

Pathways to Achieving Targeted Communication in the Media through the Integration of Big Data and Artificial Intelligence

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Abstract: The production logic and distribution paradigms of the media industry are being reshaped by the deep integration of big data and artificial intelligence technologies, whilst the ‘blanket push’ model of communication is systematically evolving towards ‘precision targeting’. However, the essence of precision communication lies not merely in upgrading technical tools; rather, it involves the intelligent re-engineering of the entire value chain—from content production and channel distribution to user engagement and performance feedback—using data as a production factor and algorithms as the decision-making hub. Current practices in targeted communication within the media sector continue to face deep-seated contradictions, such as data silos fragmenting user profiles, algorithmic echo chambers eroding public value, over-reliance on technology weakening content creativity, and unclear privacy boundaries causing a crisis of trust. Consequently, this paper outlines a pathway to achieving precision communication across four dimensions: establishing a data foundation, adapting content production, coordinating distribution across all scenarios, and implementing closed-loop performance iteration. It also provides directions for optimization in terms of value realignment and ethical regulation, with the aim of promoting a balance between technological rationality and humanistic values to achieve high-quality development in precision communication within the media sector.

Keywords: Big data; Artificial intelligence; Communication

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1. The underlying logic of how the integration of big data and artificial intelligence empowers targeted communication in the media

1.1. Comprehensive data monitoring: achieving a panoramic portrayal of the target audience

The core value of big data technology lies in breaking down the information asymmetry between content providers and audiences. Traditional audience research relies on methods such as sample surveys and

focus groups; however, these have limited sample sizes and single-dimensional data, making it difficult to accurately reflect users' actual media consumption habits and content preferences. In a smart media environment, however, every click, view, comment, share, dwell time, and even scroll speed and exit points are recorded as data, forming vast and multi-dimensional datasets of user behavior.

After undergoing data cleansing, anonymization and feature extraction, these multi-source, heterogeneous data can be transformed into a computable system of user tags. Compared to traditional demographic tags, user profiles that integrate behavioral data, contextual data and social relationship data offer greater dynamism and granularity. Clustering algorithms and association rule algorithms in artificial intelligence can segment and stratify vast numbers of users, identifying differences in content preferences across different groups and even uncovering latent needs that users themselves have not yet clearly recognized, thereby providing a refined foundation of audience understanding for targeted communication ^[1].

1.2. Iteration of intelligent algorithms: driving the adaptive optimization of dissemination decisions

If big data is likened to the 'raw material' for targeted communication, then artificial intelligence is the 'brain' responsible for 'processing and decision-making'. In the early days, targeted distribution relied primarily on rule-based matching and simple collaborative filtering algorithms; their decision-making logic was fixed and inflexible, making them poorly equipped to adapt to shifts in user interests. However, as technologies such as deep learning and reinforcement learning have matured, intelligent recommendation algorithms have gained the ability to learn autonomously and optimize dynamically.

Deep neural networks can automatically extract higher-order features from vast amounts of user behavior data, thereby capturing the complex and non-linear relationships between user interests, which in turn significantly improves the accuracy of content recommendations. Reinforcement learning algorithms treat metrics such as long-term user retention and interaction depth as reward functions, continuously refining distribution strategies through ongoing interaction with users to achieve the adaptive evolution of communication decisions. This intelligent decision-making no longer relies on manually defined dissemination plans, but instead dynamically adjusts aspects such as content combinations, push timing, and channel selection based on real-time data, ensuring that the dissemination process is constantly converging towards the optimal solution.

1.3. Adaptation for immersive experiences: Building end-to-end collaboration to create a closed-loop communication system

The integration of big data and artificial intelligence has driven targeted communication to evolve from a single-point matching model—where 'content finds the audience'—to a three-dimensional matching model involving 'content, user and context'. The effectiveness of communication is not only determined by the degree to which content aligns with users' interests, but is also significantly influenced by the context in which it is received. The same user's content needs and receptiveness vary significantly during commuting, working and leisure periods, whilst content consumption habits also differ markedly across various devices such as mobile phones, large screens and outdoor displays.

By utilizing location-based services (LBS) data, device identification data and temporal data, intelligent systems can perceive the physical and media contexts in which users find themselves, and integrate user profiling to deliver context-specific content. Simultaneously, behavioral feedback generated by users upon

receiving relevant content is immediately fed back into the data hub, thereby informing the iteration and optimization of algorithmic models. This ultimately establishes a complete end-to-end closed-loop system comprising “data input – algorithmic decision-making – context-based distribution – performance feedback – model optimisation”—a complete, end-to-end closed-loop system. This closed-loop mechanism transforms targeted communication into a continuously evolving dynamic system, rather than a one-off communication action.

2. Deep-seated contradictions and practical obstacles in current media practices regarding targeted communication

2.1. Limited data dimensions and the ‘data silo’ effect hamper the accuracy of profiling

Accurate communication requires a comprehensive and accurate user profile; however, the data collection capabilities of most media organizations are currently limited to their own platforms, meaning they can only obtain behavioral data relating to users’ interactions within a single product, and are unable to capture users’ media engagement patterns across the entire internet. This narrow scope of data leads to user profiles suffering from a ‘blind men and an elephant’ bias, with algorithms forced to make inferences based on partial data, which can easily result in over-generalized interest tags and homogenized content recommendations ^[2].

At the same time, the phenomenon of data silos within the industry remains prominent. Strict data barriers exist between different media platforms and internet ecosystems, making it difficult to circulate and share user data in a lawful and compliant manner. However, technologies such as privacy-preserving computing offer solutions for the secure sharing of data; cross-platform data collaboration mechanisms have not yet been widely established due to constraints relating to technical costs, commercial interests, and compliance risks. The fragmentation of data resources directly limits the comprehensiveness and accuracy of user profiling, constituting the primary bottleneck hindering improvements in the effectiveness of targeted communication.

2.2. The alienation of algorithmic logic and the obscuring of value: The erosion of public sphere communication

Most mainstream intelligent recommendation algorithms currently treat commercial metrics such as click-through rates, dwell time, and user retention as core optimization targets. Such technical logic naturally tends to pander to social trends by pushing content that caters to users’ superficial interests and sensory stimulation. Under the repeated reinforcement of these algorithms, users are highly susceptible to falling into ‘information silos’, where their horizons become increasingly narrow, and their perceptions become increasingly entrenched. For media organizations, an excessive focus on the precise distribution of traffic metrics risks marginalizing serious content, public information and diverse viewpoints, thereby eroding the media’s public service role and its function of social integration.

What is even more cause for concern is that the ‘black-box’ nature of algorithms results in a lack of transparency and explainability in the decision-making process regarding content dissemination. Why do users receive certain types of content? What exactly are the weightings on which the algorithms are based? And where exactly are the boundaries of human intervention? This crucial information often remains unknown. Such opacity not only infringes upon users’ right to know, but also facilitates the uncontrolled spread of content with skewed value orientations within the algorithmic system, leading to an imbalance in the public opinion ecosystem.

2.3. Technological path dependence and a mismatch in creative capacity are undermining content quality

The tendency towards a ‘technological cult’ in targeted communication is fostering a misguided industry trend of ‘prioritizing distribution over content’. Some media organizations are channeling their primary resources into building algorithmic systems and managing traffic, whilst investment in and attention to content production remain markedly insufficient. This has led to the erroneous perception that ‘algorithms take precedence, with content playing a secondary role’. In reality, distribution technology is merely a means of enhancing communication efficiency, whereas high-quality content is the true key to achieving targeted communication. Without a supply of high-quality content, even the most precise distribution amounts to nothing more than inefficient—or even ineffective—information noise.

At the same time, whilst the widespread adoption of AIGC technology has improved content production efficiency, it has also led to issues of homogenization and superficiality in content. A vast amount of template-based content, generated in bulk by algorithms, lacks intellectual depth and human warmth, making it difficult to achieve genuine communicative impact. The mechanism for human-machine collaborative content production remains immature, and the tool-based value of artificial intelligence has not been deeply integrated with the creators’ intrinsic creativity, resulting in a structural mismatch between content output capacity and quality requirements.

2.4. Blurred ethical boundaries and the erosion of privacy undermine trust in the industry

Targeted advertising is built upon the in-depth analysis of user data, and issues regarding the ethical boundaries of data collection and use have always been closely intertwined with it. Some platforms engage in the excessive collection of user data beyond what is necessary to provide their services in order to improve the accuracy of user profiling; certain sensitive personal data is used for commercial advertising without the user’s knowledge, seriously infringing upon users’ right to privacy.

Furthermore, targeted marketing based on user profiling can easily degenerate into ‘big data price discrimination’ and emotional manipulation, as algorithms exploit insights into users’ personalities, spending power and psychological vulnerabilities to implement differential pricing and targeted persuasion, thereby transforming technological advantages into undue control over users. Such practices have consistently eroded users’ trust in the media industry; once the foundation of that trust collapses, targeted communication will enter a vicious cycle of user resistance and data depletion.

3. Pathways to achieving targeted communication in the media through the integration of big data and artificial intelligence

3.1. Building a comprehensive data governance platform to lay a solid data foundation for targeted communication

Data is the core production factor in targeted communication, and a high-quality data governance system is the fundamental infrastructure for achieving it. Media organizations should break down internal data silos and establish a unified data middle platform to standardize and integrate content, user, operational and channel data, thereby forming a comprehensive data asset pool. On this basis, a scientific tagging system should be established to create multi-tiered and categorized user tags across multiple dimensions—including

demographic attributes, behavioral characteristics, interests and preferences, spending potential and social relationships—thereby achieving a finer granularity in user profiling^[3].

To address the issue of cross-platform data silos, we should actively explore data collaboration models based on privacy-preserving computing. Through technical approaches such as federated learning and multi-party secure computation, we can achieve cross-organizational joint modeling and feature sharing without exchanging raw data or compromising user privacy. This collaborative model, in which data is ‘usable but not visible’, not only enriches the data dimensions of user profiling but also safeguards the fundamental principles of data security and privacy protection. At the same time, a full-lifecycle data security management system should be established, clearly defining compliance standards for each stage of data collection, storage, processing and use, to ensure that data governance operates within the framework of the rule of law.

3.2. Refining the human-machine collaborative content production mechanism to enhance the relevance of content supply

The ‘precision’ in targeted communication ultimately lies in achieving a precise match between content and its intended audience, rather than merely ensuring precise reach in terms of traffic. We must abandon the misguided approach of ‘prioritizing distribution over content’ and deeply integrate intelligent technologies into the content production process to establish an intelligent content production system characterized by ‘human-machine collaboration with creativity at its core’. Firstly, by leveraging the efficiency advantages of artificial intelligence in information integration, source material processing and standardized content generation, creators can be freed from repetitive, basic tasks to focus on key aspects such as creative planning, in-depth investigation and value extraction. Secondly, the central role of human professionals must be reinforced, with specialist editors and journalists overseeing the content’s value orientation, fact-checking and quality standards, thereby preventing the distortion of content caused by algorithmic production.

At the same time, we are driving forward structural and modular reforms in content development, establishing a refined content tagging system that breaks down complete content products into components of varying granularity. By utilising algorithms to dynamically recombine these components based on user profiles and contextual needs, we achieve ‘single-source collection, multi-format generation and precise adaptation’. Content versions of varying depth and stylistic expression are generated to cater to the cognitive characteristics and reading habits of different user groups, ensuring that high-quality content reaches its target audience most appropriately and truly achieves a harmonious alignment between content value and user needs.

3.3. Optimizing intelligent distribution strategies across all scenarios to achieve precise temporal and spatial targeting

The distribution stage is the core hub of targeted communication; it is therefore advisable to establish an intelligent distribution system covering all channels, all devices and all scenarios in order to overcome the limitations of communication confined to a single platform or channel. The first step is to establish a unified user identification system that spans screens and devices, integrating user data across different devices—such as mobile phones, tablets, televisions and outdoor media—to achieve unified user authentication and continuous tracking of behavioral data. Based on a unified user profile, coordinate distribution across multiple devices to create a synergistic effect that enhances both the frequency and depth of information reach^[4]. Secondly, we must strengthen our ability to deliver content tailored to specific contexts and

incorporate temporal, spatial and social dimensions into our algorithmic decision-making system. By taking into account users' daily routines, geographical location and current status, we can push appropriate content at the right time and in the right context—for example, delivering concise news summaries during the morning commute, in-depth content and video programs during evening leisure time, and authoritative, real-time updates as soon as major events unfold. By precisely matching content to users' receptiveness across temporal and spatial dimensions, content engagement and conversion rates will be significantly enhanced. Furthermore, we must recognize the value of social networks in targeted communication. By utilizing artificial intelligence to analyze the structure of users' social networks and their spheres of influence, and to identify key opinion leaders, we can design dissemination mechanisms suited to social virality. Through the dual drivers of 'algorithmic recommendations' and 'social diffusion', we can achieve an organic integration of targeted outreach and word-of-mouth dissemination, thereby expanding the reach and social impact of targeted communication.

3.4. Establish a dynamic effectiveness evaluation system to create a closed-loop feedback mechanism for iterative communication

Precision communication is a dynamic process of continuous optimization, and a scientific effectiveness evaluation system is key to achieving this closed-loop iteration. We should move beyond traditional, single-dimensional evaluation criteria—centered on click-through rates and readership figures—and construct a wholly new system of communication effectiveness metrics. This system must be multidimensional and cover the entire cycle; in addition to process-oriented indicators such as impressions, click-through rates, completion rates and engagement rates, it must also incorporate deeper-level effectiveness indicators such as increased awareness, shifts in attitude and behavioral conversion, thereby comprehensively measuring the actual value of targeted communication ^[5].

By utilizing attribution analysis algorithms to attribute the effectiveness of multi-channel, multi-touchpoint campaigns scientifically, we clarify the actual contribution of different campaign stages and channel touchpoints, thereby preventing one-dimensional and biased assessments. We have established a real-time monitoring and dynamic optimization mechanism, enabling immediate tracking of campaign performance via data dashboards. Should any data anomalies or performance deviations arise, the algorithmic system can autonomously adjust distribution strategies, whilst operations staff may also intervene manually to make corrections.

At the same time, a proactive user feedback collection mechanism is established. Through diverse methods such as intelligent questionnaires, semantic analysis of comments, and user interviews, subjective evaluations regarding content quality, recommendation accuracy and privacy perceptions are gathered. These subjective user experiences are treated as key inputs for algorithm optimization. By cross-validating objective data with subjective feedback, the direction of communication is continuously refined, ensuring that targeted communication consistently aligns with users' genuine needs.

Disclosure statement

The author declares no conflict of interest.

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