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ARAŞTIRMA MAKALESİ / RESEARCH ARTICLE

Framing Discourses in Turkish News Coverage Regarding Artificial Intelligence Technologies' Prospects and Challenges

Türkiye'de Yayınlanan Haberlerde Yapay Zekâ Teknolojilerinin Olanakları ve Zorlukları Hakkındaki Çerçevelemeler

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Abstract

In recent years, the continuous and increasing implementation of artificial intelligence technologies in our daily lives has triggered discussions regarding its potentials and risks, especially in news media. However, the analysis of the way in which this technology is communicated to the public is limited. The framing approach can be applied to understand the structure of news stories and to explore the type of interpretation patterns that are used to inform the public about artificial intelligence technologies. For this purpose, a total of 209 news articles from two highly circulated Turkish newspapers were gathered between January 1, 2019 and December 31, 2019 and analyzed in order to discover how this emerging technology is framed in the media discourse with regard to its prospects and challenges. The results indicate that the following frames are used in Turkish news coverage to thematize the possibilities and potential risks of artificial intelligence: "Artificial intelligence as assistant/supporter", "economic benefit", "elimination of human error", "human replacement", and "ethical concerns". Overall, the news coverage reveals a predominately positive tendency toward artificial intelligence by emphasizing the prospects and benefits for its users.

Keywords: Journalism, News Coverage, Artificial Intelligence, Framing, Framing Analysis

Öz

Son yıllarda, yapay zekânın günlük hayatımızdaki artan kullanımı bu teknolojinin olanakları ve riskleri hakkında özellikle medya alanında birçok tartışmaya yol açmıştır. Fakat bu teknolojilerin halka nasıl yansıtıldığı hakkında çok az inceleme yapılmıştır. Çerçeveleme yöntemi, haberlerin yapısını ortaya çıkarmayı hedeflemektedir. Halkı yapay zekâ hakkında bilgilendirirken ayrıca yorum modellerini anlamak için de kullanılmaktadır. Bu amaçla yüksek tiraja sahip iki Türkçe gazetede yayınlanmış 209

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haber, 1 Ocak 2019 ve 31 Aralık 2019 tarihleri arasında toplanıp yapay zekânın olanakları ve potansiyel zorlukları açısından medyada nasıl çerçevelendiğini anlamak adına analiz edilmiştir. Sonuçlara göre, Türkiye'de yayınlanan haberlerde yapay zekânın olanakları ve risklerini temalandırmak için en çok kullanılan çerçeveler şunlardır: "Bir yardımcı/destekçi olarak yapay zekâ", "ekonomik faydalar", "insan hatasının ortadan kalkması", "insanın yerini almak" ve "etik kaygılar". Genel olarak, yapay zekâdan bahsederken kullanıcıları için yaratacağı olanakları ve faydaları vurgulayan iyimser tutumun yoğun bir şekilde sergilendiği görülmüştür.
Anahtar Kelimeler: Gazetecilik, Habercilik, Yapay Zekâ, Çerçeveleme, Çerçeveleme Analizi

Introduction

Since the inception of the field, and the coining of the term "artificial intelligence" by John McCarthy in 1956, the history of artificial intelligence research has been marked by alternating optimistic and pessimistic expectations and practices which result in high and low phases of the technological development of artificial intelligence, also known as "AI-Summer" and "AI-Winter" (McCarthy et al., 1955). In general, artificial intelligence can be defined as "systems that display intelligent behaviour by analysing their environment and taking action — with some degree of autonomy — to achieve specific goals" (European Commission, 2018, p. 1). More specifically, artificial intelligence systems can be software-based systems that can be defined as follows:

> Artificial intelligence (AI) systems […] act in the physical or digital dimension by perceiving their environment through data acquisition, interpreting the collected structured or unstructured data, reasoning on the knowledge, or processing the information, derived from this data and deciding the best action(s) to take to achieve the given goal (European Commission, 2019, p. 6).

Artificial intelligence can also be integrated in hardware such as autonomous vehicles, robots, drones, etc. (European Commission, 2018, p. 1). Additionally, artificial intelligence can be divided into "weak" (or "narrow") artificial intelligence and "strong" (or "general") artificial intelligence (Searle, 1980, p. 417). "Weak" artificial intelligence refers to systems that are already widely used, designed and trained to solve specific tasks on the basis of current data, while "strong" artificial intelligence is still in development and not widely used, referring to systems using human cognitive skills and human intelligence to solve unknown tasks (Searle, 1980, p. 417).

In recent years, the rapid developments in machine learning, the progress of automated processes, improvements in self-learning neural networks, and advances in robotics have been some of the most discussed developments. In common with other new technological media articles, artificial intelligence technologies also provide a broad field of discussion where current and future scenarios regarding this technology are scrutinized (Natale & Ballatore, 2017). The examination of questions on the prospects and challenges of artificial intelligence in news media makes it clear that discussions relating to the implementation of this new technology in many areas of life — such as privacy, labor, healthcare, mobility, marketing, etc. — are extensive. Moreover, the real and imagined scenarios of artificial intelligence are taken up and debated from different

perspectives, especially in the fields of computer science, engineering, and communication, and interpreted in different ways. Since news media provides information and knowledge to the public, it plays a vital role in the presentation of topical content. News media can determine the structuring and course of discourses, thus influence the perception and opinions of the recipients on certain issues. The manner in which news is framed allows one to draw different conclusions (Entman, 1993, p. 52). From this point of view, news is provided within a specific framework presenting an extract of the reality. For this reason, the way discussions regarding artificial intelligence technologies are handled by news media is significant, as journalists can influence the public agenda; the tendency of media coverage may also have an effect on recipients' attitudes toward this emerging technology, creating demanding, reserved, or even fearful behavior (McCombs and Shaw, 1972).

News media, particularly online news articles, may help provide the initial framework for the debate on artificial intelligence for people who feel insecure or doubtful concerning this rather little-known technology. In this regard, the research interest of this study is to analyze the online reporting of widely read Turkish newspapers on issues relating to the discussion of artificial intelligence in order to examine the journalistic contents for hidden patterns of interpretation. More specifically, this study focuses on the media coverage and builds on the framing approach to capture how prospects and challenges of artificial intelligence are depicted and framed in media discourse, as framing has the ability to shape or mould recipients' views and perceptions of an issue (Chong & Druckman, 2007, p. 104).

Several studies that examine the challenges of artificial intelligence in different fields such as computer science, medical science, economics, etc. already exist (Pew Research Center, 2018a; Yu & Kohane, 2018). According to "Public Attitudes Toward Computer Algorithms", a report published by the Pew Research Center (2018a), the fairness and acceptability of using algorithms to make decisions for humans are one of the most highlighted concerns when it comes to deploying artificial intelligence applications in situations with real-world consequences. Hence, the main challenge is to develop an artificial intelligence system that ensures a more rational, ethical, and unbiased decision-making process by evaluating the accuracy and performance of the data used to train it. Another important challenge often raised by the majority of researchers in the artificial intelligence field is the "frame problem", which refers to a technical or logical problem regarding the representation of the effects of action in logic (Yu & Kohane, 2018). A number of studies examine how the implementation of artificial intelligence is influencing or even changing our lives, and evaluate the benefits and risks of this new technology through an online survey or expert review (Cui & Wu, 2019; Pew Research Center, 2018b). Results show that the media plays a significant role in shaping public perception of artificial intelligence and that algorithm-based applications are generally perceived as being more beneficial than risky (Cui & Wu, 2019). Furthermore, artificial intelligence experts hold a common view that the increasing use of artificial intelligence in our daily lives "will make most people better off over the next decade" (Pew Research Center, 2018b, p. 2). Nevertheless, experts also express concerns regarding the potential loss of control of individuals over their lives, data abuse, widespread

economic and digital divides due to artificial intelligence technologies replacing human jobs, reduction of personal skills — such as cognitive, social and survival skills —, and a possible increase of cybercrime and cyber warfare (Pew Research Center, 2018b, pp. 3-50).

Generally, the public is concerned about the implementation of artificial intelligence and distrust this emerging technology. For example, in a study by Pew Research Center (2017) in which American citizens were surveyed (n = 4.135), the majority of participants was worried about the possible effects of robots and computers on the job market (72%), algorithms leading to hiring decisions without human involvement (67%) and the development of autonomous vehicles (47%) (p. 3). With this in mind, it is important to convey reliable information to the public in order to mitigate the barriers facing the adoption of this emerging technology, and to familiarize the public. Thus, the way artificial intelligence is covered in news media is significant. However, studies analyzing media discourse on the opportunities and risks of artificial intelligence technologies are scarce and confined to the USA context (Fast & Horvitz, 2017; Garvey & Maskal, 2020). There are currently no academic studies on Turkish media coverage of artificial intelligence. Therefore, the aim of this study is to examine different perspectives on the media portrayal of artificial intelligence technologies in Turkey, in order to provide an insight into the discourse on this emerging technology, and to enable cross-national comparisons for future research, for instance, to compare and contrast the portrayal of artificial intelligence in Turkish media with media coverage from other countries. To this end, the following research questions are posed:

RQ 1: Which frames can be identified in the newspapers in relation to the prospects and challenges of the use of artificial intelligence technologies?

RQ 2: Are there any differences and/or similarities in the way newspapers portray artificial intelligence?

The response to the proposed research questions above is formulated by conducting a framing analysis to determine whether patterns of interpretation can be identified in the online reporting on current and future artificial intelligence developments addressing the opportunities and risks of this new technology. To provide an understanding of the framing approach in news media research — which should serve as a basis for the methodological approach — the following chapter points out key assumptions of the applied approach.

Framing Approach in News Media Research

Besides communication and media science, the terms "frame" and "framing" are used in many other scientific disciplines, such as cognitive psychology, psychiatry, sociology, political science, etc. (Taylor & Crocker, 1981; Bateson, 1972; Goffman, 1974; Gerhards & Rucht, 1992; Pan & Kosicki, 1993; Dahinden, 2006). Accordingly, there exist a number of conceptions of framing. Generally, frames can be defined "as patterns of interpretation through which people classify information in order to handle it efficiently" (Scheufele, 2004, p. 402). While framing can be described as the process of activating interpretation patterns in selecting and organizing information (Dahinden, 2006, p. 28), framing in news reporting is a communicator-centered

approach referring on the one hand to the processes of news production, and on the other hand to the content structure of the media coverage or the composition of media frames (Scheufele, 2003, pp. 49, 55). The present study is concerned with the content analytical measuring of frames.

The selection of topics and the structuring of information by journalists are placed among the most fundamental processes of framing an event (Dunwoody, 1992, p. 79). De Vreese (2005) describes a frame as "an emphasis in salience of a different aspect of a topic" (p. 53). Thus, one could also consider frames as "a central organizing idea or story line that provides meaning to an unfolding strip of events" (Gamson & Modigliani, 1987, p. 143). Accordingly, a framing analysis can be defined as an approach that explores news content to figure out how a certain issue is contextualized and represented in the media. Consequently, a framing analysis is conducted in order to intersubjectively determine interpretation patterns independent of the topic through cognitive knowledge (Dahinden, 2006, pp. 18-19). When producing news, journalists use certain schemata — mentally stored patterns of ideas and behavior — that guide their belief systems and information processing in order to be able to sequence the large amount of available information and place it in an appropriate context (Tuchman, 1976; Dunwoody, 1992). Journalistic frames are thereby referred to "as a consistent bundle of schemata, which emerges in discourse, exchanges with other discourses and influences information processing" (Scheufele, 2004, p. 405).

Framing determines the discussion and the reflections of an event in the media, and provides insights about the position adopted by the media around a specific topic. Within this process topics can be conveyed in various ways — depending on how news stories are moulded by journalists — so that different media discourses of a specific theme can be exposed in news media (McQuail, 2009, p. 557). According to Robert M. Entman (1993) the process of framing can be described as follows:

> To frame is to select some aspects of a perceived reality and make them more salient in a communicating text, in such a way as to promote a particular problem definition, causal interpretation, moral evaluation, and/or treatment recommendation for the item described (p. 52).

Following this definition, some aspects are made more salient in relation to other facts, which could result in a different formulation of the truth. A frame comprises the following four elements: problem definition, causal interpretation, moral evaluation, and treatment recommendation (Entman, 1993, p. 52). This framing analysis method is based on the assumption that the frame elements are defined in advance and measured by a content analysis, then merged into a complete frame using the explorative procedure of cluster analysis (Matthes & Kohring, 2004, p. 65).

The frame element problem definition reveals topics considered by the public to be relevant to a particular issue (Matthes, 2007, p. 134). However, problem definition does not only include a negative evaluation of an event, but also positive descriptions of the central issue (Matthes, 2007, p. 135). After identifying the problem definition, the next step is to determine the causes or reasons leading to the current state of the problem, which can be ascribed to specific actors or situations (Matthes, 2007, p. 135). Since frames can also show evaluations of the described

issue, after defining the problem and determining its reasons, a prognosis or a moral evaluation of the issue is made by questioning the good or bad, or the negative and positive qualities of the described item (Matthes, 2007, p. 136). After moral evaluation, whether the news reporting consists of possible recommendations, measures or solutions for the problem should be identified (Matthes, 2007, p. 136).

It should be considered that while the frame elements are interconnected, not all frame elements can be identified within a single news story. However, at least two frame elements have to be present in a news story in order to be able to speak of a frame at all (Matthes, 2007, p. 138). It is worth noting that frames are not identified on the basis of individual news stories, but rather in relation to the overall news coverage examined. As frames are not manifest and thus not directly identifiable in media texts, it is appropriate to conduct the framing analysis according to Entman's framing concept (Dahinden, 2006, p. 202). A further reason for this is that Entman's (1993) framing approach enables a description of the frames close to the data, since the separate frame elements are first identified individually and then combined into a whole frame in a subsequent step (p. 52). By operationalizing the individual frame elements, this approach provides not only an intersubjectively comprehensible description of the characteristics of frames in news coverage but also ensures a high reliability of the analysis (Matthes & Kohring, 2004, p. 65). Against this background, the framing concept according to Entman (1993) serves as the theoretical basis for the empirical investigation.

Methodology of The Study

For this study, a research design consisting of three steps (Figure 1) is developed. In a first step, a qualitative content analysis of online news coverage is conducted to determine the frame elements and lay the basis for the ensuing quantitative content analysis. Third, a cluster analysis is used to combine the identified elements into a complete frame, whose procedures are explained below.

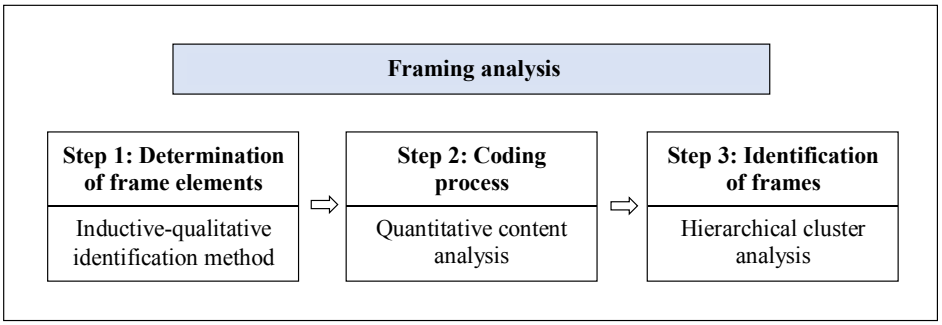

Figure 1. Research Design

Generally, various techniques such as the deductive-quantitative, inductive-quantitative, and inductive-qualitative methods can be used to identify media frames (Dahinden, 2006, pp. 201-207). For the present study, the inductive-qualitative identification method is applied as a first step by exploratively determining the frame elements directly in the data material using a qualitative content analysis, with the help of which the variables of the frame elements are inductively determined and categories are derived. For this, all articles published in the selected newspapers in which the topic of artificial intelligence is taken up are examined by employing a non-random sampling technique. For the reduction and classification of the data, the summarizing technique of interpreting the qualitative content analysis is applied by deleting insignificant parts and bundling statements (Mayring, 2008, p. 58). The category system is thus created by open coding the variables of the frame elements. This method of category formation enables a data-oriented and intersubjectively comprehensible approach, and also ensures the completeness of the categories by means of an overall view of the data material to be analyzed (Dahinden, 2006, p. 203). All data were coded by the researcher of this study.

In a second step, a quantitative content analysis consisting of gathering information about the existence or non-existence of the coded variables in the articles is conducted. The uncovered statements are then assigned to the appropriate variables of the frame elements.

As a next step, the determined frame elements are combined into complete frames conducting a cluster analysis — a dimension reduction evaluation method — in order to ascertain the extent of frames in artificial intelligence reporting and to define their content composition (Matthes & Kohring, 2004, p. 65). Hence, frames are not coded directly but variables of frame elements are combined into clusters. Using this method also makes it possible to detect new frames that emerge from the data material.

The cluster analysis is carried out in three steps. First, the similarities shared by the frame elements are determined (Backhaus et al., 2016, p. 456). It is important that the statements within a cluster are as homogeneous as possible, while the clusters should be different from one another and ensure the frames are clearly separated from each other (Backhaus et al., 2016, p. 456; Matthes & Kohring, 2008, p. 264). The Euclidean distance is used in this study as a proximity measure to compute the similarities or differences between the statements, as it is a matter of binary attributes of the frame elements which are coded in relation to their existence or non-existence to dichotomous variables (Backhaus et al., 2016, pp. 469-470). Second, cases with the same or similar characteristics are combined using Ward's method (Backhaus et al., 2016, pp. 484-494). Variables sharing similar characteristics are grouped together by carrying out an agglomerative hierarchical cluster analysis, which is considered an appropriate method to identify suitable clusters on the basis of binary variables (Backhaus et al., 2016, pp. 478-479). Since a hierarchical cluster analysis is in practice only feasible for studies with a small number of cases, the cluster analysis is carried out separately for each newspaper (Matthes & Kohring, 2004, p. 65). The determined clusters can then be defined as frames while the clustered elements reveal a whole frame (Scheufele, 2003, p. 118). And finally, the optimal number of clusters is ascertained by applying the "elbow criterion", which visually shows the

point at which the heterogeneity measure increases disproportionately; the formation of new clusters is then terminated accordingly (Backhaus et al., 2016, pp. 495-496).

Sample

As traditional newspapers go online, and the number of recipients consuming traditional news sources experiences a constant decline, online content has gained in importance (Pew Research Center, 2008). Furthermore, considering that a vast number of articles can be published online as opposed to the limited scope of printed newspapers, it can be assumed that online articles are a major information source. As it currently stands, 69,8% of the Turkish population favor reading online news (TUİK, 2019). Taking this into consideration, the homepages of two highly circulated Turkish newspapers are analyzed. The criterion for choosing the newspapers relies on the numbers of circulation, as newspapers with high circulation can provide information about the predominant opinions of their recipients. Therefore, the units of analysis are the articles published online by the following two Turkish newspapers: "Sabah" (https://www.sabah.com.tr) and "Hürriyet" (https://www.hurriyet.com.tr) (Gazete Tirajları, 2019). According to official data on the circulation numbers of Turkish daily newspapers, the weekly circulation of the newspaper "Sabah" ranged between 242.191 and 285.210 in 2019, while for "Hürriyet" this number fluctuated between 204.506 and 265.655 (Gazete Tirajları, 2019). "Sözcü" is another highly circulated Turkish newspaper whose weekly circulation ranged between 242.200 and 291.681 in 2019, but as it published fewer than 15 articles on artificial intelligence-related issues, the coverage of this newspaper was not included in the further framing analysis (Gazete Tirajları, 2019; https://www.sozcu.com.tr).

Analyzing the online archives of each newspaper, it can be observed that the news coverage on artificial intelligence was very rich in arguments in 2019. Additionally, there were many new advances in artificial intelligence applications and robotics technology during the same year. The variety of arguments and recent innovations in the field of artificial intelligence, as well as diverse reporting techniques and different journalistic forms of representation that is noticeable in the news coverage from 2019 provide a great advantage for conducting a framing analysis. Accordingly, news articles published between January 1, 2019 and December 31, 2019 are analyzed using the software tool SPSS. To collect the articles the online archives of the selected newspapers were scanned for the Turkish keyword "yapay zekâ" (artificial intelligence) in all sections of the newspapers. For the analysis of the news coverage, all editorial articles whose headlines or main body of text pertain to artificial intelligence are examined. In order to narrow down the test results, articles explicitly referring to the chances and risks of artificial intelligence in their title or main body were preferred. Advertisements and letters to the editor are not part of the sample. Moreover, links within the sample article that lead to other sites outside the articles are also not a part of the coding. Against this background, a total number of 209 articles were selected from 1.936 uncovered articles which fit the description of the search criteria of this study (see Table 1).

Table 1. Distribution of The News Coverage

Selected newspapers	Total articles n	Selected articles n
Hürriyet	1.371	106
Sabah	592	103
Total number	**1.963**	**209**

The "Hürriyet" newspaper is particularly interested in the topic of artificial intelligence, with a total number of 1.371 published articles. In comparison, "Sabah" published 592 articles relating to artificial intelligence in 2019. It is worth noting that although "Hürriyet" used the keyword artificial intelligence more than twice as often as "Sabah", both newspapers discussed the prospects and challenges of artificial intelligence in nearly equal measure: "Hürriyet" published a total of 106 news articles, while "Sabah" published 103 news articles.

Results

In the following section, the results of the study are presented on the basis of the research questions. First, an overview of the determined frame elements is given. Then the identified frames and their content composition are described.

Determination of The Frame Elements

The purpose of the qualitative content analysis is to determine the variables of the frame elements that are selected for the ensuing cluster analysis. For the operationalization of the frame elements, variables are assigned to the appropriate categories that express prospects and challenges of artificial intelligence. The dominant variables that can be assigned to the corresponding frame elements are presented in Table 2 below.

Table 2. Variables of The Frame Elements

Frame elements	Variable	Description
Problem definition	Possibility	Themes dealing with robots, autonomous vehicles, health care, applications for supporting tasks, automation processes, digital assistants
	Challenge	Themes referring to social and economic consequences, ethical concerns
Causal interpretation	Science	Research institutions that develop artificial intelligence applications, universities that support the development of artificial intelligence technologies
	Politics	Ministry of Health, Ministry of Transport and Infrastructure, Ministry of Industry and Technology, Ministry of Defense
	Business	Google, Microsoft, Amazon, IBM, Bosch, telecommunication operator, industry

Moral evaluation	Tendency of the news coverage	Very positive: Only the potentials and advantages are mentioned. Positive: Advantages and disadvantages are stated whereby the benefits prevail. Neutral: News text is written in a factual manner without judgment. Negative: Advantages and disadvantages are stated whereby the risks prevail. Very negative: Only the risks and disadvantages are debated.
Treatment recommendation	Required implementation and regulation	Supporting the process of implementation Financial investments Creating new job profiles Offering training and further education facilities Legal regulations Regulations of ethical issues Reinforcing international and interdisciplinary studies

The problem definition frame element consists of statements emphasizing central issues that mainly deal with either the benefits or challenges of artificial intelligence technologies. This frame element refers especially to themes such as the use of robots in daily life, self-driven vehicles, improvements in health care, facilitation of specific human tasks through certain artificial intelligence applications, automation processes and virtual assistants. The most prominent concerns that are raised regarding the challenges of artificial intelligence implementation are social and economic (such as the increase of social inequality or job losses) and ethical (such as the protection of privacy, lack of transparency, and the loss of privacy and freedom). Regarding the causal interpretation, the articles suggest that different actors will have an impact on the forthcoming implementation of artificial intelligence, the most important among them being researchers and/or scientists (especially computer scientists), political actors, and tech-giants like Google, Microsoft, Amazon, IBM, and Bosch, as well as Turkish telecommunication operators and industries. Additionally, the evaluation of the news coverage can also be recorded, which provides information about the tendency of reporting and shows whether the topic of artificial intelligence is presented in a very positive, positive, neutral, negative, or a very negative way. To fulfill the fourth frame element of treatment recommendation, certain measures are advised to simplify the handling of artificial intelligence technologies by society. These measures include the widespread support of the implementation process, financial investments, new job profiles, training and further education facilities, legal regulations, ethical solutions and the support of international and interdisciplinary studies.

Identification of The Frames

After the variables of the frame elements are captured, the next step is to cluster the frame elements into a complete frame. The results of the cluster analysis reveal a five-cluster solution leading to the identification of the most prevalent frames ascertained in the selected newspapers (Table 3). The frames are labelled based on the frequencies of the variables of the frame elements. In the following, the identified frames and their core arguments across the analyzed articles are presented.

Table 3. Identified Frames of Artificial Intelligence

Frame elements	Frame 1 AI as assistant/ supporter	Frame 2 Economic benefit	Frame 3 Elimination of human error	Frame 4 Human replacement	Frame 5 Ethical concerns
Problem definition					
Robots as assistant	**21.6**	11.2	12.3	8.5	11.8
Autonomous vehicles	–	8.4	**19.1**	11.4	16.1
AI in health care	12.3	5.6	10.7	14.2	–
Applications for supporting tasks	**32.5**	**14.1**	11.3	7.1	–
Automation processes	3.1	10.3	**27.5**	**15.0**	11.4
Digital assistants	18.2	13.1	–	6.3	–
Social consequences	5.2	8.0	10.1	**23.1**	**18.2**
Economic consequences	4.0	**23.3**	–	9.0	9.2
Ethical issues	3.1	6.1	9.0	5.4	**33.4**
Causal interpretation					
Research institution	**14.2**	**23.0**	12.3	10.1	14,1
University	13.0	**24.2**	9.1	9.0	**23,5**
Ministry of Health	5.2	–	11.0	7.3	9.0
Ministry of Transport and Infrastructure	–	9.4	**14.5**	14.4	**16.2**
Ministry of Industry and Technology	–	13.1	11.2	**17.2**	14.5
Ministry of Defense	5.2	–	13.4	13.8	9.2
Google	8.1	2.6	–	–	–
Microsoft	7.4	5.1	–	–	–
Amazon	7.0	3.1	–	–	–
IBM	6.4	2.0	–	–	–
Bosch	8.2	5.2	4.0	–	–
Telecommunication operator	**13.3**	11.3	3.2	11.2	13.5
Industry	12.0	22.0	**21.2**	**17.0**	–
Moral evaluation					
Very positive tendency	**29.8**	**29,8**	**26.2**	5.3	3.1
Positive tendency	**42.3**	**36,9**	24.5	12.5	7.4
Neutral tendency	21.7	27,5	**39.8**	**30.8**	**40.2**
Negative tendency	6.2	5,8	9.5	**35.2**	**34.8**
Very negative tendency	–	–	–	16.2	14.5
Treatment recommendation					
Supporting the process of implementation	**56.2**	**36.1**	**31.3**	13.0	13.2
Financial investments	**31.6**	**31.4**	16.4	11.4	9.7
Creating new job profiles	–	25.2	**28.1**	**28.3**	6.3
Offering training and further education facilities	–	–	14.0	–	–
Legal regulations	–	–	–	**32.1**	**19.6**
Regulations of ethical issues	12.2	–	10.2	15.2	**51.2**
Reinforcing international and interdisciplinary studies	–	7.3	–	–	–

n = 209	**56**	**45**	**41**	**36**	**31**
% = 100	**26.8**	**21.5**	**19.6**	**17.2**	**14.8**

The percentages of the variables of the individual frame elements are to be read as column percentages and result in 100 percent each, for example 21.6 percent of the articles from frame 1 "AI as assistant/supporter" conceptualize the topic "robots as assistants". Since the calculations are rounded values, the sum does not always add up to exactly 100 percent.

The "Artificial Intelligent as Assistant/Supporter" Frame

Among the total of 209 news articles that were analyzed, the most prevailing frame marking the main content of the discussion in the newspapers can be identified as the "artificial intelligence as assistant/supporter" frame, representing 26.8% (n = 56) of the media coverage. Articles using this frame mostly refer to the benefits of artificial intelligence and emphasize the advantages rather than the disadvantages of the implementation of artificial intelligence technologies in our day-to-day lives. These articles advocate the use of artificial-intelligence-based applications (32.5%) for daily tasks and to support the duties of doctors, educators, lawyers, jet fighter pilots, police, inspectors, etc. Other possible applications of artificial intelligence that the articles mention are making disabled peoples' lives easier — such as in the case of the "Microsoft Translator" software that aids students with hearing disabilities, and the artificial-intelligence-supported walking stick which helps individuals with visual disabilities — allowing the individual to conduct medical analyses such as sleep analyses by themselves, making it possible to create individualized diet plans on the basis of one's medical records, diagnosing diseases such as Alzheimer's disease, schizophrenia, cancer, and tumor growth, suggesting a medical treatment prior to a visit to a human doctor, and providing individual learning profiles through personal intelligence tutors based on the learning performance of the student. Furthermore, the frame refers to the use of robots (21.6%) to complete particularly demanding, monotonous, and routine tasks in our daily lives, in industry, and in the service sector. Moreover, robots can be used as teaching and learning aids at universities; serve as digital companions for elderly people to keep them engaged and connected as well as allow them to live independently by providing them with entertainment and assisting with reading and comprehension; help with childcare and help children themselves while they do their homework or play; and aid with the running of a household. Articles that make use of this frame also discuss artificial intelligence with regard to the implementation of digital assistants (18.2%) such as the "Google Assistant", "Nokia Digital Assistant", "Alexa", and "Siri", which allow users to access the information they require through voice commands, as well as chatbots that are used to simulate human conversation via text chats and/or voice commands to assist humans in completing online tasks such as shopping, banking, etc. By means of causal interpretation, scientists from research institutions (14.2%) and universities (13.0%), telecommunication operators (13.3%) and industry professionals (12.0%) describe the potential of the technology by referring to computers or robots as humanity's efficient assistants or collaborators, and considering them to be a new way of making the working processes transparent in business, health care, judiciary processes, and education. Moreover, tech giants such as Google (8.1%), Microsoft (7.4%), Amazon (7.0%), and IBM (6.4%) are mentioned as actors accelerating the development of artificial intelligence systems. With regard to the moral

evaluation, almost three quarters (72.1%) of the articles with this frame reveal a very positive or rather positive evaluation of the reporting. Accordingly, the majority of the news coverage focuses on the progress in artificial intelligence technologies in a more optimistic way and thus reveals a positive tendency. Supporting the implementation of artificial intelligence (56.2%) in daily life and financial investments (31.6%) are mentioned to promote the development of the emerging technology as a dominant treatment recommendation.

The "Economic Benefit" Frame

The "economic benefit" frame is the second prevailing frame in the articles, mentioned in 21.5% (n = 45) of the total news coverage. Articles using this frame revolve around topics that outline economic benefits or advantages (23.3%) such as new revenue potentials by delivering advertising to personalized consumer preferences and new workplaces. Furthermore, this frame is mostly encountered in articles that discuss the enhancement of economic productivity with regard to the implementation of artificial intelligence technologies to assist human labor (14.1%) especially hard physical work or hazardous tasks, also to increase productivity and economic growth. Actors from universities (24.2%), research institutions (23.0%) and from the industry (22.0%) particularly support the implementation of the emerging technology in our daily lives due the manifold possibilities and advantages of new technological developments powered by artificial intelligence, and their economic benefits. Within the analyzed articles sentiments about inventions of artificial intelligence ranges from very positive (29.8%) to positive (36.9%) to neutral (27.5%). The required measures that are articulated in this frame refer mostly to the support of the implementation processes (36.1%), stating artificial intelligence will occupy an important role in everyone's life regarding financial investments (31.4%), claiming artificial intelligence will create new job profiles (25.2%), and stating the necessity of the reinforcement of international and interdisciplinary studies (7.3%)

The "Elimination of Human Error" Frame

Another oft-used frame in the articles is the "elimination of human error" frame, addressing the possibility of accurate and swift completion of work duties due to the automation of certain tasks otherwise relying on manpower. This frame is used in 19.6% (n = 41) of articles on the themes of automated decision-making processes (27.5%) and autonomous vehicles (19.1%) with regard to the possibility of reducing or even eliminating unintentional errors by humans, as well as abolishing personal biases or emotions and thus leading to a more rational and unbiased decision-making process. The advances in artificial intelligence in relation to humanoid robots (12.3%) that can provide support and help carry out specific tasks without making errors are also discussed in this frame. Overall, this frame conceptualizes future developments of artificial intelligence technologies in a more utopian manner, outlining a near future in which computers are described as intelligent machines possessing the ability to operate and to behave in a human-like manner based on human-generated learning data. The responsibility for the prevalence of this frame is mostly ascribed to actors from the industry (21.2%) as well as political actors from the Ministry of Transport and Infrastructure (14.5%) and the Ministry of Defense (13.4%), who

tend to outline the opportunity of secure driving and of attaining accuracy in specialized tasks. Articles using this frame reveal mostly a neutral tone (39.8), but at least half of them in total shows a positive (24.5%) to very positive (26.2%) tendency. Treatment recommendations that are stated in this frame to enhance the development of new artificial intelligence applications refer to the need for supporting the implementation process (31.3%), creating new job profiles (28.1%), and making financial investments (16.4%) to promote this implementation. Furthermore, seminars and further education facilities (14.0%) should be offered to be able to deal with the emerging technology.

The "Human Replacement" Frame

The "human replacement" frame (17.2%, n = 36) is the most prevailing frame regarding the challenges of the use of artificial intelligence. This frame is apparent in news stories about workplace safety, in which the possibility of economic degradation through job losses due to the replacement of human work, and how this may cause social inequality (23.1%) are discussed. Furthermore, this frame thematizes the risk of human unemployment and re-structuring of labor regarding the automation processes (15.0%), leading to the anxiety of human replacement due to the possibility of implementing robots (8.5%) or artificial intelligence applications (7.1%) in order to assist in work duties or even fulfill tasks making up the entirety of certain job types such as cashiers, waiters, customer service representatives, salespeople, journalists, lawyers, security guards, postal workers, personal care assistants, child-minders, etc. The "human replacement" frame also treats issues regarding the potential abilities of artificial intelligence as surrogate for the medical sector (14.2%). It postulates that robots can take on the role of human doctors or medical staff, for example, by diagnosing patients or acting as their health advisors. Moreover, this frame refers to articles discussing the replacement of human drivers through efficient self-driving autonomous vehicles (11.4%) which can ensure higher levels of safety and which may reduce car accidents through faster reactions to unforeseen incidents compared to human drivers. Despite this, the articles also mention that driving should remain a human trait (5.4%). Also, the increased usage of armed drones that can replace human soldiers in dangerous situations is addressed in this frame. Prevalent actors who support the development and use of autonomous vehicles are the Turkish Ministry of Industry and Technology (17.2%) whereas the implementation of automation processes is of particular interest to the industry (17.0%). Regarding the tendency of the articles, more pessimistic statements (35.2%) are used to describe the influence of artificial intelligence, especially on human work. As required measures to counteract the replacement of humans, legal regulations (32.1%) and creating new job profiles (28.3%) are recommended to avoid unemployment and social and economic inequality.

The "Ethical Concerns" Frame

A further important challenge frame identified in the news coverage is the "ethical concerns" frame (14.8%, n = 31). It can be observed that the majority of the analyzed articles employing this frame did not discuss the ethical challenges in detail but pointed out a number of potential ethical concerns. This frame consists of statements that refer to ethical issues (33.4%) scrutinizing the

changes in the human-human, human-society and human-nature relationships, as well as the lack of transparency of artificial intelligence data that triggers discussions on ethical values. Moreover, this frame comprises statements about ethical reflections that conceptualize the misuse of artificial intelligence and the lack of data privacy, which in turn can lead to cybercrime and security threats to personal data. Social challenges (18.2%) are also discussed in this frame to underline the emergence of social inequality due to changing working and living environments. Academics (23.5%) are the ones who discuss and exemplify ethical concerns the most, followed by actors from the Ministry of Transport and Infrastructure (16.2%) who care about the public's data privacy and data protection. Most of the articles that use this frame have a neutral tendency (40.2%) as they offer readers general information and facts of ethical challenges. Nevertheless, one-third of the statements about ethical concerns express a negative (34.8%) tendency. As treatment recommendation, demands are particularly made for ethical regulations (51.2%). Furthermore, it is mentioned that the government should control the development of artificial intelligence by adopting legal regulations (19.6%) to prevent the emergence of possible threats through the implementation of said technology in people's daily lives.

With regard to the distribution of the identified frames among the analyzed newspapers, Figure 2 shows that no significant differences but congruencies can be ascertained in the coverage of "Sabah" and "Hürriyet". According to the results, the distribution of the frames differ as follows:

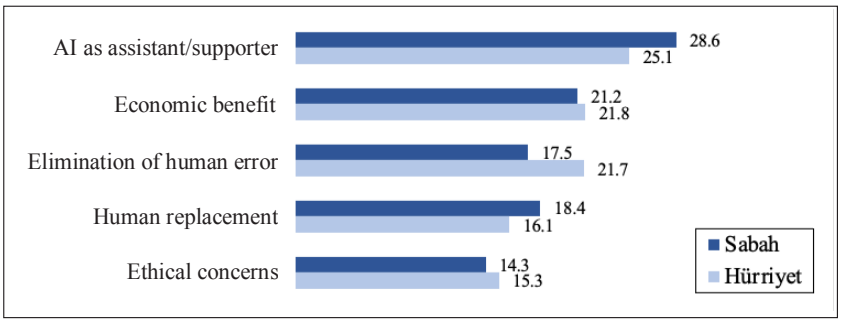

Figure 2. Distribution of The Frames Among The Newspapers

The analysis demonstrates that all of the identified five frames are used in all of the two analyzed newspapers. A further notable similarity between the examined newspapers is that the coverage of both newspapers prioritizes the discussion regarding the potentials and benefits of the use of artificial intelligence technologies. Three out of five identified frames correspond to the prospects of the emerging technology, while two frames explore possible challenges. The frame "artificial intelligence as assistant/supporter" dominates the news coverage of the prospects of artificial intelligence with 28.6% of all analyzed articles in "Sabah", which also pays slightly more attention to the frame "human replacement" (18.4%) than "Hürriyet". Whereas the frames "economic benefit" (21.8%), "elimination of human error" (21.7%) and "ethical concerns" (15.3%) appears most frequently in "Hürriyet". The order of the results does not change when taking into account the frequency of the identified frames occurring in each newspaper. In both newspapers,

the discussion on the prospects and benefits of the implementation of robots and artificial-intelligence-based applications in our daily lives plays the most important role. In contrast, the "ethical concerns" frame is less dominant than the other identified frames.

Discussion and Conclusion

This study adds to existing research on artificial intelligence by revealing how this theme is represented and discussed in Turkish online newspapers, in particular in the highly circulated newspapers "Sabah" and "Hürriyet". Frames were identified by analyzing the discussion around artificial intelligence technologies in two highly circulated Turkish newspapers, in order to get an insight into news reporting about the emerging technology and outline its prospects as well as challenges. Analyzing the collected data and considering the amount of gathered articles, it seems that the media discourse on artificial intelligence is undergoing an "AI-Summer" and there is an increase in attention to public communication, which represents not only optimistic perspectives but also some concerns of the emerging technology. The cluster analysis indicates that the frames "artificial intelligence as assistant/supporter", "economic benefit", "elimination of human error", "human replacement" and "ethical concerns" dominate the news coverage about artificial intelligence in the analyzed Turkish newspapers, referring to different prospects and challenges especially in work, communication, business, health care, and private life. It is worth noting that the analyzed Turkish media coverage does not explicitly discuss the risks of algorithmic bias, inequality, unfairness, or even discrimination caused by outdated and incorrect training data used for machine learning, as well as by incomplete databases (Noble, 2018; Eubanks, 2018).

Based on the identified frames, conclusions can be drawn regarding the media representations of artificial intelligence in online newspapers, which focuses alternately on its positive and negative outcomes in terms of both the individual and society at large, and ponders the changes that both "weak" artificial intelligence and "strong" artificial intelligence will be undergoing. On the other hand, artificial intelligence technologies engender new possibilities for businesses and entrepreneurs. Various perspectives of the theme are demonstrated in the media discourse by the use of different frames in news coverage on artificial intelligence. Overall, the analyzed Turkish news coverage about artificial intelligence reveal a positive tendency, suggesting that artificial intelligence has the capacity to improve human life. However, it is uncertain whether the positively evaluated frames also lead to a positive perception of artificial intelligence by the public. Here, journalists — as individuals responsible for setting the news agenda — have an important role in shaping the public's perception of artificial intelligence technologies. Against the backdrop of concerns surrounding the challenges posed by artificial intelligence — as mentioned in the introduction section of this paper — and the results of this study, it may be important to supply additional information to the recipients to ensure a more comprehensive understanding of new technological developments, and to avoid misunderstandings and triggering a fear of new technology. It would also be helpful to present news in a forthright manner and not from sensationalist, utopian, or dystopian perspectives. Furthermore, it will be essential to not only make the public aware of possible threats but also not to exceed the expectations of what is plausible

when reporting about innovations, in order to avoid disheartening the recipients. Conversely, it is important that the public keep following the news to be updated and knowledgeable regarding the new developments.

Despite a comprehensive depiction of the results on how artificial intelligence is communicated to the public, it would also be meaningful to explore recipient attitudes toward such news in a future study. This would allow us to decipher the effects of the identified frames and the acceptance of artificial intelligence based on the pros and cons of the emerging technology, since artificial intelligence technologies will play a significant role in the digital transformation of many fields, and possess the capacity to transform our lives by taking over physical and intellectual tasks.

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