Research and Application of Media Evaluation Technology Based on Propagation Analysis (Postprint)

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Abstract

This study leverages technical methodologies such as big data and artificial intelligence, closely aligning with the evaluation requirements of news media in the new media era, to establish a news communication index system. Through monitoring, tracking, and analyzing news, it investigates the communication behaviors of news, with particular emphasis on questions such as who is viewing and who is sharing the news. Via objective and rigorous computational models for communication influence, it enables automatic monitoring, tracking, analysis, and evaluation of multi-dimensional entities including news, media, journalists, and regions. The system provides support for operations such as media influence assessment, performance evaluation, and topic selection planning. The news communication index system has been successfully deployed in the evaluation of media organizations including Science and Technology Daily, yielding excellent practical results.

Full Text

Research and Application of Media Evaluation Technology Based on Communication Analysis

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Abstract: This paper leverages big data and artificial intelligence technologies to establish a news communication index system that aligns closely with evaluation requirements for news media in the new media era. Through monitoring, tracking, and analyzing news dissemination, the system examines communication behaviors with particular focus on identifying who is viewing and sharing news content. By employing objective and rigorous computational models

for communication impact, the system enables automatic monitoring, tracking, analysis, and evaluation of multi-dimensional objects including individual news items, media outlets, journalists, and geographic regions. This provides support for media influence assessment, performance evaluation, and topic selection planning. The news communication index system has been successfully implemented in evaluations at Science and Technology Daily and other media organizations, demonstrating excellent practical results.

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With the rapid development of the Internet, information technology has driven media transformation, ushering in the new media era that has fundamentally changed news communication patterns. Contemporary news dissemination is characterized by accelerated transmission speed, massive content volume, diversified communication subjects, and varied communication formats. News communication has become more popularized, diversified, and globalized, with enhanced interactivity between media and the public, making online communication the primary channel. Critical challenges facing all media organizations include how to rapidly quantify news dissemination power, objectively assess media influence across diverse channels, understand professional journalists' impact, evaluate media transformation effectiveness, and identify the content that most interests and engages audiences.

To address these challenges, this research employs big data and artificial intelligence technologies to establish a news communication index system that aligns with new media era evaluation requirements. Through objective and rigorous communication impact calculation models, the system enables automatic monitoring, tracking, analysis, and evaluation of multi-dimensional objects including news items, media outlets, journalists, and regions, thereby supporting media influence assessment, performance evaluation, and topic selection planning.

The system architecture comprises infrastructure, platform, tool, software system, and application layers, as shown in [Figure 1: see original paper]. The infrastructure layer consists of servers, storage, backup systems, networks, virtualization, and security equipment. The platform layer includes operating systems, databases, application middleware, development environments, and common components. The tool layer encompasses crawler engines, search engines, computing engines, and analysis engines. The software system layer comprises information source collection, source tracking and processing, and communica-

tion analysis modules. The application layer features an executive dashboard, index queries, journalist rankings, regional analysis, and trend analysis.

[Figure 1: see original paper] News Communication Index System Architecture Diagram

1. Composition of the News Communication Index System

The news communication index system specifically includes three subsystems: information source collection, source tracking and processing, and communication analysis. To analyze and evaluate news media dissemination, the system first employs monitoring technology to promptly identify news items requiring evaluation—this is source discovery. After discovering sources, the system conducts full-cycle tracking throughout the evaluation period, recording and analyzing dissemination behaviors including republication and readership statistics —this constitutes source tracking and processing. By comprehensively considering multi-dimensional communication factors related to news, media, journalists, and regions, the system designs a news communication evaluation index system and establishes a computational model to calculate communication indices for all evaluation objects, media composite indices, and journalist influence indices within the evaluation period, enabling comprehensive assessment of news, media, journalists, and regions.

1.1 Information Source Collection Subsystem

An information source is an entity that generates various types of information, including text sources, image sources, digital sources, etc. The information dissemination process can be simply described as: source → channel → destination, where "source" is the information publisher (uploader), "destination" is the information receiver (end user), and "channel" is the transmission pathway. In this system, the information source represents the object of communication analysis, which can be either a news item or a media outlet or journalist requiring evaluation. Therefore, both news items and the media publishing them can be considered sources, as can the journalists who upload information.

Source discovery is a critical component of the news communication index system, as timely identification significantly impacts evaluation quality. The system employs information detection crawler technology through the source collection subsystem illustrated in [Figure 2: see original paper] to achieve prompt source identification. By configuring sources for evaluation objects and parsing news titles, content, and other information, the system can automatically detect source updates in real-time, capture data, and incorporate them into the evaluation pool for communication behavior analysis.

[Figure 2: see original paper] Information Source Collection Subsystem Flowchart

1.2 Information Source Tracking and Processing Subsystem

Source tracking and processing represents the system' s core challenge. For identified evaluation objects, the system employs key feature comparison (such as article titles, content, authors, and publication times) and similarity analysis to lock onto target objects. It then conducts full-cycle tracking throughout the evaluation period, recording dissemination behaviors and storing relevant information in the database, as shown in [Figure 3: see original paper]. After discovering sources, the system tracks them promptly to identify republication and readership statistics, as well as source attribute information.

[Figure 3: see original paper] Information Source Tracking and Processing Subsystem Flowchart

The information source tracking and processing subsystem comprises four subprocesses: source discovery, source tracking, source analysis, and data statistics.

Source Discovery Sub-process: Through automatic scanning technology, the system promptly identifies and crawls evaluation source data, incorporating evaluation objects into the analysis database.

Source Tracking Sub-process: The system conducts full-cycle tracking of evaluation objects within the specified period. Through feature extraction, it parses article titles, content, authors, publication times, and other key information, records dissemination behaviors, and stores relevant data in the database. The system searches the entire network and precisely tracks source dissemination trajectories through similarity analysis.

Source Analysis Sub-process: The system analyzes the dissemination behaviors of tracked objects, focusing on click and republication statistics during the evaluation period. It calculates page views based on PV and UV metrics, and counts republications across media tiers according to the media database settings, recording republication addresses.

Data Statistics Sub-process: Statistics are compiled across multiple dimensions including article, author, media, and region, using customized algorithms.

1.3 Communication Analysis System

News communication analysis focuses on critical questions such as who is viewing and sharing news, recognizing that different media outlets have varying impact factors for republication. Following analysis of news communication behaviors, we have designed an evaluation index system and established a news communication index evaluation model. Through comprehensive calculation, the system computes communication indices for all evaluation objects, media composite indices, and journalist influence indices within the evaluation period, enabling multi-dimensional assessment of news, media, journalists, and regions.

Big data technology provides the foundation for communication effect evaluation, enabling scientific and objective construction of evaluation index systems

based on massive dissemination data. Drawing upon relevant research experience and theoretical models, and considering the operability and objectivity of source data acquisition, this system explores an objective, scientific, and standardized optimization method for communication power assessment index systems. Through continuous refinement based on data testing, the system achieves ongoing optimization of evaluation results through index item revision and weight adjustment.

Graham Williamson defines communication capacity as the ability of communicators and audiences to successfully encode and decode information, emphasizing "communication capability."Therefore, audience factors are comprehensively considered in building the evaluation index system through multi-dimensional assessment. Index selection primarily follows five principles: relevance, importance, comprehensiveness, objectivity, and operability, employing quantifiable data indicators for evaluation. Relevance measures the correlation between evaluation indices and communication power, eliminating irrelevant indicators. Importance measures the degree of influence indicators exert on communication power, eliminating factors with minimal impact (such as user comment volume, which is manually screened before publication and, while somewhat relevant to influence, lacks importance and is therefore excluded from the index system). Comprehensiveness measures the richness of evaluation index factors, ensuring maximum perspective coverage within operational constraints. Objectivity requires that evaluation factors remain free from subjective judgment, relying solely on objective data to ensure operational feasibility and scientific objectivity when assessing large-scale samples.

The news communication index evaluation model is based on principles of openness, professionalism, and authority, striving to be "scientific, reasonable, objective, and fair," with continuous dynamic iteration and optimization to enhance model authority and professionalism. The evaluation model features "four comprehensives" : First, it adds network-wide communication power as a crucial evaluation metric. Second, it enables assessment of all production formats, including text, images, video, and audio. Third, it achieves evaluation of all production personnel, including not only internal editorial staff but also external journalists such as correspondents and contributors. Fourth, it allows customization of media tiers and types, comprehensively considering the influence of news, media, and journalists, with autonomous definition of index weights, enabling full-dimensional evaluation of production elements.

The news communication index evaluation model is:

$$\text{Communication Index} = a \times \text{Clicks} + b \times \text{Republications}$$

where a and b are analysis coefficients.

Clicks: Represent normalized precise click counts on news items across media channels, with duplicate clicks removed.

Republications: Represent normalized republication counts across all media, calculated according to media weights.

Republications are calculated as:

$$\text{Republications} = \sum_{i=1}^{n} b_i \times \text{Rep}_i$$

where Rep_i represents republication counts across different media tiers, and b_i represents corresponding analysis coefficients for each tier.

Media tiers are classified according to influence and importance. For example, Tier 1 media comprises central mainstream media with significant influence, accounting for $b_1\%$; Tier 2 media includes regional and specialized domain media, accounting for $b_2\%$; and so forth. Specific tier quantities, media outlet names, and weight percentages can be customized according to each media organization' s actual circumstances. The normalized weight vector of the judgment matrix is calculated using the geometric mean method.

2. Application of the News Communication Index System

The system has been implemented at Science and Technology Daily and Workers' Daily, serving as an important basis for news performance evaluation. It provides decision support for topic selection planning by analyzing content for each news item, tracking dissemination paths and effects, and identifying themes and reading preferences of greatest interest to users. The system offers demonstration and promotional value across the media industry, as it can be adapted for different media outlets through parameter modifications alone.

The news communication index system has transformed the subjective nature of manual evaluation at Science and Technology Daily, significantly improving evaluation efficiency and objectivity while reducing human subjectivity and evaluation costs. It has received high recognition from Science and Technology Daily and has been formally adopted as the newspaper' s news evaluation standard and performance assessment basis. Furthermore, data analysis through communication indices provides decision-making support for news topic selection planning, demonstrating substantial practical value.

The system enables multi-dimensional objective evaluation of news, journalists, media, and regions. User demand-oriented and data-driven, it achieves fully automated news tracking and analysis, generating communication indices automatically. By constructing an intelligent communication influence evaluation system that automatically discovers, tracks, calculates indices, and generates evaluation charts and reports without human intervention, the system produces regional communication index statistics as shown in [Figure 4: see original paper].

From a macro perspective, the system conducts comprehensive analysis of media communication power, forming media composite communication indices to inform media development strategies. [Figure 5: see original paper] illustrates trend charts of media communication indices over time.

The system also analyzes the communication power of each article published by individual journalists, serving as an important reference for KPI assessment by establishing independent publication and evaluation databases for each journalist.

[Figure 4: see original paper] Regional Communication Index Statistical Chart

[Figure 5: see original paper] Communication Index Trend Chart

References

[1] Zeng Wenxi. Analysis of Characteristics and Development Trends of News Communication in the New Media Era[J]. Media Forum, 2021(22):52-53.

[2] Graham Williamson. Communication Capacity[I/OL]. (2011-04-04). http://www.speech-therapy-information-and-resources.com.

[3] Xiang Anling, Shen Yang. Optimization Method Research on WeChat Official Account Communication Power Evaluation Index System (WCI)[J]. Global Media Journal, 2019(2):170-182.

[4] Li Mingde, Gao Ru. Research on Media WeChat Official Account Communication Power Evaluation—Based on Examination of 20 Shaanxi Media WeChat Official Accounts[J]. Journal of Intelligence, 2015(7):141-147.

Author Biography

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Note: Figure translations are in progress. See original paper for figures.