insan & toplum
the journal of humanity and society
Research Article

Data Journalism in Turkey: Developing a Scale and Measuring Journalists' Skills

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Abstract: Data journalism has recently emerged as an important method of news gathering and editing in journalism. For data journalism -which includes the process of producing news from data- journalists need to have various skills and competencies. As a result of the literature review, it is observed that the required skills and competencies for data journalism have not been determined precisely, and in this regard, there is a lack of quantitative studies to measure these skills and competencies of data journalism. This study aims to develop a unique scale that will reveal the data journalism skills of news producers. For this purpose, a data journalism scale has been developed through an online survey applied to news producers registered with the Turkish Press Agency (BIK). As a result of the item pool, expert views, and the scale application stages, it is understood that data journalism skills can be measured with a 2-factor structure: "data skills and tools" and "journalism skills." The Cronbach Alpha reliability coefficient for the overall 21-item data journalism scale was calculated as 0.856, the data skills and tools factor as 0.883, and the journalism skill factor as 0.821. As a result of the research, it has been determined that while the journalism skills of the news producers are at a high level, their competence in data processing is low. In this sense -as a result of the study- a revision is recommended in both academic and professional training curriculum to include data collection, analysis and visualization skills that will improve data skills of news producers.

Keywords: Data journalism, data, data skills, journalism, scale development, data journalism scale.

Öz: Veri gazeteciliği gazetecilik çalışmalarında son dönemde önemli bir haber toplama ve kurgulama yöntemidir. Veriden haber üretme süreçlerini kapsayan veri gazeteciliği için çeşitli yetkinliklere ihtiyaç duyulmaktadır. Yapılan literatür taraması sonucunda hangi yetkinliklerin veri gazeteciliği kapsamında yer alabileceğinin kesin olarak belirlenmediği ayrıca veri gazeteciliğini ölçmeye yönelik nicel çalışmaların eksikliği gözlenmektedir. Bu çalışmanın amacı, haber üreticilerinin veri gazeteciliği yetkinliklerini ortaya koyacak özgün bir ölçek geliştirmektir. Basın İlan Kurumu'na kayıtlı haber üreticilerine uygulanan çevrim içi anket neticesinde geliştirilen veri gazeteciliği ölçek modeli önerilmiştir. Madde havuzu, uzman görüşü ve yapılan ölçek uygulaması sonucunda veri gazeteciliği yetkinliklerinin "veri becerisi ve araçları" ve "gazetecilik becerisi" olmak üzere 2 faktörlü bir yapıyla ölçülebileceği anlaşılmaktadır. 21 maddelik veri gazeteciliği ölçeğinin tamamına ait Cronbach Alfa güvenirlik katsayısı 0.856, veri becerisi ve araçları faktörü 0.883, gazetecilik becerisi faktörü ise 0.821 şeklinde hesaplanmıştır. Araştırma sonucunda haber üreticilerinin gazetecilik becerileri yüksek düzeydeyken veri işlemeye dair yetkinliklerinin düşük olduğu görülmektedir. Bu anlamda haber üreticilerinin veri becerilerinin geliştirilmesine yönelik hem akademik hem de meslek içi eğitim müfredatının yeniden programlanması; veri toplama, analiz etme ve görselleştirme gibi veri becerilerini geliştirecek eğitimlerin müfredata dâhil edilmesi önerilmerilmektedir.

Anahtar Kelimeler: Veri gazeteciliği, veri, veri becerisi, gazetecilik, ölçek geliştirme, veri gazeteciliği ölçeği.

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© İlmi Etüdler Derneği
DOI: 10.12658/M0666
insan & toplum, 2022; 12(4): 74-98.
insanvetoplum.org

Received: 18.12.2021
Revision: 2.04.2022
Accepted: 17.03.2022
Online First: 15.04.2022

Introduction

There have been discussions on the effects of technology on journalism for a long time. Nowadays, the facilitating effect of technical developments in journalism is felt as a transformative effect. This transformative effect is evident from its publication style to its content and even distribution. This study aims to determine the skills and competencies of journalists working in the field of data journalism, which is expected to have an important place in the future of the journalism profession as news stories gathering, making methods, and to measure journalists' knowledge on data journalism.

It is frequently discussed within the relevant literature of this field that data journalism emerges as an important method in ensuring the principles of democracy. In particular, transparency and accountability are presented as important principles in contemporary societies. To ensure these principles, information and documents must be accessible. From this perspective, the concepts become important such as open, accessible, available, comprehensible and usable data. To operate the principles -referred to above- in the field of journalism, the basis of data journalism is composed by placing the data in a form which can be easily found in order to be usable, accessible and understandably presented for those who want to analyze it. In studies on data journalism, it is noteworthy that data journalism will be an effective tool within the terms of functioning principles in the contemporary understanding of democracy.

A significant part of studies in the literature has been carried out to define data journalism and to identify its implementation principles. In studies conducted in Turkey and globally, the interview method is generally used as a data collection tool. In those studies, defining data journalism is indicated as the main purpose. In addition, there are survey studies to understand the perception of data journalism by media professionals. In the survey studies, discussion topics include the views of media workers about data journalism and certain structural obstacles to data journalism. In studies focusing on the relationship between data and journalism, it is attempted to understand the place and importance of data journalism as a professional practice among other news gathering and writing methods by making semi-structured interviews with journalists who produce data news in the field. In the literature, there is no objective scale about what kind of skills and competencies journalists should possess for data journalism. Therefore, the "Data Journalism Scale" which has been developed in this study is considered to be important as a quantitative study that directly measures the skills of journalists producing data news. It is anticipated that this scale will contribute to the data collection that will be a guiding source for future studies.

In the relevant literature, it is claimed in many national and international studies that there are deficiencies in the field of data journalism, it is emphasized that there should be an improvement in the technical skills of journalists. However, these findings have not been obtained through reliable and valid scales but are limited to open-ended interviews or literature review. In this context, no study has been found on data journalism skills in either articles or theses. These shortcomings are addressed in this study.

Theoretical Framework

Data Journalism

Data journalism, in its most general sense, is a form of news production that aims to create understandable and informative content with the help of data. There have been discussions about the role of data journalism in news gathering and editing. While there are opinions on this subject that argue that data journalism cannot be defined as journalism, on the contrary, those who see data journalism as a new method and an important development in journalism advocate for data journalism.

There are several studies in the literature that view data journalism as one of the investigative journalism methods (Lück & Schultz, 2019, p. 94; Appelgren & Nygren, 2014, p. 395). From this point of view, if data journalism is an investigative journalism method, it is necessary to answer the question of why such a conceptual separation is made. "Investigative journalism is defined as original reporting on events/problems that were previously unknown or undesirable for the society" (Aucoin, 2007, p. 7). Data journalism, which serves a similar purpose, is carried out to present to the public by processing data that will not attract attention at the first glance but is important in terms of social benefit. Through data journalism, there is a transition from a type of journalism in which words are processed to a new type in which numerical, visual, and textual data are processed, analyzed, and narrated. Bounegru, Chambers, and Gray (2012, p. 22) defines data journalism as a newly developing storytelling form that differs from traditional journalism in terms of its working methods with data analysis, programming, and visualization techniques. It also draws attention to the active role of data in the entire journalistic workflow. Nowadays, it becomes a necessity for journalists to acquire new skills for data journalism, which is preferred by international news organizations such as The Guardian and The New York Times. Studies on this subject focus on questions to explain what data journalism is and define the qualifications it requires. As Bounegru, Chambers, and Gray (2012) claimed in the book of Data Journalism Handbook, the

use of data in the texts of news has been presented every time from the beginning of the journalism profession till today. However, accepting data journalism as a field shows parallelism with the easy accessibility of data in the digital environment and the development of software that processes this data.

Holovaty (2006) emphasizes in his study that there is a need for change in the websites of the newspapers and draws attention to how the data is seen by the media institutions and how the data should be evaluated. The discussions that started after Tim Berners-Lee's assessment in 2010 that data analysis will shape the future of journalism have been influential in the emergence of the idea that states and institutions should open their data more (Arthur, 2010). The concepts of "open data" and "open government", which are frequently heard today, have been used for the first time in these discussions. As a result of these discussions, the Open Government Partnership was established in 2011 that also includes campaigns and training related to data journalism. A year before these developments, the Guardian established the Datablog, where the first studies that can be called data journalism were initiated. This initiative of The Guardian started with the visualization of the data in PDF format by making it analyzable which was regularly published by the government and politicians. The Guardian's efforts were on the agenda in a short period and these expenditures continue to be updated and published today. Rinsdorf and Boers (2016, p. 1) in their study defined data journalism as "... a new way of news reporting that gains insights about relevant societal trends by analyzing open datasets using (semi)automated methods to detect meaningful patterns in the data structure". Based on this definition and considering The Guardian's implementation, it is seen that data journalism can be evaluated as a process. Data journalism is a multidimensional method that brings together numbers, words, images, infographics, news narratives, and design into a coherent whole (Weber, 2017). In other words, data journalism aims to reveal the story in the data and this story -which is revealed by processing the data- is presented through data visualization aimed at the attention of the audience or readers. Data visualization has an important role in data journalism. Wibke, Engebretsen, and Mennedy (2018). In addition, there is news prepared entirely based on the text. Therefore, accessing and processing data skills and the basic skills of journalism are needed to sustain data journalism.

When data journalism samples are examined in detail, it is apparent that typical data visualizations are created by utilizing graphs, charts, maps, or some of them collectively. At this point, it is important to consider the terms "data story" and "data visualization" as different stages of data journalism. This terminological distinction is noted in the study of Veglis and Bratsas (2017). "The process of extracting useful

information from data and writing articles based on that information by embedding visualizations (in some cases interactive) into articles that help readers understand the significance of the story or allow them to pinpoint data about them."

A large number of international publishers use artificial intelligence to tag digital texts, create automated content and reformat the texts. On the other hand, as technology shapes the future of journalism, the need for qualified and experienced journalists becomes more evident. Technological developments create a need for willing correspondents who can adapt to the changes in this sector. In particular, artificial intelligence applications facilitate the work of journalists in collecting and analyzing data sets. With the Lynx Insight application in 2018, Reuters introduced a tool for journalists to collect and analyze data on this issue for journalists. However, no matter how technology advances, basic journalism skills such as accessing sources, analyzing data, and determining whether the topics are newsworthy can only be carried out by journalists.

Even if data is processed, the journalist must interpret the data, put it into context, and add information for the data to turn into news. News is a significant information tool and social need in democratic societies. The news contributes to the processing and circulation of information. The creation of a healthy public opinion in democratic societies depends on the healthy functioning of this circulation (Girgin, 2008, p. 145). Considering the body of available data, it is clear that texts or data that do not provide intelligibility and clarity -which are the primary features of news- cannot serve to inform, which is one of the main functions of journalism.

While formatting and editing the newsworthy events, it should be taken care to ensure that the news has a meaning as a whole, as well as words and sentences. After a topic is covered in the form of news, the information should be given in a way that does not require another question (Girgin & Özay, 2013, p. 16). Data technologies should be seen as a functional tool for journalism in the editing of the news; however, collecting data and presenting the data as infographics is not enough to consider journalism. Journalism will be actualized by processing this data, making it meaningful, and presenting it to the reader.

The data does not make sense on its own, therefore it is important to handle, process, analyze and transform it into information, and finally, the stages of revealing knowledge through research, learning, and observation is important. Processing all these steps from the perspective of journalism brings us to the concept of data journalism. In this context, data journalism with its most basic definition means the work of examining large-scale data sets that are independent or interconnected, analyzing and comprehending the points between the connections in the datasets,

and making a story out of the data as a result of all these processes (Aslan, Bayrakçı, & Küçükvardar, 2016).

Data journalism includes the stages of "collecting" data, and then "filtering", "visualizing" and "storytelling". During the data collection phase, the journalist can use available on-hand data sets or can also set up their own data sets if needed. Journalists at the data collection stage benefit from CSV, XLS, PDF files, indexed databases, search engines such as School of Data, and websites that provide official or private data. In the filtering stage, collected data is cleaned and sorted using software such as Spreadsheet, LibreOffice, Microsoft Excel, OpenRefine, Data Wrangling, CometDocs, and Mr. Data Converter. Then, the filtered and cleaned data is visualized with the help of Google Charts, Google Maps, Silk.co, TableauPublic, ManyEyes, FusionCharts, Gephi so that the reader can understand more easily and create catchy content. In the storytelling stage, conclusions are drawn and conveyed that will help the readers to understand and interpret the visualizations (Genel, Sayar & Sayar, 2018, pp. 73-84).

Furuncu's (2019) dissertation titled "Data Journalism in the Context of News Production Practices: The Approach of Journalists to Data Journalism in Turkey", which is a comprehensive study on data journalism in Turkey, Furuncu (2019) discussed the implementation stages of this process in data journalism in detail. Basing the study on Niles' (2009) research, she explains the stages of data journalism as: "Gathering information: Examining documents, talking to sources, using visualizations. Distilling information: Deciding which stage of information is important and interrelated. Presenting Information: Publishing the information in the news format".

In data journalism, news includes stages such as "obtaining, collecting, verifying, cleaning up, analyzing and displaying data". The details of these stages are described as follows in the "Data Journalism Handbook" (Bounegru, Chambers, & Gray, 2012).

1. Obtaining Data Set: Getting data, accessing data.
2. Cleaning Up Data: Identifying and removing irrelevant and redundant data.
3. Data Visualization-Statistics: Extracting statistics from data and trying to make sense of it through tables, graphs, maps, etc.
4. Analyzing & Interpreting: The process of making analysis and interpretations from the visuals after the visualization process of the data is completed.
5. Document Insights: Making inferences from the obtained documents.
6. Story: Creating stories for news editing according to the results obtained.

7. Information (Story) Visualization: Visualization of information in a way that the public can easily understand.
8. Application Design: Providing readers with the opportunity to examine the data behind the news (story).

These differences regarding data journalism cause the data journalist to be defined in different ways (Aslan, Bayrakçı, & Küçükvardar, 2016). A data journalist can also be defined as the person who filters the information in thousands of files and conveys it to the readers, or the person who knows code in the news centers, analyzes thousands of data sets, and understands programs. Similarly, Narmanlıoğlu (2021, p. 49) attributes "multiple expertise" to the feature that distinguishes data journalism from other types of journalism to the need for and highlights the need for skills which include connecting data journalism with journalism skills, information literacy, statistical knowledge to analyze data with, and visual design to visualize news stories obtained from data.

Simon Rogers -the data editor of The Guardian- claims that data journalism has a wide range from visualizations to long articles and concludes that the common aspects of these two different editing methods are that they are based on numbers and statistics and aim to make a story out of it (Felle, 2016). It is also necessary to draw attention to the effect of the internet at that point. Journalists can find data online and use the vast majority of tools and programs online to clean up, analyze and create accurate visualizations. In addition, the internet environment creates a distribution channel for journalists and becomes a suitable area for "open journalism" as a new concept. An important aspect of open journalism is "crowdsource," where readers are asked to contribute to the data collection process when journalists cannot otherwise find the data (Rogers, 2013). At the same time, those who read the news on the internet are also included in the news by contributing with comments. In the process, data journalism has made readers a part of the process by exposing data and encouraging them to search and find "something new from the news" (Rogers, 2013). Therefore, it should be accepted as a vital journalism technique in terms of providing interaction, which is one of the key aspects of journalism today. Academic studies on this subject have focused on the skills and qualifications required for data journalism. However, quantitative studies are needed to identify common skills in data journalism as a journalism method.

Research

Method

This research aims to make a valid and reliable scale development study to measure news producers' data journalism skills. Survey research -one of the quantitative research approaches- is applied in this study which includes a Likert-type scale study. In survey studies, data is collected from the sample at once and the characteristics of the universe are attempted to be revealed (Fraenkel & Wallen, 2011, p. 394).

In this study, the information form and the scale form developed within this research are used as data collection tools to obtain information about news producers' gender, level of education, work field, and professional experience.

Study Group and Sampling Method

In this research the initial draft form of the scale has been applied to 324 news producers who are beneficiaries of the Turkish Press Agency, the state body responsible for regulating publicly funded advertisements in the media (Basın İlan Kurumu, 2020). In the draft form -which is distributed using the online survey method- missing data and outliers are not included in the analysis then the process has been carried out using data collected from 304 participants.

Criterion sampling -one of the purposive sampling methods- is used for selecting the participants in the study. In criterion sampling, participants are expected to have various qualifications related to the problem (Büyüköztürk, Akgün, Karadeniz, Demirel, & Çakmak, 2021, p. 91; Fraenkel & Wallen, 2011, p. 100; Etikan, Musa, & Alkassim, 2016, p. 3). Since the participants in this study are required to be news producers, the link to the draft form of the scale was sent via email to the members of the press registered in the database of the Turkish Press Agency (BİK), and volunteer journalists are asked to fill in the draft form available online. Table 1 presents the demographic information about the study group in various positions such as journalist, reporter, editor, and franchise holder.

Table 1.

Demographic Information of Participants

Variables	Groups	F	Percentage
Gender	Female	78	25.7
	Male	226	74.3
Education level	Primary School Graduate	8	2.6
	Secondary School Graduate	8	2.6
	High School/Associate Degree	134	44.7
	Undergraduate Student	26	8.6
	Undergraduate Degree	92	30.3
	Post-graduate Student	8	2.6
	Post-graduate Degree	26	8.6
Professional Experience	1-5 Year	44	14.47
	6-10 Year	72	23.68
	11-15 Year	80	26.32
	15-20 Year	58	19.08
	20 and above	50	16.45
	Total	304	100%

When the demographic information of news producers is examined, it is seen that 74.3% (n=226) of the participants are male, and 25.7% of the participants (n=78) are female. According to the BIK 2020 press staff statistics, 4863 of the 7204 are male press workers and 2341 are female press workers (BIK, 2020). In this sense, the ratio of males and females participating in the research shows parallelism with Turkey in general. Considering the education level of the participants, 41.4% (n=126) of the news producers have an undergraduate degree, however, 58.6% (n=178) are not even undergraduates. The majority of the members of the press participating in the research are high school/associate degree graduates, which is also similar to the BİK reports. Finally, when the professional experience of the workers is examined, it is seen that the majority of them have been working in this profession for more than 10 years.

Scale Development Process

During the scale development process, the literature was thoroughly reviewed and the theses and research articles on data journalism were examined in detail. It comes out that there is no scale developed for data journalism in Turkish literature. The 9

theses on data journalism in the YÖK thesis archive and 11 research articles in the DergiPark academic archive were examined in depth (Oran, 2017; Bayraktar, 2018; Altun, 2019; Nasution, 2019; Koç, 2019; Furuncu, 2019; Çay, 2021; Doğu, 2015; Aslan, Bayrakçı & Küçükvardar, 2016; Narin, Fırat, Fırat & Ayaz, 2017; Erkmen, 2018; Can, Koz & Işık, 2018; Erol & Işıklı, 2019; Seyidov, 2020; Erkmen, 2020; Sütcü & Aslan Öztezcan, 2020; Livberber, 2021; Zinderen, 2019). In general, data journalism was attempted to be explained through literature and samples, data journalism practices were actualized on various news with content analysis, it is observed that the focus was mainly on how data journalism transformed traditional understanding of journalism, the process of data journalism and the importance of infographics and storytelling.

As a result of the in-depth interviews in the studies, it came out that there were deficiencies in this field. It is emphasized there is a need to improve the technical skills of journalists, but these suggestions were not made through reliable and valid scales, but instead through literature review or focus group discussions (Çay, 2021; Sütçü & Aslan Öztezcan, 2020). In this context, there has not been found any quantitative study on data journalism skills in both the research articles and theses. This study has emerged as a result of these shortcomings. In addition, the lack of framework on what data skills are causes deficiencies in systematic data journalism training. When the international literature is examined, it has been observed that there are similar situations as in Turkey. In their research, Ausserhofer, Gutounig, Oppermann, Matiasek and Goldgruber (2020) conclude that the conceptual framework of data journalism could not be developed in studies conducted before 2016. In addition, they emphasize that the vast majority of studies with data journalism are based on qualitative interviews and content analysis, and there is a lack of quantitative studies such as surveys over data journalism. It has been observed that quantitative studies conducted in this field support previous qualitative research (Palomo, Teruel, & Castilla, 2019; Heravi, 2019; Young, Hermida, & Fulda, 2018). As a result of Heravi and Lorenz's (2020) survey of 181 data journalists enrolled in the Global Data Journalists list, most of the journalists who participated had higher education in journalism. A remarkable majority described themselves as "data journalists." Although the research indicated that journalism skills among these journalists are high, there are deficiencies in their data analytics skills and there is also a lack of systematic training.

Item Pool and Expert Views

As a result of the literature review, an item pool has been created including 24 items that can be considered as data journalism skills. During item writing, the following

research articles have been used, namely the studies of Palomo, Teruel and Castilla (2019); Heravi (2019); Young, Hermida and Fulda (2018); Sütçü & Aslan Öztezcan (2020). This item pool has been presented to two academic linguists to evaluate and correct the items such as conformity with spelling rules, clarity, and simplicity of the items. The item pool has been given with the expert evaluation form to 4 academics and 3 journalists for expert views working on data journalism. The expert view is used for content validity and face validity in the study. Content validity is about how much a scale item represents and covers the skill, behavior or attitude to be measured (Büyüköztürk, Akgün, Karadeniz, Demirel, & Çakmak, 2021, p. 122). Davis' (1992) technique is preferred for the evaluation of the expert view about each item and 7 experts made their evaluation for each item ("1=Appropriate", "2=The item should be slightly revised", "3=The item should be reviewed seriously" and "4=The item is inappropriate/should be removed"). In accordance with the Davis' (1992) technique, the "Content Validity Index (CGI)'' for each item is calculated by dividing the number of experts who marked the options "Appropriate" or "The item should be slightly revised" by the total number of experts. It is accepted that items with a CGI value of less than 0.80 should be excluded. In this study, as a result of expert views collected from seven experts, two items are excluded because their CGI values are 0.71<0.80. The CGI value for the overall scale is calculated as 0.90 and this value indicates that the content validity of the item pool is high.

Two items have been removed from the draft form of the scale prepared as a five-point Likert type without reverse scoring, and it has been applied to the news producers who are registered with the Press Agency together with the information form. The validity and reliability of the draft form of the scale have been tested by making factor analysis and reliability analysis on the collected data.

Findings

Before starting the factor analysis, missing data and extreme values are removed from the collected data, and analysis is done with the data of 304 journalists. The singularity assumption has been checked considering the item-item correlation values. The correlation between the items should be between 0.30 and 0.80, and it is recommended to remove one because a correlation above 0.80 can refer to the same meaning for two items (Tabachnick & Fidell, 2007, p. 89). As a result of the analysis, since the correlation coefficient between the two items is 0.88, one item has been removed and the analysis has continued with the remaining 21 items.

After item analysis on 21 items, the Cronbach Alpha reliability coefficient of the draft form is found to be 0.882, and there does not exist any item that decreases the

reliability coefficient. The item-total correlation values of the items are found to be between 0.656 and 0.309 ($p<0.01$). It is identified that all items have a significant correlation with the total score. To check whether the sample size is suitable for factor analysis, Kaiser-Meyer-Olkin (KMO) and Bartlett Sphericity tests are performed and shown in Table 2.

Table 2.

KMO ve Bartlett Sphericity Test

Kaiser-Meyer-Olkin (KMO) Sampling Adequacy		0.831
Bartlett Sphericity Test	Chi-square	1720.919
	Degree of freedom	462
	P	0.000

The KMO value of the draft form of the scale is found to be 0.831. KMO values between 0.80 and 0.90 are considered to be very good for factor analysis (Field, 2009, p. 647). The Bartlett test of sphericity tests the homogeneity of the factors. The significance value of $p<0.05$ and the KMO value indicate that the data is suitable for factor analysis. Table 3 presents the factor loadings as a result of the principal components analysis performed before the first rotation of the draft form.

Table 3.

Pre-Rotation Factor Analysis Results for the Draft Form of the Scale

ITEM	Factor				
	1	2	3	4	5
I17	0.754				
I12	0.735	-0.351			
I11	0.728	-0.41			
I10	0.727	-0.395			
I22	0.706	-0.467			
I18	0.676				
I9	0.64		-0.37		
I5	0.635		0.473		
I13	0.573				
I15	0.566		0.321	-0.349	0.326
I16	0.497	0.392			-0.4
I7	0.427	0.373	0.377		

I6		0.65		
I3		0.623		
I14	0.394	0.61		-0.329
I1	0.35	0.607		0.505
I2	0.426	0.55		
I21	0.388	0.433		-0.428
I4	0.391	0.4		
I8	0.491		0.558	
I20		0.554		0.577

As a result of the exploratory factor analysis before the rotation, 5 factors emerged with an eigenvalue greater than 1. It explains 65.179% of the total variance. Table 4 presents the factor loading values as a result of the factor analysis and the explained variance values.

Table 3.

Eigenvalues and Explained Variance Obtained from the Scale in the First Analysis

Factor	Eigenvalue	Variance	Cumulative
1	6.539	29.722	29.722
2	3.731	16.961	46.683
3	1.561	7.094	53.777
4	1.391	6.325	60.102
5	1.117	5.077	65.179

The variance values explained as a result of the factor analysis appear as 29.72% for the first factor; 16.96% for the second factor. Since the variance explained by other factors is below 10% and they are not sufficient to explain the latent structure, the scale is accepted as a 2-factorial scale (Özdamar, 2016; Özgenel, Canpolat, & Ekşi, 2019). Since the total variance explained should be high, factor loading values should also be high. It is recommended that the lower limit value should be at least 0.30 for factor loading values (Cokluk, Şekercioğlu, & Büyüköztürk, 2018; Akbulut, 2010; Yurdugül, 2005). If the lower limit is high, the factor loading values of the factors are also high. Therefore, the lower limit for factor loading values in factor analysis is taken as 0.40.

Direct Oblimin is preferred from oblique rotations because there is a relationship between the factors. In the exploratory factor analysis, items are removed which are

included in more than one factor and the items are removed with a common variance value (communalities) below 0.5. The exploratory factor analysis is repeated by removing each item. At the end of the analysis, the eigenvalue of the 2-factor scale with 14-item and the explained variance is given in Table 5 below.

Table 5.

Eigenvalues Obtained from the Draft Scale in the Final Analysis and Explained Variance

Factor	Eigenvalue	Variance	Cumulative
1	5.259	30.936	30.936
2	3.360	19.765	50.701

As a result of the analysis, the variances explained by the two factors are found to be 30.93% and 19.76%, and the total variance explained is found to be 50.70%. According to Özdamar (2016), it is sufficient if the total variance explained is above 40% in social sciences. The scree plot in Figure 1 supports that the structure has two factors. It is not considered appropriate to include the third factor because the variance explained by the third factor is below 10% and its eigenvalue is low (Özdamar, 2016; Özgenel, Canpolat, & Ekşi, 2019).

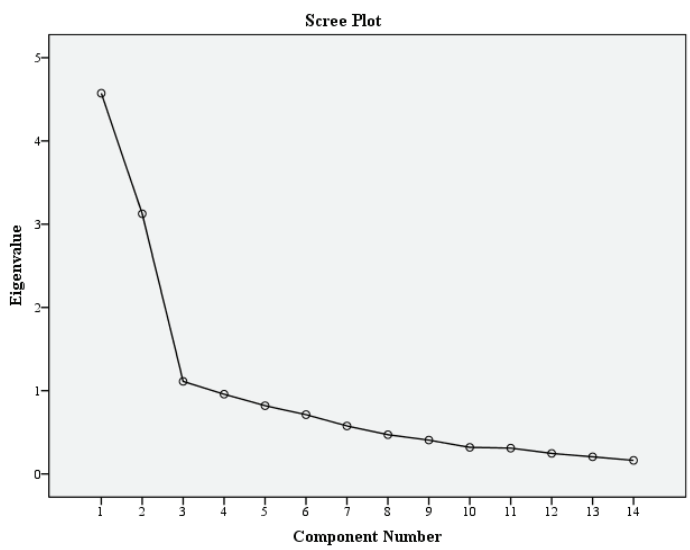

Figure 1. *Scree Plot*

The KMO value for the new structure is found to be 0.806. Table 6 presents the results of the items, factor loads, item-total correlation coefficients, and the reliability of the factors.

Table 6.

Factor Analysis, Item-Total Correlations and Reliability Test

Item	Factor load		Item-Total correlations
	Factor 1	Factor 2	
	Data Skills and Tools	Journalism Skills	
I can use systems such as Dive, Protein Dashboard, that are used to report data without writing code.	0.866		0.767
I can use data visualizer programs like "Insight", "Flourish", "Datawrapper", "Morph" to create images and infographics.	0.844		0.755
I can use programs that analyze qualitative data such as Nvivo, ATLAS.ti.	0.836		0.718
I can use data journalism platforms like Workbench.	0.765		0.663
I can use programs such as SPSS, RStudio that can analyze quantitative data.	0.760		0.701
I can create the necessary software and coding (HTML, CSS, Java, etc.) to establish the infrastructure to broadcast my news on digital platforms.	0.642		0.547
I can modify videos to adapt news content using various software and applications such as Adobe Premiere, Final Cut.	0.619		0.554
I can organize the collected data with data cleaning tools like OpenRefine and Breve.	0.605		0.519

I can uncover fake videos edited with artificial intelligence software using various applications and software.	0.523		0.509
I can use social media platforms to produce content.		0.757	0.622
I can investigate the reliability of news or information through digital sources.		0.733	0.624
I can evaluate the reliability of the news source in the digital environment.		0.722	0.557
I can effectively use social networks and websites to access information in journalism.		0.705	0.541
I can effectively follow the news verification steps.		0.679	0.601
I can use social media platforms as a means of publishing the news.		0.668	0.524
I can effectively use platforms such as web archives, confirmation sites, etc. to verify the news.		0.569	0.485
I can produce news by regularly checking public open data sources (TÜİK, World Health Organization, etc.).		0.472	0.402
Eigenvalue	5.259	3.36	
Explained Variance (%)	30.936	19.765	Total:50,7%

	Faktör 1:	Faktör 2:	Ölçek Geneli: α=0,856
Cronbach Alpha	α=0,883	α=0,821	Overall scale: α=0,856

When Table 6 is examined, it is seen that items in factor 1 are related to quantitative and qualitative data analysis, data communication, data visualization, and tools/software in data journalism. Therefore, this factor is named "Data Skills and Tools." In the literature, Sütçü and Öztezcan (2020, p. 281) include the dimensions of "Technological Tool Usage" and "Analysis Tools Knowledge'' in the knowledge skills

that data journalists should have. Heravi and Lorenz (2020, p. 34) have used the concept of "data skills'' in data journalists. In the literature, data skills are emphasized in studies related to data journalism (Bounegru, Chambers, & Gray, 2012; Bradshaw, 2017; Young, Hermida, & Fulda, 2018; Knight, 2015; Narmanlıoğlu, 2021). When the items in Factor 2 are examined, this factor is called "Journalism Skills'' because there are skills related to journalism such as producing content and news, following open data sources, researching, and confirming the news. Journalism skills are a factor for data journalism as data journalism puts the principles of journalism such as researching the news, writing the story of the news, and spreading the news, and data is the source for journalism. (Appelgren & Nygren, 2014; Borges-Rey, 2020; Heravi, 2019; Heravi & Lorenz, 2020, Narmanlıoğlu, 2021).

Expert views are taken for the content and face validity of the scale, exploratory factor analysis is applied for the construct validity and it is concluded considering the findings that the scale is valid. To determine reliability, the following factors are examined including Cronbach Alpha internal consistency analysis, item-total correlations, item discrimination for Lower-Upper groups, and finally Pearson Product Moments Correlation Coefficient between factors.

The Cronbach Alpha reliability coefficient has been taken into consideration to evaluate the reliability of both the overall scale and subfactors. As seen in Table 6, the Cronbach Alpha reliability coefficient of the overall scale is found to be 0.856; reliability coefficients for the subfactor of data skills and tools are found to be 0.883, and reliability coefficients for the subfactor of journalism skills are found to be 0.821, respectively. Cronbach Alpha internal consistency coefficients indicate that the overall scale and two sub-factors have good reliability levels (Cronbach & Meehl, 1955; Büyüköztürk, Akgün, Karadeniz, Demirel, & Çakmak, 2021; Kılıç, 2016).

When Table 6 is reviewed, it is concluded that the item-total coefficients of the items in the data journalism scale are significant ($p<0.01$) and it is between $r=0.767$ and $r=0.402$. It is claimed that items with item-total correlations above 0.30 are good items with a discriminating feature (Büyüköztürk, 2002; Field, 2009; Tavşancıl 2014).

In addition, it is tested whether the items differentiated the upper and lower groups as a result of the total scores obtained from the data journalism scale. The participants are ranked according to their total scores and divided into 27% upper and lower groups, and the independent sample t-test has been applied and the results are given.

Table 7.

Item Discrimination Analysis

Item	Group	N	$\bar{x}$	SD	F	T	p
1	Lower	84	1.29	0.554	16.306	-8.718	0.000
	Upper	80	3.13	1.244			
2	Lower	84	1.38	0.697	11.286	-9.183	0.000
	Upper	80	3.38	1.213			
3	Lower	84	1.31	0.604	19.242	-7.790	0.000
	Upper	80	3.10	1.355			
4	Lower	84	1.55	0.772	6.485	-9.043	0.000
	Upper	80	3.50	1.155			
5	Lower	84	1.33	0.570	32.473	-12.960	0.000
	Upper	80	3.78	1.187			
6	Lower	84	1.71	1.066	4.052	-6.366	0.000
	Lower	80	3.43	1.357			
7	Upper	84	1.98	1.316	2.671	-9.175	0.000
	Lower	80	4.43	1.083			
8	Upper	84	1.90	1.008	1.085	-7.033	0.000
	Lower	80	3.60	1.172			
9	Upper	84	1.45	0.803	16.546	-8.341	0.000
	Lower	80	3.48	1.339			
10	Upper	84	3.48	1.348	26.567	-5.438	0.000
	Lower	80	4.73	0.554			
11	Upper	84	3.45	1.214	20.416	-5.453	0.000
	Lower	80	4.63	0.628			
12	Lower	84	3.21	1.180	2.749	-4.712	0.000
	Upper	80	4.28	0.816			
13	Lower	84	3.90	1.008	3.434	-3.383	0.001
	Upper	80	4.60	0.841			
14	Lower	84	3.62	1.147	14.323	-5.024	0.000
	Upper	80	4.65	0.622			

15	Lower	84	3.67	1.337	17.431	-3.878	0.000
	Upper	80	4.60	0.744			
16	Lower	84	3.05	1.268	18.955	-7.560	0.000
	Upper	80	4.70	0.564			
17	Lower	84	3.36	1.165	13.435	-6.054	0.000
	Lower	80	4.65	0.700			

When both the mean score of the overall scale and the results for each item are examined, it is concluded that there is a statistically significant difference between the lower group ($\bar{x}$=2.44) and the upper groups ($\bar{x}$=4.03) ($p<0.05$). This difference is in favor of the upper group, and as a result of these findings, it can be claimed that each item and overall scale have distinctiveness.

It examined the relationships between the factors of the Data Journalism Scale and the overall scale. For this purpose, Pearson Moments Product Correlation analysis is performed and the results are given in Table 8.

Table 8.

Pearson Product Moment Correlation Between Factors

		Journalism Skills	Data Skills and Tools	Scale
Journalism Skills	Pearson Correlation	1	.230**	.676**
	Sig. (2-tailed)		.000	.000
Data Skills and Tools	Pearson Correlation		1	.872**
	Sig. (2-tailed)			.000
Scale	Pearson Correlation			1
	Sig. (2-tailed)			
**p<0.01				

When Table 8 is examined, there is a positive, weak, and statistically significant relationship ($r=0.230$; $p<0.01$) between the journalism skills factor, data skills and tools. It is already expected that the factors should show a statistically significant relationship among themselves. On the other hand, it is recommended that this correlation coefficient should be neither too high nor too low (Gündüz & Çoşkun, 2012; Tavşancıl, 2014). It is observed that the level of correlation between both factors ($r=0.230$) is not too high or too low. Data Journalism Scale has a strong positive correlation with the subfactor of data skills and tools ($r=0.872$; $p<0.01$) and the subfactor of journalism

skills (r=0.676; p<0.01). The strong correlation between the factors and overall scale supports that the scale has internal consistency and reliability.

Finally, current levels of data journalism are attempted to be revealed by analyzing the overall data journalism and then factor scores of the journalists who participated in the study registered with the BIK. The scores of the participants are given below.

Table 9.

The Scores of the Journalists

Factors	N	$\bar{x}$	SD	T	df	p
Data Skills and Tools	304	2.359	0.955	29.955	303	0.000
Journalism Skills	304	4.122	0.713	70.096	303	0.000
Data Journalism Scale	304	3.189	0.667	57.888	303	0.000

The mean score of the data journalism scale taken by journalists participating in the research is 3.189; the mean of data skills and tools subfactor is 2.359 and the mean of journalism skills subfactor is 4.122. A statistically significant difference is found between the two factors (p<0.05). It has been determined that journalists registered with the Press Agency and participating in the research have high journalism skills ($\bar{x}$=4.122), while their data skills and tools ($\bar{x}$=2.359) are quite low.

Discussion And Result

This study aims to draw attention to the lack of quantitative studies on data journalism which has emerged as innovative journalism and to develop an original scale that will reveal the data journalism competencies of news producers. The majority of studies on data journalism have been carried out using qualitative research methods. In these studies, in-depth interviews were conducted with news producers about data journalism, and the deficiencies observed in the field were emphasized and certain suggestions were made. By taking into account the fair implementations of data journalism, it has been attempted to draw the conceptual framework of data journalism based on various news. In addition, when the literature is reviewed, it has been observed that measurability remains weak in determining the competencies needed for effective data journalism. The main research problem of this study has emerged from these discussions and it has been attempted to reveal which competencies can be evaluated within data journalism.

Data journalism, as mentioned earlier, puts journalism principles on the first rank. Heravi (2017) argues that journalism and research skills are the first competencies

any student should learn, putting journalism first and other data and computational skills second. The most important topics to be covered after journalism skills are data analysis skills, including familiarity with data and data sources, understanding of the process of data journalism projects, and sufficient statistical knowledge. The sub-factors of the Data Journalism Scale proposed in this study are formed as journalism and data skills. Expert views have been taken on the item pool including 21 items and the data have been analyzed as a result of the study. The total variance explained by the 14-item 2-factor scale is calculated as 50.7%, and this value is in the appropriate range for social sciences. The Cronbach Alpha reliability coefficient of the Data Journalism Scale is found to be 0.856; Cronbach Alpha reliability coefficient for data skills and tools factor is found to be 0.883 and journalism skills factor is found to be 0.821, respectively. It is concluded that both the overall scale and the sub-factors are reliable.

As a result of the study, the data journalism skills of the news producers have been measured and it is found out that the mean of journalism skills of the participants is high ($\bar{x}$=4.122); however, their data-related skills ($\bar{x}$=2.359) are relatively low. Among the possible reasons for this situation include that journalism education is shaped from the perspective of traditional understanding focused on social sciences, the inadequacy of digital technologies courses in the curriculum of communication faculties, and also, as Heravi (2019) emphasizes, news producers have prejudgments about coding and software. In a world where technological tools are so widespread in news production processes, increasing the data competencies of news producers is very crucial for journalism. Therefore, it is important to make necessary curriculum development studies to increase data skills in the higher education area that provides workforce to the media sector, to take steps to eliminate the prejudgments about software and coding, and to help understand data analysis and statistics in social sciences.

This study is important as it is a scale development study that can measure data journalism with the participation of news producers registered with the BIK, and through this scale, the data journalism levels of media producers are revealed. In addition to being a communication tool in journalism, the importance of data journalism is increasing as data is now a source for news. In this sense, it is recommended to apply this newly developed scale to different groups, to re-test the reliability and validity studies of the scale, and to reveal the data journalism skills of media workers on the outside of the BIK. Thus, it is expected that new quantitative studies will provide a new perspective to the literature that supports qualitative studies both for future researchers and for data journalism practice and research areas.

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Appendix 1

Faktör	Madde
Veri Becerisi ve Araçları	Kod yazmadan verileri raporlaştırmaya yarayan Dive, Protein Dashboard gibi sistemleri kullanabilirim.
	Görseller ve infografikler oluşturmak için "Inzight", "Flourish", "Datawrapper", "Morph" gibi veri görselleştirme programları kullanabilirim.
	Nitel verileri analiz edebilen Nvivo, ATLAS.ti gibi programları kullanabilirim.
	Workbench ve Datashare gibi veri gazeteciliği platformlarını kullanabilirim.
	Nicel verileri analiz edebilen SPSS, RStudio gibi programları kullanabilirim.
	Haberlerimi dijital platformlarda yayınlayacak alt yapıyı kurabilmek için gerekli yazılımı ve kodlamayı (HTML, CSS, Java vb) oluşturabilirim.
	Videoları, Adobe Premiere, Final Cut gibi çeşitli yazılımlar ve uygulamalar kullanarak haber içeriğine uygun olarak değiştirebilirim.
	Topladığım verileri OpenRefine, Breve gibi veri temizleme araçları ile düzenleyebilirim.
	Yapay zeka yazılımlarıyla kurgulanan sahte videoları çeşitli uygulamalar ve yazılımlar kullanarak sahteliğini ortaya çıkarabilirim.
Gazetecilik Becerisi	Sosyal medya platformlarını içerik üretmek için kullanabilirim.
	Dijital kaynaklar üzerinden haberin ya da bilginin güvenilirliğini araştırabilirim.
	Dijital ortamda haber kaynağının güvenilirliğini değerlendirebilirim.
	Sosyal ağları ve internet sitelerini habercilikte enformasyona ulaşmak için etkili kullanabilirim.
	Haber doğrulama adımlarını etkili şekilde takip edebilirim.
	Sosyal medya platformlarını haberi yayınlama aracı olarak kullanabilirim.
	Haberleri doğrulamak için web arşivleri, teyit siteleri vb. platformları etkin şekilde kullanabilirim.
	Kamusal açık veri kaynaklarını (TÜİK, Dünya Sağlık Örgütü vb.) düzenli kontrol ederek buralardan haber üretebilirim.