Analysis of New Media Diffusion Patterns from a Technical Perspective: The Resonance Model and Postprint Validation

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Abstract

For the rise of new media, "diffusion of innovations" and "uses and gratifications" are the most widely adopted explanatory theories. However, these theories also have their limitations when confronted with today' s new media development. Building upon the diffusion of innovations theory, this paper proposes a resonance model for new media diffusion, which employs the resonance effect formed by the operational laws of new media itself, its socio-cultural environment, and technical conditions to explain phenomena in new media development. On the basis of this model, it attempts to analyze the influencing factors of this resonance and their mechanisms of action.

Full Text

A Technological Perspective on New Media Diffusion Patterns: The Resonance Model and Its Validation

Abstract: The diffusion of innovations theory and the uses and gratifications approach represent the most widely adopted explanatory frameworks for the rise of new media. However, these theories exhibit limitations when confronted with contemporary new media developments. Building upon diffusion of innovations theory, this paper proposes a resonance model of new media diffusion, which explains phenomena in new media development through the resonant effects formed by the interplay of new media' s operational logic, sociocultural environment, and technological conditions. Based on this model, the paper attempts to analyze the influencing factors of this resonance and their modes of operation.

Keywords: New media; Resonance; Innovation diffusion; Technological perspective

In recent years, new media development has exhibited several novel characteristics. First, new media categories continue to emerge in endless variety, becoming increasingly segmented. Second, the time cycle from emergence to large-scale adoption has grown progressively shorter. Third, new media promotion has become increasingly intertwined with social networks, which have become the primary channel for dissemination. Fourth, new media increasingly emphasize their technological identity, both in external communications and in product design and organizational structure. Whereas content previously occupied a dominant position in media management architectures (including both new and traditional media), technology now commands significantly greater authority, even becoming the dominant force.

In product terms, these changes have rendered "rigid demand" and "stickiness" as everyday metrics for evaluating whether new products can win user favor. Consequently, when conceptualizing new media as an "innovation" and defining its advantages, the complexity far exceeds what can be captured by a single technology or product. Katz (1974), in *The Uses of Mass Communications*, summarized media contact behavior as a causal chain process of "social factors + psychological factors → media expectations → media contact → need satisfaction," thereby establishing the basic model of uses and gratifications theory. This approach proceeds from the user and individual perspective, positing an active audience. However, this "activeness" is contextualized within effects research rather than media selection contexts. Consequently, audience research influenced by behaviorist psychology traditions often examines media contact behavior in isolation from media production processes and social systems, failing to comprehensively reveal the social relationships between audiences and media.

1. Literature Review

Regarding how a new medium becomes recognized by users and ultimately achieves large-scale application, diffusion of innovations and uses and gratifications represent the two most frequently employed theories. An innovation diffusion process comprises four fundamental elements: innovation, communication channels, time, and social systems. For Rogers (1995), innovation could be a new idea, practice, or object. This "newness" does not require objective novelty or creativity; what matters is that individuals or units adopting the innovation perceive it as novel. This definition of "innovation" appears well-suited for understanding new media today.

When explaining the composition of innovation characteristics—which determine adoption rates—Rogers identified the most crucial component as "relative advantage," or the degree to which an innovation is perceived as better than what it replaces. This does not require objective superiority; what matters is that individuals perceive the innovation as advantageous. In new media diffusion, how should we define this advantage? Typically, analysis proceeds from technical, cultural, and economic dimensions to examine the various benefits a new medium offers. These characteristics have been operationalized as the richness

of interactive experience, ease of use, and product acquisition cost.

Without new exogenous forces (or oscillators), and if the intensity of such forces cannot offset the diminishing marginal returns in the relentless iteration of new media, then—from the perspective of either the new media lifecycle or innovation diffusion curves—eventual attenuation and demise become inevitable. These external forces manifest as influences from the natural, cultural, and social environments in which new media operate, corresponding to the "social system" in Rogers' (1995) four basic elements of innovation diffusion. The author operationalizes these forces as communication environment fit, marginal benefits of new media use, and target population scale.

These external forces persist continuously, but transforming them into energy absorbable by new media requires technological mediation and catalysis. When diffusion of innovations theory analyzes how innovation characteristics affect diffusion speed and patterns, complexity, trialability, and observability constitute important features. Complexity refers to the degree to which an innovation is perceived as difficult to understand and use; trialability denotes the degree to which an innovation can be experimented with on a limited basis; and observability signifies the degree to which innovation results are visible to others. With new media development, these characteristics increasingly depend on technological drivers for their manifestation. The author operationalizes them as technological richness and technological acceptance.

2. The Resonance Model of New Media Diffusion

Like any product category, new media as a product possesses a lifecycle, with inherent patterns governing its emergence, development, popularization, and decline. In diffusion of innovations theory, time represents a crucial element that influences both diffusion speed and patterns. Diffusion speed refers to the time required for a certain proportion of members in a social system to adopt an innovation, while diffusion pattern refers to the process of cumulative adoption proportions changing over time—the ultimate manifestation being the diffusion curve. Innovations inevitably enter a decline phase, which represents a natural phenomenon. Causes of innovation decline include intangible wear, tangible wear, and artificial wear (also called promotional wear). Several common diffusion curve forms exist: short-term, low-efficiency, early-decline, and stable types. Different innovations exhibit different diffusion curves, and the same innovation may also display different curves under varying conditions. In the new media domain, these various diffusion curve forms likewise exist. The resonance model of new media diffusion aims to explain the processes through which these different diffusion curves emerge.

In layman' s terms, resonance describes a phenomenon where a physical system vibrates with greater amplitude at its resonant frequency than at its natural frequency. Examining the mechanism of vibrational effects reveals that oscillating physical systems possess their own natural frequencies. Without external

forces (i.e., oscillators), vibrational energy gradually dissipates through internal damping until ultimately exhausted and the system stops vibrating. During this process, applying force with an oscillator at the system' s identical frequency (i.e., energy input) can sustain vibration. If this energy input exactly equals the energy dissipated per cycle, the system maintains constant vibration without stopping. If the added energy exceeds the energy dissipated per cycle, energy accumulates and vibration amplitude gradually increases. Regardless of how small this energy may be, given sufficient time, the structure will eventually vibrate excessively and collapse. The key to resonance lies in the oscillator' s frequency approximating the system' s frequency, enabling energy accumulation. If frequencies differ substantially, input energy instead cancels itself out.

Here we observe that a resonance system' s core elements are its natural frequency, exogenous forces (oscillators), and the transmission system that connects exogenous forces to the natural frequency.

In new media diffusion, the natural frequency refers to new media' s operational logic. This includes what Negroponte (1997) described as "mass media being redefined as systems for transmitting and receiving personalized information and entertainment," and what Bennett (2013) considered as "digitally connected interpersonal networks fostering emotionally intense, face-to-face interactions in squares, camps, mosques, and large assemblies." The communication characteristics of democratization, interactivity, and rapidity have constituted new media' s advantages since the Weibo era. Since then, the fundamental logic for new media product emergence and development has involved addressing specific user rigid demands, providing space for free expression, and fully stimulating and leveraging user social stickiness to generate revenue—this constitutes the "natural frequency."

These characteristics are operationalized as the richness of interactive experience, ease of interactive experience, and product acquisition cost. Without new exogenous forces (or oscillators), and if such forces cannot offset diminishing marginal returns, eventual attenuation and demise become inevitable from either the new media lifecycle or innovation diffusion curve perspective. These external forces manifest as influences from the natural, cultural, and social environments, corresponding to the social system in Rogers' (1995) framework. The author operationalizes these forces as communication environment fit, marginal benefits of new media use, and target population scale.

Technology serves as the transmission and catalytic mechanism for converting these persistent external forces into energy absorbable by new media. When diffusion of innovations theory analyzes innovation characteristics' impact on diffusion speed and patterns, complexity, trialability, and observability represent important features. With new media development, these characteristics increasingly depend on technological drivers. The author operationalizes them as technological richness and technological acceptance.

Based on the above analysis, this paper proposes the resonance model of new

media diffusion (see [Figure 1: see original paper]).

3. Analysis of Influencing Factors in the Resonance Model

Rogers initially employed the relationship between time and adopter numbers to describe innovation curves while studying farmers' adoption of hybrid corn. Wang Huijun et al. (2002), analyzing agricultural innovation diffusion curves, proposed that innovation diffusion decline primarily results from various forms of "wear and depreciation," including: (1) intangible wear: innovations failing to diffuse promptly, becoming obsolete, and being replaced by newer innovations; (2) tangible wear: gradual loss of innovative characteristics over time; (3) policy wear: changes in national policies, laws, regulations, and structural adjustments affecting certain innovation applications and causing premature decline; (4) price wear: premature decline due to price increases and diminishing comparative benefits; and (5) artificial wear: innovation failure or premature decline due to improper promotion methods.

New media diffusion similarly experiences various influencing factors. Such wear that may cause innovation diffusion attenuation corresponds to energy dissipation and loss in vibration.

Stober (2004), reviewing new media evolution history, analyzed cultural, institutional, and economic factors' influence on new media (see [Figure 2: see original paper], [Figure 3: see original paper]).

3.1 Algorithmic Technology

Despite employing big data and AI recommendation technologies for content production and distribution, specific algorithmic and technical configurations directly affect new media positioning and attributes. This becomes evident when comparing Douyin and Kuaishou. In these platforms, algorithmic mechanisms employ different temporal and popularity weights. Kuaishou initially selects the best and eliminates the worst; after reaching a certain threshold, it selects the new and eliminates the old, reflecting user equality. Douyin, conversely, prioritizes excitement over novelty—Kuaishou values newness over heat.

These mechanisms determine that Kuaishou rapidly identifies user preferences through initial testing, sets caps on traffic allocation to top users, significantly reduces exposure opportunities for high-heat and old videos, enables everyone to express themselves, and achieves decentralization. Hence, Kuaishou' s slogan: "Everyone deserves to be recorded." Douyin, meanwhile, provides a pool of recommended content vetted by large user numbers, continuously delivering content to users who can manually select preferences. Douyin' s top users receive larger traffic shares, high-heat videos gain continuous exposure, and user attention concentrates at the top, achieving centralization.

Algorithmic technology carries substantial weight during new media products' early and middle stages.

3.2 Content Mechanisms

A continuous supply mechanism of content aligning with positioning requirements constitutes a crucial factor for a new medium' s establishment and maintenance. Pear Video exemplifies this through establishing the world' s largest citizen journalist network, becoming the largest UPGC (User-Generated Professional Content) media platform. By the end of 2017, Pear Video had amassed over 20,000 core citizen journalists globally, with a talent pool exceeding 3 million individuals across 525 cities.

Given this massive scale, does video content require manual screening? Pear Video has developed mature coping mechanisms. Currently, over 250 team members participate in content screening, verification, editing, and review, with staff on duty 24 hours daily. The special nature of news content requires meticulous production processes. Compared to traditional media workflows, Pear Video has added verification and cross-review procedures to ensure content authenticity. Additionally, to manage the entire production workflow for vast quantities of material, Pear Video independently developed a Spider system that monitors real-time processing status for each piece of material.

If Pear Video demonstrates a UGC+PGC content mechanism, then Weibo, Miaopai, Kuaishou, and Douyin host numerous MCNs (Multi-Channel Networks). MCNs unite influential internet PGCs (Professional Content Generators) in vertical fields, providing them with content production management, content operation, fan management, commercial monetization, and other professional services and management. Simply put, MCNs can be understood as organizations that control and operate top internet celebrities. Two years ago, MCN remained a niche term, but with support from platforms like Meipai and Weibo, the concept gradually moved from obscurity to the forefront. In May 2017, Weibo launched a vertical MCN cooperation plan, initiating collaborative partnerships with MCNs across various vertical fields. Through resource and policy 倾斜, the platform helps them build high-quality account matrices, including account recommendations, content recommendations, opening specific functional permissions, and other deep cooperation models with particular benefits.

Notably, Douyin initially only allowed videos under 15 seconds. Only after later extending video length to one minute did numerous MCNs enter Douyin, bringing explosive growth. This occurred because MCNs could hardly demonstrate their professional and team-based operational advantages within 15 seconds, while UGC disadvantages became immediately apparent once duration increased. Thus, content mechanisms carry substantial weight during new media' s middle development stage, while simultaneously being constrained by technical factors.

3.3 Business Models

Dallas Smythe (1977) proposed that the primary product of commercial mass media is audience labor (attention). In *Communications: Blindspot of Western Marxism*, Smythe argued that advertising time slots represent the indirect effects of communication, while broadcast programs serve as free bait to lure audiences to the production site—before television sets. Audience measurement companies then calculate their numbers, categorize different types of people, and sell these data to advertisers.

With new media development, the ability to develop more attention monetization methods has become a new competitive battlefield. In March of this year, Douyin began batch-integrating Taobao sales links—shopping cart buttons appeared in numerous million-follower accounts, displaying product recommendation information that directly linked to Taobao for seamless 跳转 and purchase. Douyin' s integration of "e-commerce" opened a path from short-video social content to e-commerce.

Another manifestation of business models involves industry giants' boosting effects. In new media, this particularly appears as platforms with dual attributes of platform and capital influencing new media' s nature and status, followed by support measures including subsidies, investment, and traffic guidance. Typical examples include Toutiao' s platform-level subsidies for short video domains like Douyin, Huoshan Video, and Xigua Video to enrich its product line and build a traffic moat, as well as its extensive global short-video acquisitions.

Thus, continuously expanding business models carries substantial weight during new media' s later development stages, determining how far new media can progress.

3.4 Value Ethics

The most typical case involves the popular new media product "Baozou Manhua" (Rage Comics). After publishing content insulting revolutionary martyrs, Baozou Manhua was delisted from multiple platforms, faced public and media backlash, and experienced direct impacts on its IPO.

Another case involves the public outcry following Tencent' s TOPIC (Trend of Interest Content) Fund' s investment in the new media platform "Chaping" (Bad Reviews), which has long been notorious among content entrepreneurs for plagiarism and "washing" articles. Upon learning of Tencent' s investment, the public interpreted it as Tencent encouraging and supporting such intellectual property violations, creating enormous pressure. That evening, Tencent announced it would restart a more rigorous due diligence process and negotiate share withdrawal if the investment contradicted Tencent' s intellectual property protection principles.

Numerous ethical and moral norms permeate new media development, maintaining substantial influence throughout the entire process.

Based on these influencing factors, new media diffusion can be categorized into different types (see [Figure 4: see original paper]):

- **Short-term type:** Short cycle, rapidly peaking then declining, primarily influenced by content mechanisms and business models. Typical example: live quiz apps.
- **Low-efficiency type:** Slow diffusion speed, low peak, long duration but consistently inefficient operation, primarily influenced by algorithmic technology and value ethics. Typical example: Soul.
- **Early-decline type:** Normal investment, development, and promotion phases, but premature decline, primarily influenced by policy regulation and value ethics. Typical example: Neihan Duanzi.
- **Stable type:** Normal development across all phases, smooth transitions between stages, highest efficiency. Typical examples: WeChat, Weibo.

The resonance model of new media diffusion largely aims to address limitations in diffusion of innovations theory and uses and gratifications theory when explaining new media diffusion. The model remains imperfect and requires improvement through deeper research. Although this paper has analyzed various factors that trigger "resonance" and influence it, how these factors interact requires further investigation. In other words, what is the resonance mechanism? Technology, as a factor exerting tremendous influence on new media development, does not have a one-time effect but rather continuous and multiple impacts. How technology continuously reshapes new media itself similarly awaits further study.

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