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Research Article

Visualization acceptance among the data journalists in the United Arab Emirates: A structural equation modeling-based study

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ABSTRACT

New trends and practices in journalism and news-making contribute to data journalism's increasing adoption and use. This study highlights and examines data journalism as a significant practice among journalists in the United Arab Emirates. Theoretically supported by social cognitive theory, data from 309 journals is analyzed using structural equation modelling. The results show a strong preference among Emirati journalists for using data journalism professionally. These journalists encode data using various visualization approaches to improve data availability and transparency for readers. Also, they prioritize assuring easy and understandable data decoding among audiences, potentially promoting critical thinking. Thus, the study concludes that Emirati journalists are assertive about adopting and using data journalism approaches to enhance their skills and provide transparent data to readers. Also, data journalism's preference reflects technology's integration into traditional journalism, transforming communication into a two-way process. Finally, the research discusses the study implications, limitations, and recommendations accordingly.

Keywords: data journalism, social cognitive theory, United Arab Emirates, journalism and media, visualization, decoding, encoding

INTRODUCTION

News is critical to daily communication, providing updates on different topics, personalities, and events worldwide (Binns, 2017). Simons et al. (2017) emphasize that the preceding aim of news is to inform and empower the public, giving them the rudimentary right to knowledge. According to Farhi and Mohamed (2023), journalism provides individuals with the information required to make personal, communal, societal,

and governmental decisions. While information is available from myriad sources, journalism stands out for its credibility and distinctiveness. Conventional platforms such as newspapers, radio, and television, along with online platforms of established news organizations and journalists, function as preliminary mediums for distributing journalistic content (Broussard, 2020). However, with the beginning of digital technology, online resources have acquired prominence due to their proximity and accessibility (Afsar & Kumari, 2020). Digital journalism represents a dynamic sector within reporting, using advanced technology to collect, produce, and disseminate news designed for a tech-savvy audience. It involves an organized process of creating and covering news stories and providing on-time updates on national and international events available online. Online journalism contains many subjects, including politics, sports, business, travel, and more (Kotisova, 2020). Thorsen (2019) argues that digital journalism allows journalists to access, ascertain, refine, and disseminate news efficiently. Also, it facilitates direct engagement with audiences, helping journalists to determine preferences, refine content, and improve the overall quality of digital journalism. Similarly, "data journalism" appears as a critical concept, improving the depth and pertinence of news reporting by examining and using extensive datasets to prepare insightful narratives (Lewis et al., 2020; Mutsvairo, 2019). Bhargava and D'Ignazio (2021) highlight that data journalism uses numerical data to share news in today's digital landscape, incorporating elements of statistics, computer science, journalism, and graphic design to enhance content and inform readers comprehensively. According to Rey (2018), data journalism is essential in narrating stories from data analysis. Journalists adeptly gather, interpret, and present data through graphical illustrations like graphs and maps, stimulating a clearer understanding of complex issues. Integrating storytelling features allows for contextualizing results from the subjects' viewpoint (Willnat et al., 2019), promoting a connection between the news narrative and readers' understanding, generally referred to as a "new arc." This technique resonates globally as journalists increasingly adopt data journalism, striving to provide readers with news embedded within visual data frameworks (Beiler et al., 2020; Lewis et al., 2020; Treadwell et al., 2016). Data journalists acknowledge a crucial role in improving data literacy among readers, breaking down barriers, and promoting deeper understanding on a broader scale (Bebawi, 2020; Boyles & Meyer, 2018).

Situation of Data Journalism in the United Arab Emirates

Arab journalism has been under scrutiny due to authoritarian governments, with the Middle Eastern region ranking low in terms of press autonomy. Arab journalism has been scrutinized due to authoritarian governments, with the Middle Eastern region ranking low in press autonomy (Lewis & Nashmi, 2019). This situation has led to a dual system of press regulation (Farhi & Mohamed, 2023), with both self-censorship and state-imposed restrictions being common. Multiple regional journalists are moving towards data-driven and credible reporting, which suggests greater accessibility to the public. Emirati journalists have been acquainted with data journalism for some time, assuming it is a robust professional practice within their commitment to press freedom and normative standards. Most Emirati journalists are actively involved in data journalism, considering it essential to their profession (Fahmy & Attia, 2021).

The significance of data journalism in the United Arab Emirates (UAE) lies in its ability to make intricate information discernible to readers and to shed light on crucial social issues without constraints. Emirati journalists use tools like code-free browser extensions and programming languages like Python to access and analyze data. This focus on data journalism highlights the broader concerns among UAE journalists concerning freedom of expression and access to information as rudimentary human rights (Kabha, 2019). This situation has led to a dual system of press regulation, with both self-censorship and state-imposed restrictions being common. Multiple regional journalists are moving towards data-driven and credible reporting, which suggests greater accessibility to the public (Chettah & Farhi, 2023; Farhi & Mohamed, 2023). Emirati journalists have been acquainted with data journalism for some time, assuming it is a robust professional practice within their commitment to press freedom and normative standards. Most Emirati journalists are actively involved in data journalism, considering it essential to their profession (Snoussi, 2019). The significance of data journalism in the UAE lies in its ability to make intricate information discernible to readers and to shed light on crucial social issues without constraints (Chettah & Farhi, 2023; Farhi et al., 2023). Emirati journalists use tools like code-free browser extensions and programming languages like Python to

access and analyze data. This focus on data journalism highlights the broader concerns among UAE journalists concerning freedom of expression and access to information as rudimentary human rights (Darwish, 2020).

Study Gaps and Objectives

Despite data journalism being widely accepted and practiced in the UAE, studies highlighting its acceptance remain scarce. Further, examining its acceptance based on social cognitive theory (SCT) further fills the theoretical gap for examining the acceptance of data journalism. Thus, this study examines Emirati journalists' perspectives on data journalism, including their understanding, skillfulness, and opinions on its adoption, use, and results (Fahmy & Attia, 2021). It draws on the audience reception theory, investigating how audiences consider data journalism in written text and visually. The research is structured into different sections: an introduction and problem statement, a literature review on data journalism, theoretical support, techniques used, data computation and results, and a discussion of results leading to conclusions.

Significance

This research highlights how Emirati journalists perceive and engage with data journalism, a contemporary field in modern media. By analyzing their perspectives, skills, and attitudes toward data-driven reporting, the study illuminates the evolving landscape of journalism within the UAE. This research indicates the dynamics that shape the integration of data journalism practices within the Emirati media ecosystem. Paramount to the research is applying the SCT to investigate the acceptance of data journalism among Emirati journalists. SCT provides a theoretical framework to apprehend the psychological and social processes affecting journalists' attitudes, beliefs, and behaviors towards data-driven reporting practices. Using SCT, the study aims to reveal the factors driving or inhibiting the adoption of data journalism within the Emirati journalistic community, presenting insights into the dynamics of media production and consumption in the UAE.

LITERATURE REVIEW

Social Cognitive Theory

Social cognitive theory by Albert Bandura supports current research assuming the role and effect of external factors in driving the cognitive process (Conner & Norman, 2015; Schunk, 2001). At its core, the relevant theory proposes that human actions are proposed by the triadic function of different factors, including behavioral factors, environmental, and personal factors (Weber et al., 2018). Now, talking about the current research, this theory supports investigating how visualization, such as visualization, maps, choropleth maps, and others, ensure data availability, further leading to ensuring audience decoding of the relevant content (Chen et al., 2021). By applying SCT to the study of data journalism acceptance (Lu, 2020), this research examines how journalists' perceptions regarding different facets of data journalism are affected by their usability to ensure that the audience can easily decode the provided information. Visualization methods are critical in data journalism (Kalatzi et al., 2018; Porlezza & Splendore, 2019). SCT implies that journalists may learn from observing effective visualization methods in data-driven stories produced by their peers or significant figures in the field (Stalph, 2018). If they perceive these techniques as improving the clarity and impact of storytelling, they are more likely to adopt and prefer data journalism practices themselves. Besides, data availability is a critical factor in adopting data journalism practices (Engebretsen et al., 2018). The SCT asserts that journalists' belief in their ability to access and analyze available data affects their engagement with data-driven reporting. If journalists perceive data as accessible and applicable to their reporting needs, they are more likely to integrate data journalism into their practice (Young, 2017).

Importance of Data Journalism

Numbers are the language through which we analyze the data surrounding us daily. Terms like "data" and "journalism" can be problematic, particularly in today's digital age. Earlier, "data" primarily referred to numerical information presented in tables, the volume of reporters' interchange with numbers two decades ago (Heravi, 2019). However, in the current digital era, numbers have evolved to enclose a broader spectrum of information, allowing data journalism to emerge as a powerful tool for describing complex stories through visually engaging infographics. As Treadwell et al. (2016) emphasized, data journalism can act as a source to

inform a story or as a mechanism to present it. However, caution must be exerted in its use, as it can shape and limit narratives. According to Zhang and Feng (2019), data journalism can underline scientific discoveries and present them to readers in various formats, including stagnant graphics and interactive features, enhancing the context of breaking news stories. The beginning of digital media has revolutionized the dissemination of breaking news, once the upscale domain of conventional media outlets. Mutsvairo (2019) emphasizes the changing landscape where news is now reported by many individuals and organizations, highlighting the increasing significance of data journalism in gathering, organizing, and visualizing details beyond what is prominent to the naked eye. Appelgren (2018) emphasizes the importance of data, the language of interconnectedness in today's world, which may appear insignificant but holds ample value when viewed from a practical perspective. Data journalism is becoming essential in journalism, presenting a new set of skills for accessing, estimating, and visualizing digital sources. Kabha (2019) indicates that journalists must acclimate and move closer to their sources in an era loomed by digital sources. Bradshaw (2017) notes that the Internet has opened doors to exceptional possibilities, and while data journalism is still in its infancy, it operates a critical dual role for news organizations: highlighting distinctive stories and maintaining the watchdog role, particularly during challenging economic times.

Role of Data in Data Journalism

Journalists have increasingly shifted to data to move beyond only reporting news stories to diagnosing their importance. Multiple options for the subject area are available. The procedure leading to the next financial crisis has started. The things we use are established in economics. Irrefutable data visualization is handy in financial embezzlement or political gaffes, where little room remains for debate (Lewis et al., 2020). As emphasized by Westlund and Hermida (2021), statistics should act as an abundance of inspiration for journalists. They can show how demographic variables like age, gender, and education level affect general risks. In its transformative power, data can generate abstract concepts discernible to a broad audience. Journalists armed with data can scrutinize the complexities behind events such as riots or political debates, reveal inaccuracies, and propose solutions to complex problems, as articulated by Fahmy and Attia (2021). Command in data compilation, organization, and visualization entrusts journalists to document more objectively about the world. Bradshaw (2017) underline that constructing arguments from proof rather than speculation or quotations significantly promotes journalistic integrity. The initial step in preparing any data-driven narrative concerns sourcing a dataset, potentially from the results section of articles that convey compelling stories (Bradshaw, 2017). Steering through raw data, akin to investigating unknown territories, requires diligence from journalists to reveal the invisible stories ingrained within (Borges-Rey, 2016).

Data Journalism and Visualization

Various factors emphasize the significance of considering data visualization. A well-crafted visualization can swiftly and significantly influence viewers, streamlining complex narratives (Lewis & Nashmi, 2019). Unlike other visual mediums like photography and video, data visualization is embedded in measurable data, striving to illustrate rather than only describe in a written manner (Cushion et al., 2017). In an age of media usually designed for distinct perspectives, data visualization offers narratives grounded in facts, not prejudice (Palomo et al., 2019). Also, it serves primary news needs, including reporting accidents and deeper investigations and presenting fresh perspectives on familiar topics (Porlezza & Splendore, 2019). Cushion et al. (2017) such as the portrayal of political divides in the United States. The transition from freely alternating colors to represent political parties before 2000, where Ronald Reagan's victory in 1984 is still vivid, highlights the effect of visual representations (Snoussi, 2019). Notably, The New York Times used varying circle sizes in a 2006 map to demonstrate the distribution of New Orleans citizens after Hurricane Katrina, emphasizing the power of visual storytelling (de-Lima-Santos & Mesquita, 2021). For example, national agencies and research centers have used interactive tools to create narratives about the COVID-19 pandemic, focusing on its most influential elements. By incorporating interactivity and visualization, the media improves its credibility and encourages user engagement, placing users at the epicenter of data access, exchange, and interaction through interfaces (Codina, 2021). Acknowledging the critical role of interaction and visualization in intricate information processes instigates reevaluating practices and systems (Beiler et al., 2020). The digital ecosystem has generated dynamics that contest established relationships among information, narrative perception,

Table 1. Questionnaire items and sources

Variables	Items	Source	# of items
Data journalism	Data visualization improves the transparency of journalistic storytelling. Access to pertinent data sources positively affects my inquisitiveness in data journalism. I am confident in my ability to analyze and interpret data for journalistic purposes. Organizational support for data-driven reporting motivates me to engage in data journalism practices.	Auväärt (2022)	4
Visual encoding	Visual representations enhance the audience's understanding of intricate data. The selection of visual elements significantly affects the effectiveness of data storytelling. I consider selection of color schemes and visual styles when creating data visualizations. Visual encoding approaches improve engagement of readers/viewers with data-driven stories.	Lewis and Nashmi (2019)	4
Data availability	Access to myriad and reliable data sources encourages data journalism practices. Restricted data availability poses challenges for integrating data-driven elements into journalistic content. Journalists need help accessing timely and relevant data for their reporting. Improved data translucency from government and organizational sources encourages journalists to use data in their storytelling.	Appelgren and Lindén (2020)	4
Audience decoding	Audiences value data-driven stories in journalism. Understanding audience interests and demographics helps design data journalism content effectively. Audience feedback and engagement metrics provide insights into significance of data storytelling. Translating intricate data into efficiently understandable narratives improves audience understanding and engagement.	Beiler et al. (2020)	4

content curation, access, consumption, and participation methods. It also facilitates a review of different agents' roles–journalists, documentalists, information curators, audiences, researchers, informing communities, media, and society are expected to play (Auväärt, 2022; Fahmy & Attia, 2021; Lewis & Nashmi, 2019). Highlighting the significance of combining interaction and visualization presents investigations into how digital text is defined, developed, produced, consumed, and analyzed, encompassing multimedia, mutable, adaptable, and transmedia structures.

H1: Data journalists prefer visual encoding in their professional practices in the UAE.

H2: Data journalists ensure data availability in their professional practices in the UAE.

H3: Data journalists ensure a simple and enhanced audience decoding in the UAE.

RESEARCH METHODOLOGY

Study Design and Data Collection

This research involves a cross-sectional design based on data gathering for a shorter time with greater generalizability of results. Further, the researchers employed the survey technique for data-gathering purposes. (Abbott & McKinney, 2013) The questionnaires were close-ended, based on the five-point Likert scale. **Table 1** provides an overview of the study questionnaire and sources. Data was collected from September 15, 2023, to January 1, 2024. After the data collection, the researchers coded the data and conducted the statistical analysis using statistical package for social sciences and Smart-PLS for structural equation modelling (SEM).

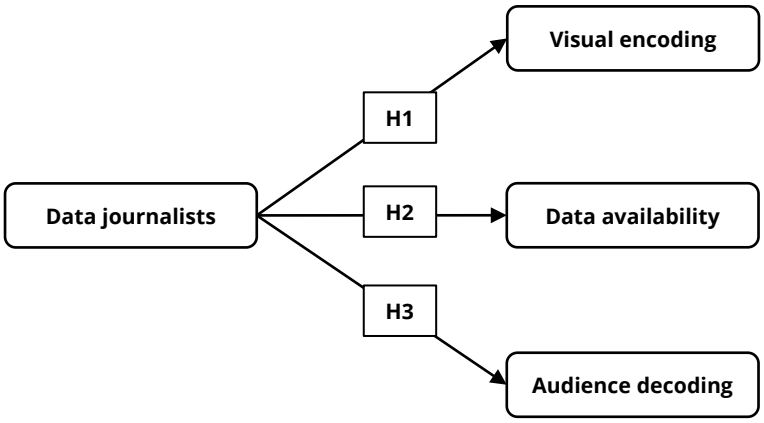

Figure 1. Explanatory framework (Source: Authors)

Table 2. Data normality assessment

	Kolmogorov-Smirnov[a]		Shapiro-Wilk	
	Statistic	Significance	Statistic	Significance
Data journalism	0.489	0.529	0.462	0.345
Visual encoding	0.425	0.518	0.553	0.400
Visualization	0.485	0.511	0.456	0.416
Data availability	0.143	0.491	0.906	0.342
Audience decoding	0.445	0.537	0.529	0.292

Sampling Approach

The population of this research was the journalists in the UAE. However, the researchers used a convenient sampling method for sample selection purposes. According to Acharya et al. (2013), despite much criticism of the convenient sampling approach, it is one of the most preferred approaches in social sciences research. Convenient sampling helps the researchers choose and collect responses from the individuals considered appropriate for their research. Notably, this research involved n = 319 respondents presently working as data journalists in organizations and independently. However, the current sample size is selected according to two criteria. First, the study applies *structural equation modelling*. According to Thakkar (2020), research involving structural equation modelling should include a sample of a minimum of n = 200 individuals to ensure the validity of the results. The sample was also selected using the G* Power analysis (see **Figure 1**). Thus, the calculation revealed a minimum sample size of n = 72 with one independent variable, effect size (f^2) at .015, and error of approximation value at .330. Hence, according to both criteria, the chosen sample size for this research was ideal. After the data collection, the researchers scrutinized the collected questionnaires. The overall response was 96.6%, as n = 11 questionnaires were missing or wrongly filled in by the study respondents.

Normality Testing

Since this study depends on quantitative approaches, parametric tests were selected to scrutinize the collected data, requiring verification of its normality. Thus, the normality of the relevant data was evaluated using the Kolmogorov-Smirnov and Shapiro-Wilk tests. The analysis showed that all variables had significance values exceeding the threshold of 0.7 (Khatun, 2021), implying that the data did not follow a normal distribution. Therefore, parametric tests were considered appropriate for the current research, as described in **Table 2**.

DATA ANALYSIS

The data analysis first involves the calculation of respondents' demographics. The demographics of the respondents highlight the characteristics of the sample population. Concerning gender distribution, the data shows that 52.0% of respondents specified as male, while 48.0% identified as female, suggesting a relatively

Table 3. Demographics of respondents

Variables	Constructs	N	%
Gender	Male	166	52.0
	Female	153	48.0
Age	20-30 years	214	67.1
	31-40 years	105	32.9
	41 years or above	88	21.8
Educational level	Diploma/certification	18	5.6
	Undergraduate	40	12.5
	Graduate	81	25.4
	Postgraduate	113	35.4
	Doctorate	67	20.6

Table 4. Convergent validity analysis

Variables	Items	FL	AVE
Data journalism	DJ1	0.719	0.801
	DJ2	0.823	
	DJ3	0.785	
	DJ4	0.873	
Visual encoding	VEC1	0.722	0.836
	VEC2	0.251	
	VEC3	0.703	
	VEC4	0.615	
Data availability	AVA1	0.752	0.900
	AVA2	0.811	
	AVA3	0777	
	AVA4	0.940	
Audience decoding	ADC1	0.963	0.916
	ADC2	0.940	
	ADC3	0.582	
	ADC4	0.963	

proportional representation between the genders. Moving on to age demographics, a substantial majority, including 67.1% of respondents, falls within the 20 to 30 years category, 32.9% are aged 31 to 40, and 21.8% are 41 or above. Analyzing educational backgrounds, the data shows a myriad spectrum. Among respondents, 5.6% hold diplomas or certifications, 12.5% are undergraduates, 25.4% are graduates, 35.4% are postgraduates, and 20.6% have doctorates. An additional 6.6% fall into the 'other' category, showing mixed educational attainment levels among participants. This diversity highlights the range of educational levels within the sample. The mean gender representation is approximately 0.48, showing a slightly higher proportion of males within the sample. The mean age of roughly 0.66 suggests a younger average age among respondents. Concerning education, the mean score of approximately 2.60 mirrors a mixed distribution of educational backgrounds, with a significant standard deviation exhibiting diversity in educational levels. **Table 3** represents the demographics of respondents.

Inner Model Analysis

Following Mello and Collins (2001), convergent validity helps measure the internal consistency of research contracts as it is crucial for the construct being studied to show internal consistency. To evaluate internal consistency, researchers first performed two computations: Factor loading and average variance extraction (refer to **Table 1**). It is worth noting that factor loading, and average variance extraction have a threshold value 0.7 (Genser et al., 2007). Values below this threshold confirm the convergent validity of the measurement model. In the present study, most Factor Loading values exceed the threshold of 0.5. Besides, average variance extracted (AVE) values also surpassed the threshold value of 0.5 (data journalism 0.801, visual encoding 0.836, data availability 0.900, and audience decoding 0.916). Thus, the analysis reveals the establishment of convergent validity for the measurement model. **Table 4** shows the values regarding factor loadings and AVE. The goodness of fit, also called model fit, is crucial for evaluating how well the gathered data aligns with the normal distribution (Chwialkowski et al., 2018). It implies whether the sample data accurately represents what researchers anticipate finding within the population. In this study, the goodness

Table 5. Construct reliability analysis

Variables	Cronbach's alpha	Composite reliability
Data journalism	0.781	0.771
Visual encoding	0.793	0.783
Data availability	0.796	0.900
Audience decoding	0.735	0.883

Table 6. Fornell-Larcker criterion

	Data journalism	Visual encoding	Data availability	Audience decoding
Data journalism	**0.641**			
Visual encoding	0.417	**0.698**		
Data availability	-0.344	0.462	**0.810**	
Audience decoding	0.306	0.392	0.403	**0.839**

Table 7. Coefficients of determination R^2

Variables	R^2	Strength
Visual encoding	0.752	Strong
Data availability	0.542	Strong
Audience decoding	0.701	Strong

of fit was estimated through different metrics. The chi-square value was calculated to be χ^2 = 2.117 (06), with a probability level of .041, suggesting a close alignment between the sample data and the anticipated population characteristics. Besides, the standardized root mean square (RMSEA) value was assessed as 0.127, representing a significantly lower value than the acceptable threshold of 0.850.

Further, construct reliability is tested using Cronbach's alpha and composite reliability analyses (Bolarinwa, 2015) (**Table 5**). The reliability of data journalism has a Cronbach's alpha of 0.781 and a composite reliability of 0.771, indicating that the measurements for data journalism are relatively reliable within the model. Besides, visual encoding shows good reliability, with a Cronbach's alpha of 0.793 and a composite reliability of 0.783. This suggests that the measurements for visual encoding are compatible and dependable within the model. Results further reveal that data availability shows more robust reliability, with a Cronbach's alpha of 0.796 and a composite reliability of 0.900. This indicates that the measurements for data availability are highly consistent and reliable within the model. Finally, audience decoding shows acceptable reliability, with a Cronbach's alpha of 0.735, suggesting moderate internal consistency. Also, its composite reliability of 0.883 presents good overall reliability within the model.

The researchers further analyzed discriminant validity using the Fronell-Larcker criterion and Hetreotrait-Monotrait (HTMT) ratio scale (Voorhees, 2016). Calculating the squares of AVE values indicated that the relevant values are not only more significant than the correlation values but also distinct and uncorrelated. **Table 6** shows the results of the Fronell-Larcker criterion. Further, calculating the Hetreotrait-Monotrait ratio scale indicated the HTMT value of 0.037, lower than the threshold value of 0.85. Thus, discriminant validity exists in the measurement model.

Further, before examining the structural model, coefficients of determination R^2 are estimated to determine the extent to which the independent variable causes variance in the dependent variables (Piepho, 2019). **Table 7** shows the results of coefficients of determination R^2. Results revealed that the R^2 value of visual encoding is 0.752, suggesting that around 75.2% of the variance in visual encoding is described by the independent variables in the model. The relationship is marked as "strong," indicating a significant effect of data journalism on visual encoding. The R^2 value of data availability is 0.542, meaning that the data journalism in the model accounts for about 54.2% of the variance in data availability. The relationship is labelled as "strong," indicating a notable influence of data journalism on data availability. Finally, the R^2 value of audience decoding is 0.701, indicating that the data journalism in the model explains approximately 70.1% of the variance in audience decoding. The relationship is shown as "strong," suggesting a substantial impact of data journalism on audience decoding.

Hypothesis testing is important in research focusing on cause-effect relationships, where regression analysis is commonly used. In the current study, the researchers also used path analysis to investigate the hypotheses, which serve as preliminary premises. According to Bagozzi and Yi (2012), path analysis plays a

Table 8. Path analysis, regression weights

S/R	Hypotheses	Path	t	Mean	Standard deviation	Significance
H1	Data journalism → Visual encoding	5.321	7.341	3.650	0.264	.000***
H2	Visual encoding → Data availability	4.620	9.622	3.320	0.385	.000***
H3	Data availability → Audience decoding	3.515	26.635	3.750	0.347	.000***

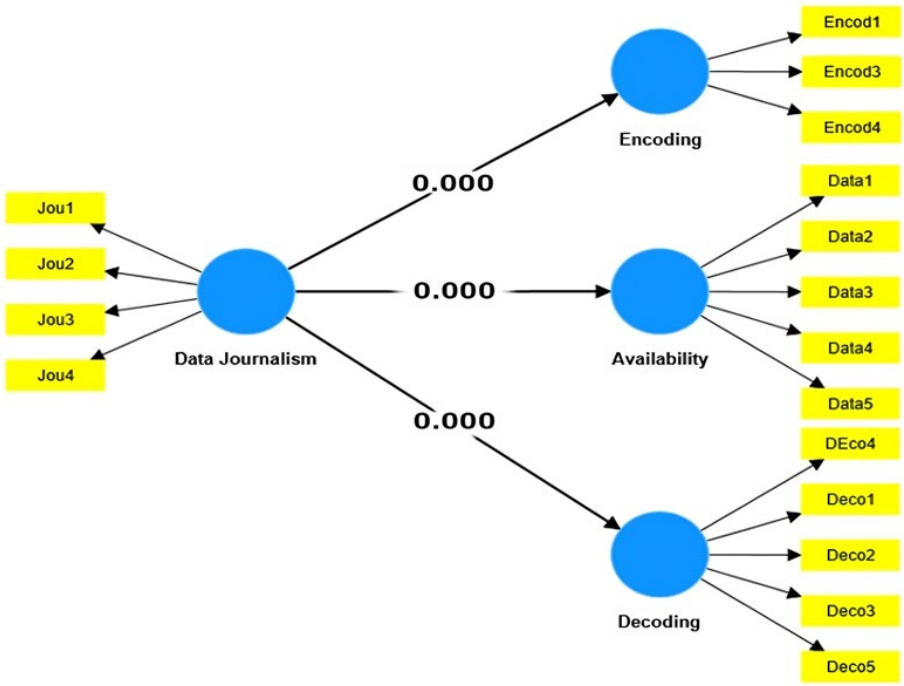

Figure 2. Final path analysis (significance values) (Source: Authors)

critical role in SEM, allowing researchers to evaluate the effects of variables on proposed outcomes through different causal paths. Regarding the first hypothesis, "**H1:** Data journalists prefer using charts and graphs in their professional practices in the UAE," the path analysis shows a significant positive relationship between "data journalism" and "visual encoding" (β = 7.341, p < 0.000). This indicates that UAE data journalists prefer using charts and graphs in their professional practices, supporting **H1**. The second study hypothesis, "**H2:** Data journalists ensure data availability in their professional practices in the UAE," also remained significant. The path analysis reveals a significant positive relationship between data journalists and data availability (β = 4.620, p < 0.000). This implies a strong relationship between the use of visual encoding techniques among Emirati journalists for professional practices in the UAE, supporting **H2**. Finally, the third hypothesis was "**H3:** Data journalists ensure a simple and enhanced audience decoding in the UAE." The analysis also shows a significant positive relationship between data journalists and audience decoding (β = 3.515, p < 0.000). This indicates that data journalists in the UAE ensure a simple and improved audience decoding process, supporting **H3**. **Table 8** summarizes the results of path analysis, and **Figure 2** graphically illustrates the obtained results.

DISCUSSION AND CONCLUSION

Media texts undergo a process of encoding and decoding as they are communicated from content senders to audiences. The sender encodes messages, which the audience then decodes. As Friedman-Romell (1995) noted, Stuart Hall's propositions remain applicable in conventional and new media contexts despite divagations in how individuals decode messages. Data journalism also involves translating data into visual forms, i.e., graphs, charts, or maps. The more visualizations are available, the easier for audiences to understand the related information. Warnes (2018) underlines that visual encoding in data journalism should comply with certain rules, considering the audience's level of understanding. This research focuses on data journalism practices, including data visualization that further improves audience decoding processes,

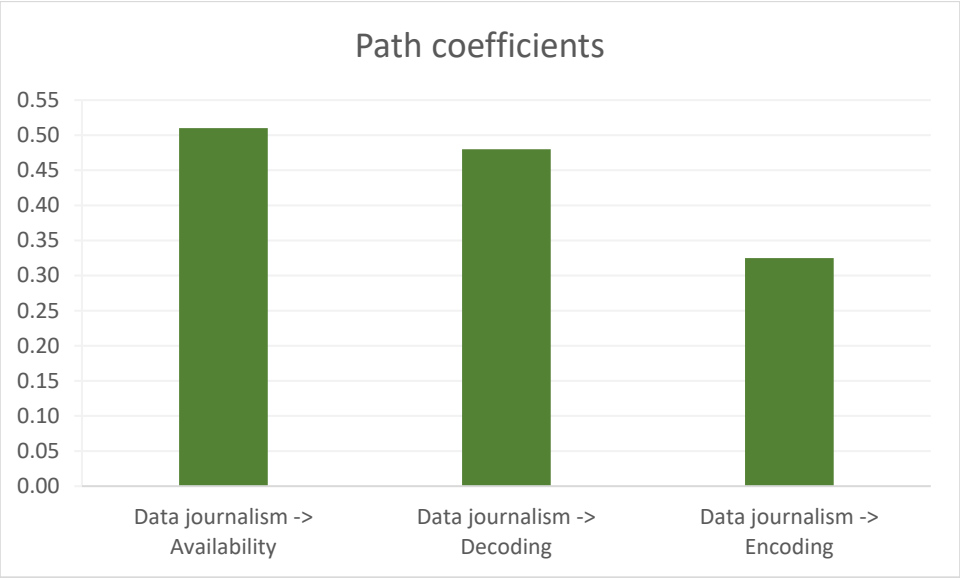

Figure 3. Path coefficients bar chart (Source: Authors)

specifically within the UAE. **Figure 3** illustrates the path coefficients bar chart to overcome the obtained results.

According to most respondents, visual encoding, based on data visualization, enhances the transparency of journalistic storytelling, while access to relevant data sources positively influences their interest in data journalism. Also, respondents voiced confidence in their capability to analyze and interpret data for journalistic purposes. Respondents also indicated that organizational support for data-driven reporting was a motivating factor for preferring data journalism practices, underlining the importance of institutional support in encouraging data-driven journalism initiatives. Regarding the visual encoding of the data journalism practices, respondents indicated a more comprehensive agreement with using visualization as their primary consideration. According to the study respondents, visual representations improve the audience's understanding of complex data, while selecting visual elements significantly affects the effectiveness of data storytelling. Most respondents consented that using different color schemes and visual styles is essential when creating data visualizations. Besides, visual encoding approaches were identified as improving the engagement of readers/viewers with data-driven stories, highlighting the importance of thoughtful visual presentation in sharing complex information. In their study, Weber et al. (2018) also emphasized the significance of using visual elements effectively to tell influential stories with data. Weber et al. (2018) imply that visualization approaches are carefully chosen and designed for the data and the audience. These visualization approaches can improve the accessibility and engagement of data-driven stories, helping journalists to communicate complex information more effectively to their audiences. This is also consistent with the argumentation by Fu and Stasko (2023). As noted, data plays a consequential role in journalism, especially how it is conveyed through charts and visualizations. Newspapers pioneered infographics to capture the public's interest, with iconic examples like USA Today's Snapshots featuring simple yet visually attractive graphics. In recent years, advancements in web-based interactive visualization tools, particularly D3.js, have revolutionized how data stories are told. Prominent news organizations such as The Guardian, The New York Times, and The Washington Post were among the first to adopt these innovative web-based interactive and dynamic visual approaches. Encouraged by their success, a new wave of websites, including FiveThirtyEight and The Pudding, has emerged, continuing to advance the field of data storytelling.

According to the respondents, access to diverse and reliable data sources facilitates data journalism practices, while limited data availability poses challenges for incorporating data-driven elements into journalistic content. The respondents indicated that journalists frequently encounter problems accessing timely and relevant data for their reporting. Further, the respondents consented that enhanced data transparency from government and organizational sources encourages journalists to employ data in their storytelling. Bradshaw (2017) further emphasizes that data availability is essential for journalists to create

informative and impactful stories based on data. Data access helps journalists conduct a thorough analysis, discover insights, and offer evidence-based narratives to their audiences. Bradshaw emphasizes the importance of transparency and unrestricted access to data sources, allowing journalists to ascertain information and encourage accountability in reporting (Munoriyarwa, 2022),

also highlighted the importance of data availability as a core consideration and feature of data journalism. Using data stories, providing further resources to verify the credibility, and gathering even more information on the reported phenomenon is imperative in data journalism. Gehrke (2020) notes that a crucial element in the growth of data journalism is the global exchange of knowledge among data journalists. They often share their techniques, tools, and sometimes details about the data sets they use with their peers. This practice of sharing processes can be partly attributed to the collaboration between journalists and activists, many of whom have backgrounds in computer science. These collaborations often involve joint efforts in data collection, analysis, and visualization using public data. This collaborative spirit has introduced the concept of transparency, which is seen as a way to enhance journalism's credibility in the Internet age. More broadly, transparency is linked to the digital environment of the Internet, which has shifted from mass communication to network communication. This new environment highlights interactivity and interconnectivity, encouraging greater conversation and engagement.

Finally, respondents widely agreed that audiences value data-driven stories in journalism. Apprehending audience interests and demographics is important for effectively designing data journalism content. Also, respondents revealed that audience feedback and engagement metrics offer practical insights into the significance of data storytelling. Residents also consented that translating complex data into easily understandable narratives was recognized as a method to improve audience understanding and engagement. These findings underscore the importance of audience-centric approaches in data journalism, emphasizing the need for journalists to create content that satisfies the interests and requirements of their audience while using feedback and engagement metrics to enhance their storytelling. As noted by Túñez-López et al. (2020), data journalism promotes critical thinking skills among audiences by enabling them to analyze and decode data independently, promoting civic engagement and responsibility in the digital age. As such, data journalism catalyzes improving audience decoding by democratizing access to information and enabling individuals to steer the complexities of the contemporary information landscape. Thus, the growing popularity of data journalism in the UAE presents an array of opportunities for designing and crafting data visualizations. Data journalists in the region are probing different tools to produce engaging and informative visual representations for their audience. This implies that data journalism is becoming an established and blended approach in the UAE today, as Borges-Rey (2020) highlighted. Stalph et al. (2024), on the other hand, argued that audience engagement in data journalism is crucial, as it converts passive readers into active participants in the storytelling process. By using interactive visualizations and data-driven narratives, journalists can create more immersive and personalized experiences for their audience. This engagement promotes a deeper understanding of complex topics, as readers can explore data at their own pace and draw conclusions (Ali, 2023; Ishmuradova et al., 2024). Also, interactive elements such as polls, quizzes, and comment sections invite audience feedback and discussion, further improving the relationship between journalists and their readers (Tahat et al., 2024). Finally, this interaction increases the reach and influence of data journalism and facilitates a more informed and engaged public (Anderson & Borges-Rey, 2019; Ferrer-Conill & Tandoc, 2018).

Thus, the current situation regarding data journalism in the UAE holds considerable importance. This research underlines Emirati journalists' longing to adopt data journalism methodologies to enhance their abilities and deliver transparent data to their readers. The importance of data journalism also mirrors the integration of technology into traditional journalism, reshaping the landscape to facilitate two-way communication. Practically, readers are not just stagnant consumers of news but active participants who can share their views. Furthermore, when readers share reports on their profiles, it boosts the value and utility of data journalism, expanding its reach and influence in the mass media.

Implications

The research results highlight the applicability of the social cognitive theory in comprehending data journalists' behaviors and practices in the UAE. Considering the results, it is found that social cognitive theory

provided useful insights into how data journalists employ different useful approaches in professional practices. Under the relevant theory, different factors, particularly outcome expectations, shape journalists' perceptions and behaviors toward data journalism. Besides, the findings suggest that visualization, data availability, and improved audience decoding are the direct factors improving the effectiveness and adoption of data journalism practices among journalists in the UAE. By acknowledging the effect of outcome expectations on journalistic perceptions, policymakers, educators, and media practitioners can develop more specialized training programs, provide adequate resources, and create supporting environments to facilitate the growth and sustainability of data journalism in the UAE. Finally, under the social cognitive theory, improving the practice and training of data journalists can contribute to extending data-driven storytelling and democratizing information in the UAE media landscape.

Limitations and Recommendations

This study has some intrinsic limitations that should be recognized. First, the investigation solely focused on data journalism and journalists within the UAE, raising apprehensions about the generalizability of the results to other regions. Future researchers can cope with the relevant literature by replicating the current research and employing it in different geographical locations. Second, the research specified its focus on graphs and charts as the primary data visualization approaches, thereby constraining the breadth of the study. Analyzing the other visualization approaches and available platforms to generate interactive charts can delimit this scope. Finally, the third limitation involves using a convenient sampling approach, which introduces the potential for researcher bias and criticism concerning the selection criteria. Hence, future researchers can employ other sampling approaches and overcome the relevant limitations. This study suggests the need for further research into data journalism in the UAE. In particular, investigations into data journalism

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