invest in the necessary tools and techniques (Jamil, 2021). This requires a commitment to training and education and a willingness to experiment and take risks in pursuing high-quality, data-driven journalism (Mansoor, 2021).

1.1 Study Aims

According to Thienthaworn (2018), data journalism is a modern journalistic practice involving data to

uncover and report news stories. Using statistical analysis, data visualization, and other digital tools to extract meaning from large data sets are innovative aspects of data journalism. Data journalism has become increasingly important in the digital age as data is now more widely available than ever (Kalatzi *et al*., 2018). Hence, by considering the increasing importance of journalism, this research examined the factors behind increased data journalism acceptance among journalists in Pakistan under the theoretical perspective of diffusion of innovation theory. The current project is organized to present the findings more empirically and systematically. In this regard, the first section of this study is based on the introduction to the topic, study problem, and objectives. Further, the second section involves the review of existing literature to provide empirical and theoretical support to the current study leading to develop the study hypothesis and conceptual framework. The third section discusses the most relevant methodological approaches for the current research. The fourth section involves data analysis and results. Finally, the fifth chapter is based on a discussion regarding the results, conclusion, and limitations.

2. Review of Literature

2.1 Data Journalism in Pakistan

The importance of accepting data journalism in Pakistan cannot be overstated. As a developing country with a rapidly growing population and a diverse range of social, economic, and political issues, Pakistan needs high-quality, data-driven journalism that can help to inform and educate the public. According to Jamil (2021), one of the key opportunities presented by data journalism in Pakistan is the ability to uncover and report on issues that may have been previously overlooked or ignored. By analyzing data sets and identifying patterns and trends, journalists can highlight important social and economic issues, such as poverty, education, and healthcare, and hold those in power accountable (Shabbir, 2020). In addition to uncovering new stories and issues, data journalism also has the potential to improve the quality and credibility of journalism (Zayani, 2020) in Pakistan. By providing a rigorous and evidence-based approach to reporting, data journalism can help to establish trust with audiences and differentiate news organizations from competitors who rely on less rigorous reporting methods.

2.2 Diffusion of Innovation Theory

Present research is theoretically supported by the diffusion of innovation theory. Notably, the relevant theory is based on Everett Roger's work providing an empirical idea regarding acceptance of innovation due to certain characteristics. Notably, the diffusion of innovation theory provides a valuable framework for understanding the adoption of data journalism. Although the relevant theory provides a comprehensive picture of the adoption process, data journalism, as part of the technological approach (Mutsvairo, 2019), also supports it. According to Uskali (2020), journalists and news organizations who are early adopters and innovators are more likely to succeed in a rapidly evolving digital landscape. de-Lima-Santos & Mesquita (2021) argued that data journalism has transformed how journalism is produced, distributed, and consumed and has played a significant role in the diffusion of innovation theory. According to this

theory, innovations (in this case, data journalism) are accepted due to different distinct characteristics that add value to the role and importance of journalism. Thus, the diffusion of innovation theory provides a useful framework for understanding the adoption of data journalism. The characteristics of digital media, such as speed and immediacy, interactivity and engagement, multimedia content, ability to fulfil news gathering and dissemination, and global reach, are attractive to early adopters and innovators who are looking for new ways to engage with audiences and create compelling news content (Holman & Perreault, 2019). According to Olman (2022), today, digital platforms have no geographic boundaries and can reach audiences worldwide that further facilitate and validate the use and acceptance of data journalism. Journalists use data journalism to expand their reach and connect with audiences in new markets. The global reach of data journalism appeals to early professionals looking for new ways to expand their audience and reach new markets. Figure 1 below illustrates the explanatory framework of current research study.

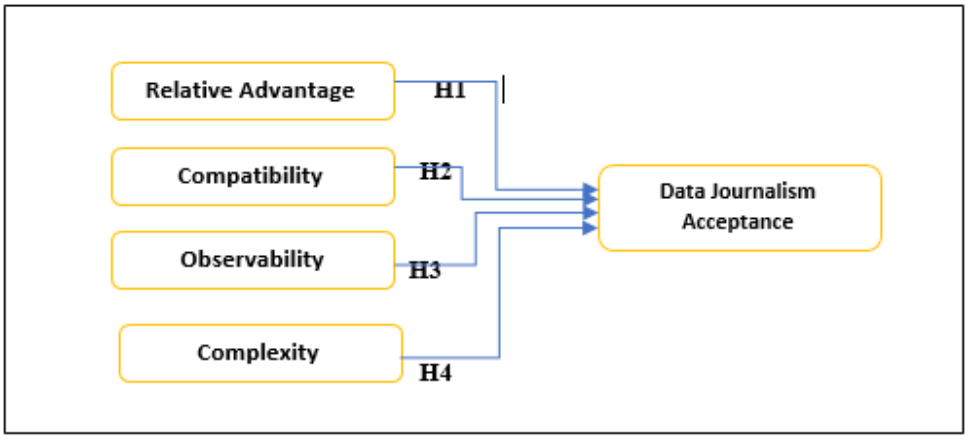

Figure 1: Explanatory Framework of Study

2.3 Relative Advantage in Data Journalism

According to Epp & Loosen (2021), data journalism has gained popularity in recent years due to its ability to provide a competitive advantage to journalists and news organizations. Here Zhang and Feng (2019) cited an example of data journalism providing journalists with unique stories and angles that are not available through traditional reporting methods. Data analysis can reveal patterns and trends that may not be immediately obvious, and journalists can use this information to develop unique stories that stand out from the competition. On the other hand, Thienthaworn (2018) links up data journalisms to storytelling. As noted, data journalism can provide journalists with new tools and techniques for storytelling. It involves data visualization tools that help illustrate complex data sets in a way that is easy to understand and engaging for audiences, improving news stories' impact and effectiveness. Uskali (2020) further argued that storytelling in data journalism is based on using data and visualizations to tell compelling and informative stories that engage audiences. Effective storytelling in data journalism involves finding the right data to support a story, analyzing, and interpreting the data to identify trends and insights,

and presenting the data clearly and engagingly using visualizations such as charts, graphs, and maps. Storytelling in data journalism aims to provide audiences with a deeper understanding of complex issues and help them make informed decisions. Effective storytelling in data journalism requires technical skills, such as data analysis and visualization, and journalistic skills, such as interviewing, research, and fact-checking. By combining these skills, journalists can create impactful stories that help audiences to better understand the world around them (Vural & Masip, 2021). Consequently, Veglis & Maniou, (2018) consider data journalism also provides news organizations with new revenue streams by offering data services such as data analysis and visualization to external clients, further diversifying revenue streams and creating new growth opportunities. H1: Relative Advantage has a significant positive effect on Data Journalism Acceptance.

2.4 Compatibility in Data Journalism

Compatibility plays an important role in accepting an innovation. The same case is with the acceptance of data journalism among journalists. Compatibility refers to the degree to which data journalism tools can be easily integrated into existing workflows and processes. According to Lowrey & Hou (2021), data journalism can be integrated seamlessly into newsroom workflows by ensuring compatibility, making it easier for journalists to adopt and use these new tools and practices. Consequently, this can lead to greater acceptance of data journalism among journalists, as it helps to reduce the barriers to adoption and makes it easier for journalists to produce high-quality, data-driven stories. As noted by Camaj *et al*. (2022), data-driven stories are highly compatible with modern news-gathering practices, providing journalists with new tools and techniques for uncovering and reporting on stories. With the vast amount of data available today, journalists increasingly turn to data-driven approaches to help them find and develop news stories. According to Appelgren *et al*. (2019), one of the key advantages of data-driven stories is that they enable journalists to identify and analyze patterns and trends that may take time to be apparent through traditional reporting methods. By analyzing data sets and visualizing the results, journalists gain new insights and identify stories that might have gone unnoticed. According to de-Lima-Santo (2022), the compatibility of data journalism can be determined by the fact that data-driven stories are highly compatible with modern newsroom workflows. With the increasing use of digital tools and platforms in newsrooms, data-driven stories can be created and shared more efficiently. Besides, data visualization tools allow journalists to present complex data sets in a way that is easy to understand and engaging for audiences, while social media and online publishing platforms allow stories to be distributed quickly and widely. As data journalism tools and practices evolve, ensuring compatibility and consistency will remain important for news organizations looking to stay competitive in the rapidly changing media landscape (Appelgren & Lindén, 2020). H2: Compatibility has a significant positive effect on Data Journalism Acceptance

2.5 Observability in Data Journalism

Data journalism is a practice that involves the use of data and statistical analysis to tell compelling stories

that help audiences understand complex issues. According to Olrichs (2019), one of the key features of data journalism is observability, indicating that data journalists are committed to being open and honest about their methods, sources, and data limitations. According to Atinuke (2021), observability is important in data journalism for several reasons, such as it helps to build trust with audiences. By being transparent about their methods and sources, data journalists show that they are committed to accuracy and rigor. As a result, it helps counter the perception that data journalism is "manipulative" or "biased." Further, observability is essential for the reproducibility of data journalism. If other journalists or researchers want to replicate the analysis of a data journalist, they need to be able to access the same data and understand the same methods. Data journalists make it easier for others to reproduce their work by being transparent about their process (Veglis & Maniou, 2018). According to Parasie (2019), observability is necessary for accountability. Data journalists can be held accountable for their work when they are transparent about their methods and sources. This means that if errors or inaccuracies are discovered, they can be corrected, and the public can be informed. Heravi (2019) argued that there are several best practices that journalists normally follow to ensure observability in data journalism. These data journalists clearly explain their methods and data sources in their reporting. They also provide links or citations to their data sources so that others can access and verify the data. According to Appelgren *et al*. (2019), data journalists stay clear about the limitations of their data and any assumptions or caveats they make in their analysis.

H3: Observability has a significant positive effect on Data Journalism Acceptance

2.6 Complexity in Data Journalism

Data journalism is a complex practice that involves collecting, analyzing, and interpreting large amounts of data to create informative and engaging stories. Unlike traditional journalism, data journalism requires specialized skills in data analysis and visualization and an understanding of statistics and programming languages (Cheruiyot & Baack, 2019). According to Mutsvairo *et al*. (2020), one reason why data journalism is comple511 is that it requires a deep understanding of data sources. Data journalists identify and access relevant datasets, which can be challenging given the vast amounts of available data. Additionally, data journalists also clean and transform data to ensure accuracy and reliability. Okon & Ndukwe, (2020) argued that complexity is an integral part of data journalism is that it often involves working with large datasets. These datasets can contain millions of rows and columns and require specialized tools and techniques for analysis that also increases user's interest towards data journalism as an appealing journalistic practice. Data journalists must be able to identify patterns and trends in the data and use statistical methods to test hypotheses and draw conclusions. According to Jiang & Rafeeq (2019), we consider data journalism as having complexity as because it often involves working on tight deadlines. Data journalists must be able to collect and analyze data quickly while also ensuring that their reporting is accurate and reliable. Thus, data journalism requires a high level of attention to

detail, and the ability to work efficiently under pressure. H4: Complexity has a significant positive effect on Data Journalism Acceptance.

3. Research Methods

This study is based on the case study approach to examine the factors proposed to determine data journalism acceptance among Pakistani journalists. The case study method was selected as the aim was to examine the relevant phenomenon in a single setting to acquire in-depth results (Swanborn, 2010). Further, a five-point Likert scale survey questionnaire was applied for the data collection. According to Ponto (2015), survey questionnaires are mostly applied in short-term research studies as they are cost-effective, providing generalizable results. Notably, the data gathering was performed from November 2022 to January 2023. After attaining their consent for participation, the respondents were sent the questionnaire through WhatsApp and Emails. The data was collected and further calculated using both descriptive and inferential statistics (Genser *et al*., 2007).

3.1 Study Sampling

As the population of the current research involves journalists working in Twin cities (Rawalpindi and Islamabad), the sample was selected to ensure representativeness. The two cities were specially selected for some basic reasons, including the presence of the national press club Pakistan working in both cities, where the required details (names, emails, and personal data) of the respondents were available. Besides, both cities have a wider acceptance of technology due to the local government's strategic implementation of digital technology programs. Moreover, the sample *n*= 300 was selected based on the two criteria. First, this study is based on Structural Equation Modelling. Sim *et al*. (2018) consider the projects using Structural Equation Modelling should be at least *n*= 200 individuals to avoid any concerns regarding the validity and reliability of results. Further, the G* Power analysis was used for the sample size determination (Taherdoost, 2016). The relevant analysis revealed a minimum size of *n*= 74 individuals with four predictors would be ideal for this study, indicating the select sampled size of *n*= 300 respondents is ideal. Figure 2 shows the sample size distribution according to G* Power Analysis. The respondents were further selected by using the convenience sampling method. Despite the relevant sampling size has gain criticism due to the researchers' own bias (Henry, 1990), the selection criteria was based on selecting those journalists who are practicing data journalism in Pakistan.

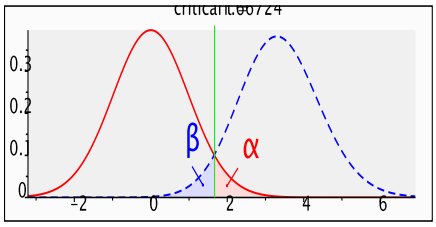

Figure 2: Sample Size Distribution According to G* Power Analysis

After data gathering the responses were carefully analyzed and evaluated. It was found that n= 17 responses were incompletely filled by the respondents. Thus, *n*= 283 questionnaires were finalized for the further analysis purposes. Overall, the response rate of 94.3% remained suitable and significantly higher than the minimum threshold percent of 60% (Deutskens *et al*., 2004).

3.2 Research Ethics

This research is based on some primary ethical considerations. First, the respondents were provided with informed consent as an important ethical consideration (Golder *et al*., 2017). They were briefed about the research topic, aims, further perceived outcomes, and their importance. The respondents were also ensured that their private information would be kept confidential and would not be used for any further purposes. Finally, the respondents were told they could withdraw from recording their responses without consideration or obligation.

3.3 Common Method Bias

According to MacKenzie & Podsakoff (2012), Common Method Bias occurs when the determined relationship between the variables is inflated. In other words, Common Method Bias is a systematic covariance and is highly unlikeable in regression-based studies (Çizel *et al*., 2020). Thus, the relevant analysis in this study is also conducted that indicated the CMB percentage at 19.2%, which is significantly lower than the threshold value of 50.0%. It is assumed that the Common Method Bias is under control.

4. Analysis and Findings

Following the guidelines proposed by Kennedy *et al*. (2019), this research evaluated the reliability and validity of our research model. Notably, both criteria were measured by applying the principles of convergent validity. Findings in Table 1 indicate that the construct reliability as affirmed as acquired Cronbach Alpha Values range from .728 to .836, surpassing the recommended value of .7 (Tehseen & Sajilan, 2017). Additionally, the Composite Reliability Values range from .729 to .852, indicating that the construct reliability has been successfully established. Convergent validity was further assessed using Factor Loading values and Average Variance Extracted Values (AVE) to validate it further. Our results show that the AVE values range from .776 to .887 (Carlson, 2010), exceeding the threshold values and supporting the convergent validity of the model.

Table 1: Reliability and Validity Analysis

Constructs	Items	Loads	AVE	CA	CR
	REL1	.619			
Relative Advantage	REL2	.761	.772	.728	.738
	REL3	.738			
	REL4	.819			
	COM1	.903			
Compatibility	COM2	.503	.807	.836	.830
	COM3	.373			
	COM4	.711			
	OBS1	.916			
Observability	OBS2	.257	.756	.744	.852
	OBS3	.670			
	OBS4	.687			
	CMX1	.514			

Complexity	CMX2	.789	.840	.792	.729
	CMX3	.794			
	CMX4	.937			
Data Journalism Acceptance	JOU1	.943	.935	.801	.791
	JOU2	.936			
	JOU3	.941			
	JOU4	-.942			
	JOU5	.915			

To further proceed with the validity procedures, the measurement model's discriminant validity was examined using Fornel-Larcker and Heterotrait-Monotrait Ratio (HTMT) scales recommended by Rasoolimanesh (2022). Table 2 shows the bivariate Pearson correlation indicating that the square roots of the Average Variance Extracted (AVE) values are greater than the structural correlation values. Besides, all the correlation and calculated AVE values do not correlate with each other. Furthermore, calculating averages of all variables and using the HTMT scale revealed a value of .173, lower than the recommended threshold value of .85, supporting the successful establishment of discriminant validity (Voorhees, 2016).

Table 2: Bivariate Pearson Correlation

	REL	**COM**	**OBS**	**CMX**	**JOU**
REL	**.595**				
COM	.154	**.651**			
OBS	.455	.071	**.571**		
CMX	.068	-.059	.062	**.705**	
JOU	.252	.021	.346	.248	**.874**

The goodness of fit was assessed as the final step of measurement model analysis. According to Tenenhaus *et al*. (2009), the goodness of fit determines the extent to which observations accurately match the data distribution in a study. Thus, model fit analysis in this research yielded a chi-square value of x2 = 1.062 (11) with a probability value of .001, indicating a good fit. Furthermore, the Standardized Root Mean Square (RMSEA) value was calculated to be .013, which is lower than the recommended threshold of 0.9 and indicates a strong model fit. Additionally, the Tucker and Lewis Fit (TLI) value was .926, and Non-Fit Index (NFI) was at .829, overall showing a good fit in the current study. Figure 3 shows the measurment model after eliminanating the items having leading values less than .5 (Chwialkowski *et al*., 2018).

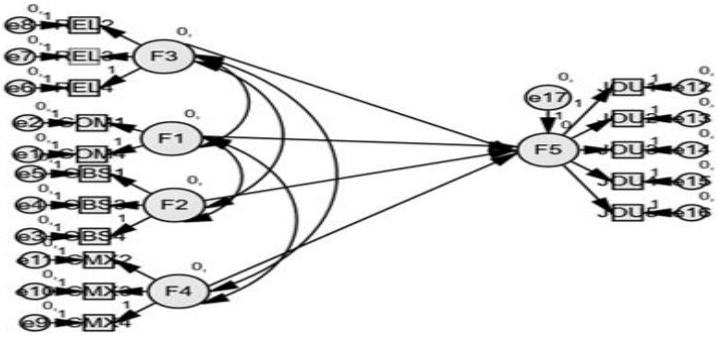

Figure 3: Measurement Model

As this study is based on four predictor variables, examining multicollinearity was of greater importance. According to O'brien (2007), examining the presence of Multicollinearity before conducting regression analysis in studies with multiple predictor variables is important. Multicollinearity refers to the correlation between predictor variables as an undesirable phenomenon in regression-based studies (Asthana, 2018). To assess the potential Multicollinearity between variables, the Variance Inflation Factor (VIF) analysis was conducted (See Table 3). Results indicate that the VIF value for Relative Advantage is 1.288, Observability is 1.262, Compatibility is 1.029, and Complexity is 1.011. Overall, all VIF values are below the recommended cutoff value of 3.0 (Shrestha, 2020), indicating that Multicollinearity between all the predictor variables is well-controlled.

Table 3: Variance Inflation Factor Analysis

Variables	**Sig.**	**Collinearity Statistics**	
		Tol.	**VIF**
Relative Advantage	.078	.776	1.288
Compatibility	.959	.971	1.029
Observability	.000	.792	1.262
Complexity	.000	.989	1.011

Path analysis was conducted to examine the current research's structural model (Novak *et al*., 2021), including regression weights, *t*-values, and significance values (Ringle & Sarstedt, 2016). Analysis revealed that the proposed effect of Relative Advantage on Data Journalism Acceptance remained significant with the *p*-value of p> .000. Further, in the H2 of the study, a significant positive effect of compatibility on the Data Journalism Acceptance also remained significant with the p-value of p> .000. Furthermore, H3 and H4 of current research proposed significant effects of Observability and Complexity on the Data Journalism Acceptance among the Pakistani journalists. Results showed that both predictors (Observability and Complexity) significantly affect Data Journalism Acceptance. Overall, the results remained supportive, and the proposed explanatory work remained validated. Table 4 shows the details

of path analysis, including path values, t-values, and significance values obtained in the current research.

Table 4: Hypotheses Testing

Hyp.	Relationships	*β*	*t*	*P*
H1.	Relative Advantage → Data Journalism Acceptance	.647	6.408	***
H2.	Compatibility → Data Journalism Acceptance	.772	12.104	***
H3.	Observability → Data Journalism Acceptance	.598	10.975	***
H4.	Complexity → Data Journalism Acceptance	.988	57.128	***

5. Discussion

According to Holman (2022), the acceptance of data journalism among journalists can be justified by its ability to provide insights and perspectives that are not available through traditional reporting methods. Data journalism helps uncover patterns, trends, and relationships hidden in large datasets, enabling journalists to report on complex issues more compellingly and informatively. Data journalism can also enhance transparency and accountability by giving readers access to raw data and analysis, allowing them to draw their conclusions and hold institutions and individuals accountable. In this regard, the diffusion of innovation theory provided a useful framework to understand the adoption of data journalism among journalists in Twin cities. While initially embraced by a small group, data journalism has gradually gained acceptance among most journalists as a powerful tool for enhancing the quality and impact of journalism. According to Thienthaworn, (2018), the benefits of data journalism, including its ability to uncover hidden patterns and relationships, enhance transparency, and promote accountability, provide a strong justification for its continued adoption and integration into journalism. As the current research was based on the survey method, calculating the data was on both inferential and descriptive statistics. The respondents strongly agreed with the importance of data journalism as an important journalistic practice today. Talking specifically about the gathered responses, Tables 5 and 6 show the descriptives of the responses. Notably, the first hypothesis of the current study was H1: Relative Advantage has a significant positive effect on Data Journalism Acceptance". Most respondents widely agreed with the attribution of data journalism to their acceptance behavior. According to 83.4% of respondents, they consider data journalism as a unique approach to professional journalism. 80.3% of respondents agreed that data journalism is comparatively more organized, leading them (82.5%) to search for an independent venue to display their journalistic practices. 87.1% of respondents also agreed that the unique features of data journalism further motivate them to continue using it as the primary journalistic method today. These results are consistent with the argumentation by Uskali (2020). As noted, data journalism is a unique journalistic practice involving data, statistics, and visualizations to uncover insights and tell stories that traditional reporting methods cannot. Unlike traditional journalism, data journalism relies on data-driven approaches to analyze and interpret

complex issues and trends, enabling journalists to report on topics with greater depth, accuracy, and impact. Further concerning the H2: Compatibility has a significant positive effect on Data Journalism Acceptance"**,** the respondents agreed that data journalism is compatible with their (81.5%) with their needs. 79.8% of respondents also agreed that data journalism integration was easy as it is convenient to practice (82.7%). Finally, this compatibility with their professional needs is helping them (81.45%) to accept and practice data journalism in Pakistan. As noted by Lowrey and Hou (2021), data journalism is highly compatible with professional journalistic needs as it enhances and complements traditional reporting methods rather than replacing them. By incorporating data and statistics into their reporting, journalists can uncover and convey complex information that may only be apparent from traditional sources. This provides a more nuanced and accurate portrayal of events and helps journalists maintain their credibility as professionals committed to providing accurate and informative reporting. Furthermore, data journalism can help journalists to reach new audiences and engage with readers in new ways, creating opportunities for increased exposure and impact.

Table 5: Descriptive of Study Variables (REL, COM, OBS)

Variables	Items	Min	Max	M	SD	Var
Relative Advantage	REL1	2	4	3.92	.321	.103
	REL2	2	4	3.90	.306	.094
	REL3	2	4	3.87	.358	.128
	REL4	2	4	3.84	.409	.167
Compatibility	COM1	0	4	3.74	.804	.646
	COM2	3	4	3.92	.274	.075
	COM3	2	4	3.89	.351	.123
	COM4	2	4	3.88	.380	.144
Observability	OBS1	2	4	3.95	.268	.072
	OBS2	2	4	3.96	.234	.055
	OBS3	2	4	3.92	.315	.099
	OBS4	2	4	3.87	.390	.152

Regarding the third study hypothesis, **"**H3: Observability has a significant positive effect on Data Journalism Acceptance," 86.4% of respondents agreed that data journalism is based on comparatively more transparent reporting patterns. According to 82.5% of respondents, data journalism enables the audiences to access the reported data independently, improving their critical thinking abilities (82.5%). For 82.1% of respondents, data journalism contains transparency/observability as an appealing aspect, leading them to accept it as a modern journalistic practice. As noted by Parasie (2019), Data journalism provides greater observability and accountability by making raw data and analysis accessible to readers, allowing them to conclude. As a result, data journalism has emerged

as a critical tool for improving the quality and impact of journalism, and it continues to grow in significance as data becomes an increasingly central component of our society and culture.

Table 6: Descriptive of Study Variables (Complexity, Data Journalism Acceptance)

Variables	Items	Min	Max	M	SD	Var
Complexity	CMX1	2	4	2.49	1.34	1.79
	CMX2	3	4	3.87	.333	.111
	CMX3	2	4	3.84	.382	.146
	CMX4	2	4	3.93	.276	.076
Data Journalism Acceptance	JOU1	0	4	3.68	.811	.657
	JOU2	2	4	3.95	.254	.065
	JOU3	2	4	3.93	.270	.073
	JOU4	0	4	3.68	.811	.657
	JOU5	2	4	3.95	.268	.072

Finally, the last hypothesis, "H4: Complexity has a significant positive effect on Data Journalism Acceptance," also received affirmation as the gathered data showed a greater agreement regarding complexity as a primary aspect of data journalism. According to 82.8% of respondents, data journalism is attractive as it needs strong skills to practice. 79.2% of respondents agreed that data journalism requires a collaborative effort of different fields that further their interest in accepting data journalism. 85.5% of respondents agreed that complex reporting system increases the acceptance of data journalism, leading them (83.2%) to accept data journalism as a professional practice. According to Jiang and Rafeeq (2019), data journalism often requires collaboration between journalists, data scientists, and programmers to ensure accuracy and reliability. Additionally, data journalists must navigate legal and ethical issues, such as privacy concerns, and ensure that their reporting adheres to journalistic standards. These factors make data journalism a challenging, complex, competitive, and multifaceted field that requires specialized expertise and experience. Thus, the subjective reviews of the respondents also indicated that importance of accepting data journalism in Pakistan lies in its potential to improve the quality of journalism and contribute to a more informed and engaged society. As data journalism continues to grow in importance and popularity worldwide, Pakistan's journalists and news organizations must be equipped with the skills and resources needed to embrace this powerful approach to reporting.

6. Conclusion

This study was based on investigating the potential factors that may contribute to increased data journalism acceptance among journalists in Twin Cities. The findings remained consistent with the idea that data journalism is increasingly important today as the amount of data available to journalists continues to grow. It allows for more in-depth and fact-based reporting, which can help to uncover stories that would otherwise go unnoticed. Furthermore, data journalism enables journalists to provide context and analysis to complex issues,

providing a deeper understanding of the world around us. However, efforts should be made to establish data repositories and promote open data initiatives that make data more readily available to journalists. Creating platforms and tools that facilitate data exploration and utilization can further improve observability, enabling journalists to see the potential impact and value of data journalism in their reporting. Thus, it is concluded that data journalism is widely accepted because it is committed to openness, complex approaches, skills, expertise and distinctive features. By having expertise in their approaches, data journalists can build trust with audiences, ensure the reproducibility of the work, and be held accountable for their reporting.

7. Study Implications and Contributions

This research focused on data journalism acceptance among Pakistani journalists within the framework of the Diffusion of Innovation theory, which makes significant contributions to the field. By examining the factors of relative advantage, observability, and compatibility, the study provides empirical evidence on the factors affecting the acceptance of data journalism in Pakistan. Applying the Diffusion of Innovation theory allows for a deeper understanding of adopting and integrating data-driven reporting practices. By focusing on these precise factors, the research contributes to the existing body of knowledge; this study offers insights into Pakistani journalists' unique challenges and motivations when incorporating data journalism practices into their work. An important implication of the study is the need for targeted training and education programs for journalists. By highlighting the relative advantages of data journalism, these programs can equip journalists with the required skills and knowledge to effectively utilize data in their reporting. News organizations and journalism institutions can play a critical role in adopting. Data-driven practices by incorporating data journalism training into their curricula and providing journalists with ongoing support and resources. Finally, the study emphasizes the significance of integrating data journalism within newsrooms in Pakistan. News organizations should acknowledge the value of data-driven reporting and provide the critical resources and infrastructure to support journalists in incorporating data journalism practices into their workflow. By promoting a culture of data-driven journalism and integrating it into the broader news production process, newsrooms can drive widespread acceptance and utilization of data journalism practices among Pakistani journalists.

8. Study Limitations

This study contains some primary limitations. First, the convivence sampling technique is used, which limits its scope. Secondly, the population is based on respondents from two cities, which questions the generalizability of results in other geographical regions. Finally, the diffusion of innovation theory describes other characteristics that can be tested in data journalism. As this study focused on only four characteristics, the relevant selection also narrowed its scope.

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