Impact of Newspaper Language on Technology Adoption Speed: A Closer Look at the US Energy Sector

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Overview

Even reputable news outlets sometimes resort to sensationalized news articles and fearmongering as means to attract the attention of their readers (Brown et al. 2018). If such strategies dissuade decision-makers from investing in or supporting policies favoring clean energy technology, this could pose an additional challenge to combating climate change.

This paper seeks to investigate whether the language used in newspaper articles affects the speed of technology adoption, focusing on wind and solar photovoltaic energy as an example. While previous literature on technology adoption models have identified various influencing factors (Lai 2017), they have mostly relied on surveys to capture sentiment and have not examined the broader effects that public sentiment or editorial media has on technology adoption speed (Khalid et al. 2021; Qazi et al. 2023).

To address this gap, we employ web scraping and machine learning techniques to analyze a broad database of newspaper articles. These results enable decision-makers to better understand and potentially counteract the impact of sensationalized news and aims to motivate further research leveraging the technical feasibility of news sentiment analysis to accelerate the clean energy transition.

Methods

Previous literature highlight the importance of public sentiment as an influencing factor in technology adoption speed (Lai 2017). However, research applying theoretical concepts like the Technology Adoption Model has not adequately explored this aspect, usually relying on surveys with limited reach (Khalid et al. 2021; Qazi et al. 2023). On the other hand, there are papers that prove the technological feasibility of capturing public sentiment through editorial media using machine learning, but do not connect those insights to better understanding technology adoption speed (Hartmann et al. 2022; Kim et al. 2021; Nuortimo et al. 2018).

This paper contributes to existing literature by bridging the gap between automated sentiment analysis and technology adoption research through leveraging machine learning to capture public sentiment and highlight the influence of news media on the speed of the clean energy transition.

The study employs a three-step process to investigate the relationship between newspaper language and technology adoption speed Firstly, the necessary data on newspaper articles is collected. Secondly, I determine the news sentiment, and finally, use an instrumental variable approach to show causality between newspaper language and technology adoption speed, which is proxied via planned and available wind and solar photovoltaic energy capacity.

Online newspaper articles on solar and wind in the US serve as data basis for the subsequent analysis. These articles are gathered through ethical web scraping, APIs provided by the news outlets and third-party providers (e.g., Nexus Uni), and cover the time span between 2008 and 2022.

The sentiment is determined using an open-source machine learning model. The individual sentiment for each article is aggregated to one value per news outlet and quarter, weighting for factors such as novelty of the news and length of the article. Additionally, an extreme language dictionary is leveraged to analyze for exaggerated wording (Bochkay et al. 2020).

The Deepwater Horizon oil spill accident serves as an instrumental variable, quantified through the number of headlines in leading news outlets. The accident is likely to influence news sentiment, but it did not

trigger discussions of a faster shift to clean energies at the time in the US. Therefore, an unexplained increase in wind and solar photovoltaic capacity after the event indicates a causal relationship between newspaper language and technology adoption speed.

Results

This paper aims to demonstrate the impact of editorial media language, specifically online newspaper articles, on technology adoption speed using wind and solar photovoltaic energy capacity in the US as an example. It shows whether decision-makers are affected by news sentiment, which can either positively or negatively influence technology adoption speed. I further determine how various factors in news media, such as the frequency of negative news articles, extreme language, and levels of controversy within and between news outlets, can affect technology adoption speed.

Conclusions

By increasing understanding of how news media influences the pace wind and solar photovoltaic technology is adopted and by raising awareness with decision-makers about the effects of the news they consume, this study could ultimately accelerate the pace of renewable energy transition.

Moreover, regulations can be considered to increase transparency in editorial media. For instance, news outlets could provide indicators of the depth of research by the journalists and editors involved, as well as links to fact-checking sites, to further increase awareness. Some news outlets have already voluntarily adopted some of these measures.

References

Bochkay, Khrystyna; Hales, Jeffrey; Chava, Sudheer (2020): Hyperbole or Reality? Investor Response to Extreme Language in Earnings Conference Calls. In *The Accounting Review* 95 (2), pp. 31–60. DOI: 10.2308/accr-52507.

Brown, Danielle K.; Harlow, Summer; García-Perdomo, Víctor; Salaverría, Ramón (2018): A new sensation? An international exploration of sensationalism and social media recommendations in online news publications. In *Journalism* 19 (11), pp. 1497–1516. DOI: 10.1177/1464884916683549.

Hartmann, Jochen; Heitmann, Mark; Siebert, Christian; Schamp, Christina (2022): More than a Feeling: Accuracy and Application of Sentiment Analysis. In *International Journal of Research in Marketing*. DOI: 10.1016/j.ijresmar.2022.05.005.

Khalid, Bilal; Urbański, Mariusz; Kowalska-Sudyka, Monika; Wysłocka, Elżbieta; Piontek, Barbara (2021): Evaluating Consumers' Adoption of Renewable Energy. In *Energies* 14 (21), p. 7138. DOI: 10.3390/en14217138.

Kim, Serena Y.; Ganesan, Koushik; Dickens, Princess; Panda, Soumya (2021): Public Sentiment toward Solar Energy—Opinion Mining of Twitter Using a Transformer-Based Language Model. In *Sustainability* 13 (5), p. 2673. DOI: 10.3390/su13052673.

Lai, P. C. (2017): The Literature Review of Technology Adoption Models and Theories for the Novelty Technology. In *JISTEM* 14 (1). DOI: 10.4301/s1807-17752017000100002.

Nuortimo, Kalle; Härkönen, Janne; Karvonen, Erkki (2018): Exploring the global media image of solar power. In *Renewable and Sustainable Energy Reviews* 81, pp. 2806–2811. DOI: 10.1016/j.rser.2017.06.086.

Qazi, Atika; Bhowmik, Chiranjib; Hussain, Fayaz; Yang, Shuiqing; Naseem, Usman; Adebayo, Abayomi-Alli et al. (2023): Analyzing the Public Opinion as a Guide for Renewable-Energy Status in Malaysia: A Case Study. In *IEEE Trans. Eng. Manage.* 70 (2), pp. 371–385. DOI: 10.1109/tem.2020.3046749.