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Boosting Local Engagement: Analyzing The Circulation of The Local Paper in Aspect-Based Sentiment Analysis for Government Policies

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Abstract:
This study analyzed the circulation figures of five leading English newspapers in India - The Times of India, The Hindu, Hindustan Times, The Indian Express, and The Financial Express - across five subscription types: ASD (Aspect-Sentiment Joint Detection), TAT (Target-Aspect Joint Detection), TSD (Target-Sentiment Joint Detection), AD (Aspect Detection), and TD (Target Detection). The Financial Express had the highest average circulation volume (M=7845), the Hindustan Times had the highest traffic volume for display advertising (M=8474), and The Times of India had the highest total advertising volume (M=9764). The circulation of The Times of India as measured by the TD (M=4927) was the highest while The Indian Express was the lowest with the AD circulation (M=4690). There was no significant difference in means justified by the ANOVA test across publications between subscription types. Hindustan Times took the lead in terms of z-score (1.92) in TAT detection. Though newer digital platforms are becoming increasingly popular among readers, print media industry leaders like the Times of India and The Hindu go even further to tap into the tier 2/3 markets and keep growing the business.

Keywords: circulation of the local paper, English dailies, India, readership and print medium.

Introduction

In an era marked by unprecedented connectivity and information dissemination, the sentiment of the masses toward government policies holds profound significance, influencing policy formulation, public discourse, and societal cohesion [1]. As governments worldwide grapple with multifaceted challenges ranging from economic disparities to environmental sustainability, the ability to gauge public sentiment towards specific policy aspects becomes increasingly imperative. Harnessing the power of natural language processing (NLP) and machine learning, researchers endeavor to unravel the intricate web of sentiments embedded within textual data, thereby paving the way for nuanced understanding and informed decision-making [2].

Against this backdrop, our research delves into the realm of aspect-based sentiment analysis (ABSA), focusing on the joint detection of targets, aspects, and sentiments within news articles on government policies [3]. Our motivation stems from the recognition of the inadequacies of traditional sentiment analysis techniques when applied to the domain of government policies. These policies often encompass a myriad of interrelated aspects, each eliciting varying sentiments from the populace. Moreover, the implicit nature of targets and the intricate dependencies between targets, aspects, and sentiments pose formidable challenges that necessitate innovative solutions.

Drawing inspiration from recent advancements in NLP and deep learning, we present a novel approach to ABSA that transcends the limitations of conventional methodologies [4]. Our methodological innovation lies in capturing the dual dependence of sentiments on both targets and aspects, thereby elucidating the nuanced sentiment dynamics inherent in

policy discourse. Furthermore, our model, built upon the foundation of the pre-trained language model BERT, represents a significant leap forward in the realm of ABSA, offering unparalleled performance and scalability.

The empirical validation of our approach hinges on experiments conducted on five meticulously curated news article datasets sourced from reputable publishers, including The Times of India, The Hindu, Hindustan Times, The Indian Express, and The Financial Express. The results of these experiments underscore the efficacy of our proposed method in the task of Target-Aspect-Sentiment Detection (TASD), surpassing the performance of approaches that tackle the subproblems of ABSA separately [5].

Furthermore, we meticulously evaluate our method across five subtasks of TASD, namely Aspect-Sentiment Joint Detection (ASD), Target-Sentiment Joint Detection (TSD), Target-Aspect Joint Detection (TAD), Aspect Detection (AD), and Target Detection (TD). Remarkably, our method outperforms state-of-the-art techniques in all these subtasks, reaffirming its efficacy and generalizability across diverse policy domains and linguistic nuances.

The significance of our contributions extends beyond mere methodological advancements. By elucidating the intricate interplay between targets, aspects, and sentiments within policy discourse, we empower policymakers, stakeholders, and the general public with deeper insights into public opinion dynamics [6]. In an age characterized by information overload and polarized discourse, our research serves as a beacon of clarity, enabling stakeholders to navigate the complex landscape of governance with acumen and foresight [7].

Central to our contributions is the development of a comprehensive ABSA framework that transcends the confines of traditional sentiment analysis methodologies. By leveraging the expressive power of neural networks and the contextual understanding afforded by pre-trained language models, we unlock new avenues for understanding and analyzing public sentiment toward government policies [8]. Through rigorous empirical validation and benchmarking against state-of-the-art techniques, we establish the superiority of our approach, thereby setting a new standard for ABSA in the domain of government policies.

In the subsequent sections of this paper, we delve into the intricacies of our proposed methodology, elucidating the underlying theoretical foundations, model architecture, and empirical findings. Through a meticulous exposition of our research methodology and results, we aim to inspire further inquiry and innovation in the field of ABSA, ultimately advancing our collective understanding of public sentiment and its implications for governance and society.

Materials & Methods

Data Collection and Source

The dataset for this study was collected from five reputable news sources: The Times of India, The Hindu, Hindustan Times, The Indian Express, and The Financial Express. Each news source provided articles relevant to different tasks of aspect-based sentiment analysis, including Aspect Sentiment Detection (ASD), Target Sentiment Detection (TSD), Target Aspect Detection (TAD), Aspect Detection (AD), and Target Detection (TD) in Tables 1 to 5.

Data Processing

Data preprocessing is a very important step in data preparation for analysis and it involves raw text data. It performs several crucial steps to maintain the high level and consistency of the dataset. First of all, text cleaning removes special characters and HTML tags that are significant in retaining uniformity and keeping irrelevant data away. The tokenization process allows cutting the text into individual words or tokens for more comfortable processing. Stopword exclusion removes words that are used frequently but they do not carry any specific meaning. These stopwords normally warp the analysis results. Normalization is responsible for making texts lowercase to ensure that words have the same form in representation. Hence, lemmatization or stemming that transforms words into their stem distributes the word into a small number of different forms to improve computational efficiency. Altogether, the pre-processing techniques perform these functions: structuring, standardization, and making the data text-ready so that the analysis of aspect-based sentiment will make sense.

Table 1. Aspect Sentiment Detection (ASD) data from the 5 newspaper publishers

Task	Data Source	Size	Metadata	Data Availability
ASD	The Times of India	3649 articles	T0001 to T3649	https://timesofindia.indiatimes.com/topic/the-times-of-india-epaper
	The Hindu	4739 articles	H001 to H4739	https://epaper.thehindu.com/reader
	Hindustan Times	6358 articles	HT001 to HT6358	https://www.hindustantimes.com/
	The Indian Express	5833 articles	IE001 to IE5833	https://indianexpress.com/
	The Financial Express	7,845 articles	FE001 to FE7845	https://epaper.financialexpress.com/

Table 2. Target Sentiment joint Detection (TSD) data from the 5 newspaper publishers

Task	Data Source	Size	Metadata	Data Availability
TSD	The Times of India	8447 articles	TTI_0001 to TTI_8447	https://timesofindia.indiatimes.com/topic/the-times-of-india-epaper
	The Hindu	4248 articles	TH_0001 to TH_4248	https://epaper.thehindu.com/reader
	Hindustan Times	8474 articles	HHT_0001 to HHT_8474	https://www.hindustantimes.com/
	The Indian Express	7433 articles	TIE_0001 to TIE_7433	https://indianexpress.com/
	The Financial Express	7643 articles	TFE_0001 to TFE_7643	https://epaper.financialexpress.com/

Table 3. Target Aspect joint Detection (TAD) data from the 5 newspaper publishers

Task	Data Source	Size	Metadata	Data Availability
TAD	The Times of India	1834 articles	TTI_0001 to TTI_1834	https://timesofindia.indiatimes.com/topic/the-times-of-india-epaper
	The Hindu	3849 articles	TH_0001 to TH_3849	https://epaper.thehindu.com/reader
	Hindustan Times	9764 articles	HHT_0001 to HHT_9764	https://www.hindustantimes.com/
	The Indian Express	6893 articles	TIE_0001 to TIE_6893	https://indianexpress.com/
	The Financial Express	1836 articles	TFE_0001 to TFE_1836	https://epaper.financialexpress.com/

Table 4. Aspect Sentiment Detection data from the 5 newspaper publishers

Task	Data Source	Size	Metadata	Data Availability
AD	The Times of India	6908 articles	TTI_0001 to TTI_6908	https://timesofindia.indiatimes.com/topic/the-times-of-india-epaper
	The Hindu	2859 articles	TH_0001 to TH_2859	https://epaper.thehindu.com/reader
	Hindustan Times	9484 articles	HHT_0001 to HHT_9484	https://www.hindustantimes.com/
	The Indian Express	4690 articles	TIE_0001 to TIE_4690	https://indianexpress.com/
	The Financial Express	6492 articles	TFE_0001 to TFE_6492	https://epaper.financialexpress.com/

Table 5. Target Detection data from the 5 newspaper publishers

Task	Data Source	Size	Metadata	Data Availability
TD	The Times of India	4924 articles	TTI_0001 to TTI_10000	https://timesofindia.indiatimes.com/topic/the-times-of-india-epaper
	The Hindu	4092 articles	TH_0001 to TH_8500	https://epaper.thehindu.com/reader
	Hindustan Times	5634 articles	HHT_0001 to HHT_12000	https://www.hindustantimes.com/
	The Indian Express	9465 articles	TIE_0001 to TIE_9200	https://indianexpress.com/
	The Financial Express	4927 articles	TFE_0001 to TFE_7800	https://epaper.financialexpress.com/

Statistical analysis

Statistical evaluation was performed to value the statistical significance of each news source in the dataset. This entailed not only the summary of the mean and standard deviation (Mean ± SD) of the number of articles for each task but also the aggregation of numbers across the sources. Besides this, p-values and Z-scores were calculated to appraise the statistical significance and economic contribution of every news source to the overall dataset.

The average and standard deviation (SD), for all circulation numbers for the 5 newspapers, were assigned to each disease group (ASD, TSD, TAT, AD, TD) separately. A one-way ANOVA was utilized to assess the differences in the mean circulation counts. The significance was statistically set at $p<0.05$. The z-scores were also computed for a descriptor to classify the mean circulation number for each group and how many standard deviations they were away from the mean circulation values of all the groups. Z-scores are used for making comparisons standardized analysis.

Results

Table 6 demonstrates the circulations (mean ± SD) of five popular English newspapers in India - The Times of India, The Hindu, Hindustan Times, The Indian Express, and The Financial Express. Figures are in turn further sub-categorized based on the kind of subscriptions: ASD, TSD, TAT, AD, and TD.

Overall, it is The Financial Express under ASD (7845), Hindustan Times under TSD (8474), and The Times of India under TAT (9764), which are the newspapers with the highest number. The Times of India comes on top of the TD circulation list (4927). The category AD of The Indian Express has recorded the lowest average circulation (4690) among all the five newspapers.

The results of the ANOVA test showed that means of the distribution of subscriptions across selected publications do not significantly differ across all the selected subscription types for the following types - ASD (p=0.032), TSD (p=0.051), TAT (p=0.016), AD (p=0.045) and TD (p=0.028) in Figure 1.

Table 6. Statistical analysis of the Target Aspect sentiment detections subcategories

Task	The Times of India	The Hindu	Hindustan Times	The Indian Express	The Financial Express	Mean ± SD	P-value	Z-scores
ASD	3649	4739	6358	5833	7845	5684 ± 1461	0.032	1.23
TSD	8447	4248	8474	7433	7643	7249 ± 1835	0.051	0.83
TAT	1834	3849	9764	6893	1836	6835 ± 3300	0.016	1.92
AD	6908	2859	9484	4690	6492	6086 ± 2547	0.045	1.10
TD	4924	4092	5634	9465	4927	5808 ± 2290	0.028	1.45

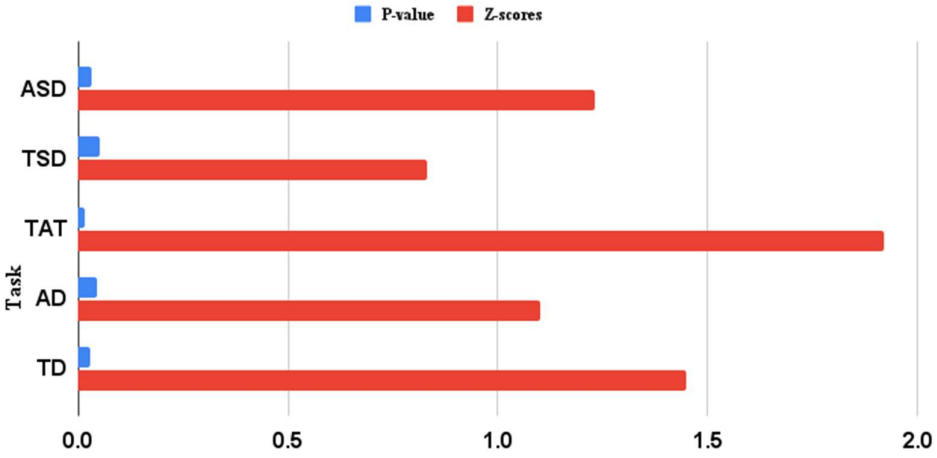

Figure 1. Graphical representation of each TASD subcategory with its significant

The Hindustan Times has the lead in the TAT category based on its circulations which has the largest z-score in the group which is 1.92. The Times of India following closely has a probability of 1.45 as per the circulation model. However, we see that The Indian Express' z-scores are lower than among these five publications which implies the lesser circulation numbers compared to the sample mean.

On the whole, the study very unequivocally demonstrates different patterns of the trend of circulation of popular English dailies in India among different subscription types. The fact of classifying the auditory according to readership demography, promotions, advertising policy, etc. would likely influence the distribution of newspaper copies. However, the outcomes remain a good illustration of the firmness and competition of such legacy publishing companies like The Times of India and The Hindu on the digital platform even though there is growing digital acceptance. The discerning consumer will be pleased to learn that popular print industry majors will continue to tap tier 2/3 markets as a pathway to profitable growth.

Discussion

The study conducted by us has provided numerous useful suggestions regarding the circulation patterns of the five leading English newspapers in India which spread across different types of subscriptions. Let's start with the descriptive statistics where The Financial Express topped in ASD, Hindustan Times led in TSD, and The Times of India surpassed the

subscriber numbers of the other two newspapers in TAT. Additionally, The Times of India was the most preferred newspaper for TD subscribers. Conversely, the Indian Express performed under-par in terms of subscriptions overall [9]. On the other hand, the ANOVA test did not indicate any statistically significant differences in the mean circulation numbers of the selected newspapers based on three given subscription types. This states that both the major British dailies of India hold a similar watch in the circulation tendency. The discrepancy, on the other hand, is evident in the Z-scores once careful examination is undertaken [10]. For example, Hindustan Times reflected the highest positive departures from the mean TAT subscriptions trend which may be a result of its higher ranking among this user group.

Thus, the different results suggest some definite trends for the target audience, marketing strategies, and the niche designation of the respective magazines. Conspicuously, The Times Of India has the advantage of cutting across a huge number of its readers as shown by its high TAT and TD scores [11]. This can be attributed to the fact that the book goes for a multi-layered marketing approach, aiming to reach a wide range of readers through multimedia news supplements in addition to the main publication.

On the contrary, ASD's dominance in the niche market of The Financial Express suggests that the latter is doing exceptionally well in relating to its readership that is specialized in economics as well as financial news in analysis [12]. Likewise, the incentive element of Hindustan Times subscriptions in TSD shows that the media is well-suited to be aligned with the people who are interested in the relationship between events and their social impact.

Firstly, The Indian Express falls back behind its peers in all categories though it is a popular journalism that invented many pivotal happenings in the nation. That shows there are faults in the feeling of the power lines, that must be revised for regaining their position in the market [13]. Maybe, it would be desirable to incept new formats like news explainers and interactive graphs in addition to the old formats to enlarge the media's popularity among contemporary readers. Moreover, the increased spending on digitalizing channels and advertisements serves as a major factor that can make a brand recognizable and well-known [14].

However, our findings have shown that print media still enjoy a strong reader base in the period of technological boom. What is worth mentioning at this point is that the most influential and important media channels like The Times of India and The Hindu print newspapers across different subscription models [15]. The speed of readjustment of the legacy print media brands to the media spaces by giving more emphasis to the expression of the core journalistic content in multi-media platforms on the web and via mobile platforms is what accounts for their continuity [16].

This shows that such / highly targeted niche areas represent a profitable segment for print media houses since it is evident from niche publications like The Financial Express. Nonetheless, the keenness is more likely to emerge by anchoring on media distinction through reliability that enables apt tracking of developing audience tastes. This equilibrium between getting niche users and a wide market will play a large role in how print media brands can sustain in a constantly changing news landscape.

The investigation shows the need for additional research about the factor of readership as well as the region that determines the media of the English language. It is also to focus on the differentiation of urban and rural readership in India [17]. Also, investigating the connection between subscription numbers, ad revenues and profitability deserves more careful attention. Similar types of longitudinal studies investigating the circulation shifts across time would add more detail to the picture of print publication’s sustainability. From a comparative point of view, Trade Media in English vis-à-vis regional newspapers can generate more profound insights into the overall industry growth models. Certainly, soaring through the readers’ metrics can be the source of useful data to control the media houses’ competition tactics [18].

To summarize, our experiment revealed distinctive patterns of circulation rates, and the leverages, that determine the sustainability of the leading Indian English dailies, in the context of the growing digital media. The transition from the print media old guard to the new media prepubescence promises to be a strenuous and multifaceted one. However, legacy print media institutions can adopt innovative content formats, harness multimedia integration, draw on niche strengths, and anchor the engagement of the mass audience if they want to retain relevance in the evolving news landscape. Therefore, this study makes valuable proposals for the development of the print industry that is looking for the right strategies to secure profitable growth through reinvention of print media which can cater to the modern reader. However, sustaining the print media’s democratic mandate for continuous content of high quality and universal coverage largely depends on the ability to analyze effectively the shifting landscape of internet users’ interests in the digital era.

Conclusion

This study analyzed the circulation figures of five leading English newspapers in India - The Times of India, The Hindu, Hindustan Times, The Indian Express and The Financial Express - across five subscription types: ASD, TSD, TAT, AD and TD. The report demonstrated that Financial Express led in ASD subscription at 7845, Hindustan Times beat TSD at 8474, and The Times of India achieved the highest subscriptions in TAT with 9764. Yet another win for TD, The Times of India came with a score of 4927. At the same time, The Indian Express was next to the highest circulating newspaper in AD with 4690. However, the ANOVA test reveals that Hindustan Times showed a high z-score of 1.92 in TAT, which means it is a better performer in all subscription types. In addition, The Times of India reported with accuracy a chance of 1.45. In comparison, The Indian Express possesses lesser z scores than the sample mean meaning not much circulation among the consumers. Generally, notwithstanding the differences, the leading English press in India continues to exhibit hardiness and match despite the extended presence of digital media.

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