

A Survey on the Science and Technology News Stories Published on Three Iranian News Websites

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Abstract

Communicating science to the public is one of the important issues in societies. Given the importance of news websites in communicating science, this article aimed to examine different aspects of science-related news stories like subjects, internationality, formats, and readers' comments rate, published on the Iranian national news websites. Contents of 1711 science-related news of the top three ranked influential Iranian news websites, including ISNA, Mehr News, and Fars News, in one month in 2019, using the Dewey decimal classification (DDC) schema and inductive coding system, were analyzed. The results revealed that science and technology-related news stories published in the sample news websites have a bias toward international technology as the main subject class, and astronomy and medicine subclasses in the textual format. Like other developing countries, science reporting in Iran needs to be more professional, and there is a need for professional training programs for science journalists for better coverage of science-related news stories.

Keywords: Science Communication, News Website, Science Journalism, News Classification, Iranian News Websites.

Introduction

Science communication or communication of science is disseminating "accurate and undistorted" scientific statements, such as facts, theories, and ideas, among people who need to know about them (Guidotti, 2016). There are many studies on the status of science communication both in developed and developing countries in different media. Previous studies have explored science communication in various media platforms, including television (Jaki, 2018; Dan, 2016; Miller, Augenbraun, Schulhof & Kimmel, 2006), radio (Merzagora, 2004;

Thakar, 2004; Keller, 2017), newspapers (Elmer, Badenschier & Wormer, 2008; Summ & Volpers, 2016; Spratt, 2001; Gordon, Deines & Havice, 2010), and online platforms such as social networks (Dumlao & Duke, 2003; Babu & Gopaldaswamy, 2011; Allen, 2001; López-Goñi & Sánchez-Angulo, 2018; Moukarzel, Rehm, Del Fresno & Daly, 2020). However, the literature on science communication in developing countries remains limited (Tran, 2021). Schäfer (2017) believes that today, the public and many decision-makers obtain their desired science-related news increasingly from online media, and the question of how these media cover science and scientific topics is an important question to be answered.

Therefore, this study tries to add to the body of evidence on the science communication status in a developing country, Iran, in an online context, online websites.

Science communication in Iran has not a long history, and it informally started with the entrance of the radio to Iran. In the early times, science communication in Iran was limited to scientific magazines, like *Daneshmand*, dispersed radio/ TV programs, and some voluntary activities by elites. Formal thoughts and initiatives toward science communication in Iran started with the “Iranian Association for the Popularization of Science (IAPS)” establishment (Ghadimi & Nazifkar, 2010). Today, science communication efforts are followed seriously in text-based and audiovisual media with science-related magazines and journals, TV channels, and the establishment of some specific associations dedicated to science communication (Tohidi, Asadi, Nikpayam & Rangeran, 2010). Ghadimi and NazifKar (2010) identified several challenges that hinder effective science communication in Iran, including:

- resistance from the general public towards accepting science;
- low levels of science and technology (S&T) and human development;
- a lack of clear understanding of science communication concepts;
- insufficient budgets and facilities for science communication;
- poor perception of the importance of science communication among policymakers.

The main goal of the current study is to reach a clear understanding of various aspects of the science and technology news stories communicated to the public through news websites in Iran. To this goal, three main questions are answered:

- 1) How are science main and sub-subjects covered in sample news websites?
- 2) What are the various origins of science news across sample platforms?
- 3) How do different formats contribute to communicating science news?
- 4) What is the level of user engagement with science news on sample platforms?

Literature Review

Many studies have focused on the different aspects of science communication in various media types. Dan (2016) investigated the status of science communication on TV in China; the results suggested that among six different communication channels used, TV is in the third place after computer and mobile networks; and in terms of media credibility, it is in the first place. The results also showed that documentaries with human, nature, exploration, and discovery subjects are highly ranked.

Elmer et al. (2008) have studied the coverage of research fields in German newspapers. They analyzed 4077 news during 2003-2004 and 2006-2007 in German nationwide newspapers; the results revealed that the science communication rate increased during these

periods, and medicine was covered more than other fields of science. Bauer (1998), during a longitudinal study using surveys and media analyses, tested the medicalization-of-science-news thesis. The results confirmed this thesis both quantitatively and qualitatively. Appiah (2012) studied science journalism in Ghana and found that health science (70.5%) followed by Agricultural (37.4%) and Basic (14.4%) sciences are the top three topics covered by science journalists. Bucchi and Mazzolini (2003) studied the science coverage in an Italian daily press for 50 years and found that more than half of the stories (52.7%) are related to medicine and biology, and engineering (14.7%) have more articles than the other non-medical science fields. Metcalfe and Gascoigne (1995), in a study in the context of the Australasian science magazines, confirm the dominance of the life science and medicine topics coverage as well.

Crises, like health or environmental ones, are the subject of many studies on science communication. Spratt (2001) studied the science communication status in some media during the Influenza pandemic in 1918 in the United States of America and concluded: "emphasis on facticity and empirical data did far more than relay medical truths to the public." Global warming coverage status in the Mexico City newspapers during 2004-2006 by Gordon et al. (2010) suggested that the frequency of stories in the newspaper has reached to peak during global warming-related events like international conferences. 'International relation' was the most frequent solution in articles for global warming.

Many studies have focused on science communication in new media, such as social networks or weblogs (Minol, Spelsberg, Schulte & Morris, 2007). Barel-Ben, Garty, and Baram-Tsabari (2020) studied the public engagement level difference in stories written by organic reporters and scientists on two major Israeli news websites. They found no difference in public engagement with different items and concluded: "This creates an optimistic starting point for filling the science news void by scientists as science reporters." Welbourne and Grant (2016) investigated the factors affecting the popularity of scientific videos on YouTube; the content analysis of 390 videos revealed that user-generated content and videos with consistent science communicators are more popular than videos whiteout regular science communicators are.

Materials and Methods

The study began by selecting three major Iranian online news websites, Mehr News, the Iranian student's news agency (ISNA), and Fars News, based on a report published by Partotech.com that ranked Iranian news agencies and websites according to the rate of citations to their news stories on other websites (Partotech. Com, 2019). Each of the selected websites had a dedicated section for science and technology news, with an average of at least 15 stories published per day. ISNA is published by "Jihad Daneshgahi" and has an academic context, while Mehr News and Fars News are published by governmental organizations. In Iran, there is no clear distinction between news websites and news agencies; some websites have "news agency" in their title while having a news website specification.

A total of 1,711 news stories published during one month (23/07/2019-23/08/2019) in three news websites' science and technology sections were analyzed. The main two reasons for choosing this one month were: that the data for ranking news websites in the report was limited to this period, and there were no significant science-related events, like COVID-19, in this month to affect the news stories.

For every entry or news story, different data, including title, full text, subject, the

internationality of the news stories, user engagement, and news format are extracted. Dewey decimal classification (DDC), as a comprehensive subject classification scheme, is used for the subject classification of news stories. The reason for choosing the DDC is that the user community of the general news websites' science section is the public, just as in public libraries; and the dominant classification system that is used in many public libraries, especially in Iran, is DDC.

During the subject classification of the news, in some cases, where the news title was not informative enough to classify, or the news story covered more than one subject, the keywords and the full text of the news were referred to assign a main and sub-subject class. To avoid some of the possible discrepancies among the authors, as different coders, the first author accomplished the subject classification of the news because of his complete familiarity with DDC. A pilot study of the various types and internationality of the news led to an inductive coding system presented in the following lists. This coding system has an objective nature; therefore, the inconsistencies among coders, the second and the third authors, were trivial. The codes for the news formats are:

- Textual report: For stories on the S&T status in textual format.
- Interview: For interviews with S&T managers or researchers.
- Pictorial reports: For stories with photographic content, photos are the necessary elements of the news.
- Video reports: For stories presented in the form of Video.
- Complex: For stories with various content formats, each with relatively equal importance.

The codes for the internationality of news stories are:

- National news stories: For stories about national science-related events/ persons/ achievements.
- International news stories: For stories about science-related events/ persons/ achievements in countries other than Iran.

The total count of the readers' comments under a news entry is recorded as the user engagement rate for that news.

Results

During one month, a total number of 1,711 news stories related to S&T were published on three news websites, including Mehr News (559), ISNA (680), and Fars News (472). The news stories distribution among three news websites shows that ISNA has published more scientific news than the others have.

Subject classification of the news stories

Content analysis of the news stories based on the Dewey decimal classification (DDC) schema, presented in Table 1, revealed that news stories are mainly about technology (class 600) and science (class 500). The results showed that news websites had not covered news about Language (class 400) and history and geography (class 900) in their S&T group. Given the news subclasses, news stories related to astronomy, medicine, and engineering have more frequency than other subclasses.

Table 1
Distribution of news stories under main and subclasses

Main class	subclass	Number of news stories	% of all news stories
Technology	Medicine and Health	243	14.2
	Engineering	231	13.5
	Technology	187	10.9
	Chemical Engineering	58	3.38
	Management and Public relations	54	3.15
	Home and family management	26	1.51
	Agriculture	12	0.7
	Construction of buildings	10	0.58
	Manufacture for specific uses	7	0.4
	Manufacturing	7	0.4
	Total	835	48.8
Science	Astronomy	281	16.4
	Science	107	6.25
	Earth Sciences and Geology	64	3.74
	Biology	21	1.22
	Plants	18	1.05
	Animals (Zoology)	16	0.93
	Fossils and prehistoric life	15	0.87
	Chemistry	9	0.52
	Mathematics	6	0.35
	Total	537	31.38
Social science	Law	28	1.6
	Social problems and social services	24	1.4
	Education	22	1.28
	Commerce, communications, and transportation	18	1.05
	Social sciences, sociology, and anthropology	18	1.05
	Economics	16	0.93
	Statistics	11	0.64
	Public administration and military science	9	0.52
	Political science	4	0.23
	Customs, etiquette, and folklore	2	0.11
Total	152	0.088	
Computer science, information, and general works	Computer science, knowledge, and systems	129	7.53
	News media, journalism, and publishing	11	0.64
	Magazines, journals, and serials	1	0.06
	Library and information sciences	1	0.06
	Total	142	0.082
Philosophy and psychology	Psychology	37	2.16
	Ethics	1	0.06
	Total	38	0.022
Arts and recreation	Arts	1	0.06
	Area planning and landscape	1	0.06

Main class	subclass	Number of news stories	% of all news stories
	architecture		
	Sculpture, ceramics, and metalwork	1	0.06
	Outline of sports, games, and entertainment	1	0.06
	Total	4	0.002
Religion	Other religions	1	0.06
	Religion	1	0.06
	Total	2	0.001
Literature	Literature, rhetoric, and criticism	1	0.06
	Total	1	0

The results show that all three news websites have published more news stories about technology (class 600), and ISNA has published more news stories (347) about technology than others have. In addition, the distribution of the top three subcategories among three news websites (Figure 1) suggests that ISNA in astronomy and medicine and Mehr News in engineering subclasses have published more news stories.

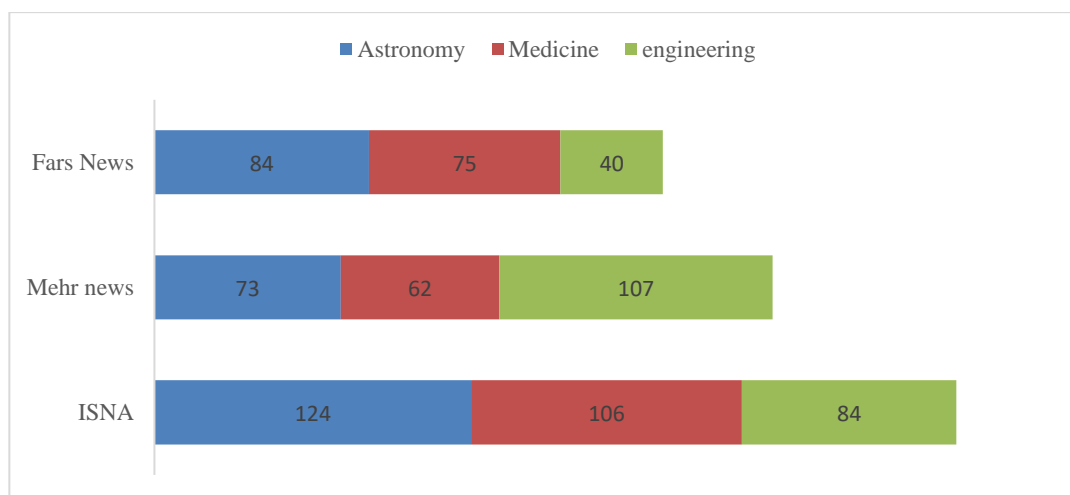


Figure 1: Distribution of top three subcategories among three news websites

News stories internationality

Data analysis suggests that international news stories' coverage (966) is more than national news (745) in the S&T sections of three news websites. News analysis based on the internationality of the news stories in each news website (Figure 2) and each DDC main class (Figure 3) shows that S&T news stories in Fars News have more international orientation than the others. Mehr News has covered more national news stories than ISNA and Fars News. The gap between national and international news stories in the science main class is greater than in other main classes, and general works of technology, science, and computer science are the subclasses that have covered more international news stories than national ones.

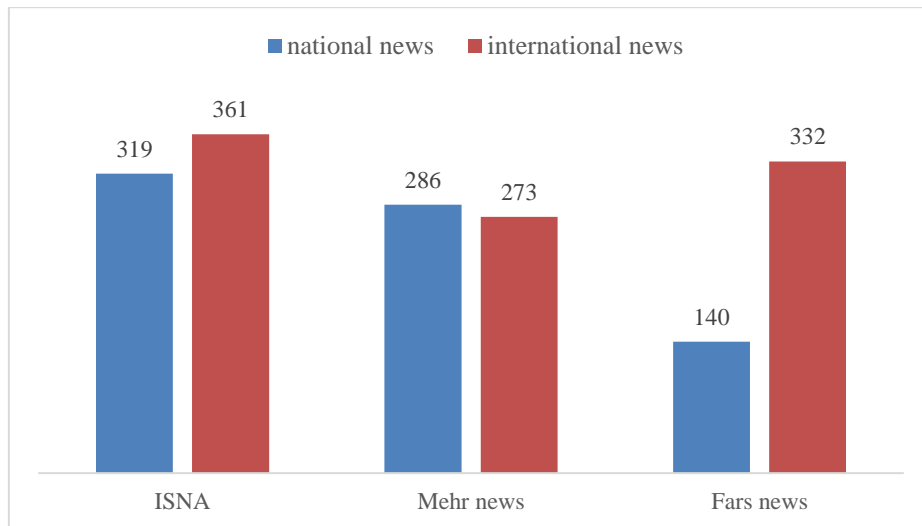


Figure 2: Distribution of national/ international news stories in each three news websites



Figure 3: Distribution of national/ international news stories in each main category

Reader's comments on the news stories

The total number of readers' comments on the 1711 news in three news websites was 231, and the number of comments per news was 0.13. The majority of news (1608 out of 1711) was left uncommented by the readers. Fars News (186) has more comments than Mehr News (32), and ISNA (13).

Formats of the news stories

Analysis of the news formats showed that the primary kind of news stories used in the S&T section of news websites is textual reports (1477 out of 1711, 86%), followed by interviews (135 out of 1711, 8%). The distribution of different types of news stories among three news websites (Figure 4) shows that the diversity of news in ISNA is more than in two other news websites.

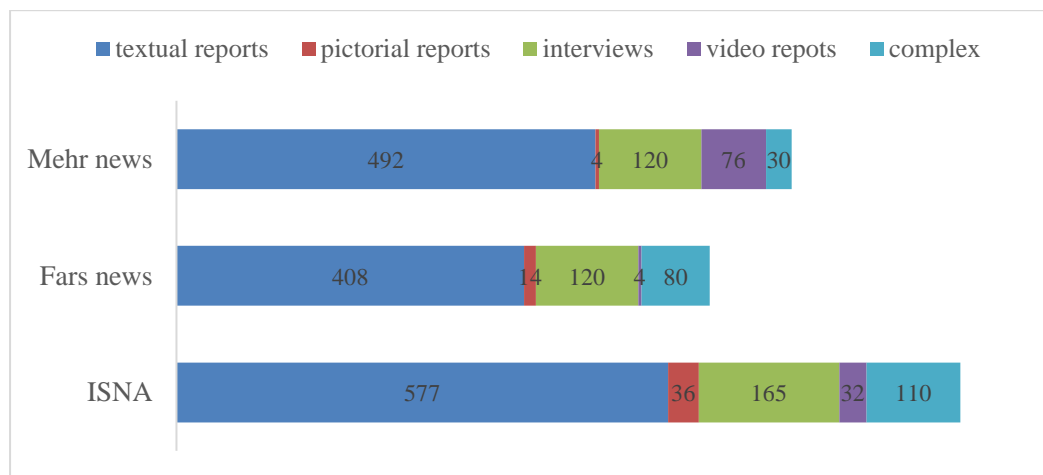


Figure 4: Distribution of different formats of the news on news websites

Discussion

Various studies have investigated the science news stories' coverage in different news media in developed (Einsiedel, 1992; Metcalfe & Gascoigne, 1995) and developing (Appiah, 2012; Tran, 2021) countries. This study tried to do the same in a developing country and add to the existing body of literature.

The results of this study show that ISNA has published more science news stories. One possible reason for this can be the affiliation of the news media. ISNA is administered by "Jihad Daneshgahi" and is related to an academic context, whereas the other two news websites, Mehr News and Fars News, are supported by general governmental organizations. The other reason for the different numbers of news stories on news websites might be the number of professional S&T journalists on each news website. Unfortunately, there is no information about the reports on the news websites.

Making a compromise between the value of information/ sources (newsworthiness) and the readers' needs and wants is one of the challenges for science journalists. Journalists' and public perceptions and understandings of science affect choosing news stories. In this regard, Bauer (1998) has cited the results of a national survey in the UK that showed the public regards medicine, chemistry, physics, astronomy, and biology disciplines as "more scientific" than the other disciplines, such as psychology, economics, astrology, and history. He concludes that:

Medicine is the current core of a popular representation of science. Evidence confirms the medicalization-of-science-news thesis both qualitatively and quantitatively.

The results of this study, along with those of other studies (Bucchi & Mazzolini, 2003; Elmer et al., 2008), confirm his thesis. It can be confirmed that public perceptions of science impact journalists' choices of science stories to some extent. In other words, science journalists need to make more efforts to introduce other fields of science to the public.

In the DDC, medicine is categorized as technology. All three news websites in this study covered more news stories on the main class technology that applies science to solve problems. Technology news stories, in many cases, solely report new advances in different fields. Medicine, engineering, and general technology-related news stories, such as technological education, publication, and patents, are the top three technology subjects covered by science journalists.

Findings also suggest that under the main science class, astronomy, general science-related

news stories, and earth science are the top three subclasses, and this is aligned with Elmer et al. (2008), which found astronomy as one of the popular S&T subjects of the German newspapers. Regarding DDC main and subclasses, some critical subjects such as social science, computer science, and psychology have not been covered well enough on Iranian top news websites. The reason might be that these subjects, especially social science, and humanities, should be placed in other parts of the news media, such as social, cultural, or political sections (Wormer, 2009).

Analysis of the origin of the S&T news stories published on the top three news websites shows that more than half of the news stories (56.5%) are taken from international S&T sources, like Reddit, CNN, and Reuters; this is compatible with similar studies in developing countries (Tran, 2021). One of the main reasons is considering the translators as the primary content producers in the science service of many news media (Boroujerdi Alavi & Bonyadi, 2015); this is partly due to the low level of S&T developments in developing countries and the lack of communication between science journalists and scientists or scientific organizations.

In addition to the bias toward some subjects and international S&T sources, the results show that science writers publish news stories mostly in textual format and neglect the capacities of the online environment in content provision. Moreover, in many cases, the national science news stories are about science and technology managerial issues. All of these confirm the conclusions of the other studies on the lack of professional knowledge of the existing science journalists in developing countries (Tran, 2021; Boroujerdi Alavi & Bonyadi, 2015; Appiah, 2012) and the importance of the provision of training and mentoring for them.

Conclusion

Based on the findings of this study, the main categories of technology and science, with subcategories such as astronomy, medicine, and engineering, have emerged as dominant topics in the science sections of the sampled news websites. Specifically, ISNA has emerged as the leading publisher of science-related news stories, with a notable emphasis on international coverage over national stories. A significant proportion of these news items are presented in textual report format, while user engagement, as indicated by the number of comments per news story, is generally low, with many stories receiving no comments at all.

One major limitation of the study is the restricted sample size, which may impact the generalizability of the findings. Future research endeavors could enhance our understanding of the status of science reporting on news websites by replicating this study with a larger and more diverse sample. Additionally, there is a need for further investigation into user attitudes towards science and technology news stories, the perceptions of science journalists regarding their field, and the selection criteria employed by science journalists when utilizing various news sources on websites.

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