A Review of Media Evolution History: Based on "A History of Science and Technology Development in Chinese News Media" (Postprint)

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Abstract

"A History of Science and Technology Development in Chinese News Media" (hereinafter referred to as "Media History") takes technology as its point of departure, attempting to answer: How has media actually evolved, where did it come from and where is it heading, and what evolutionary process has it undergone in between; what is the inherent logic of media evolution, and what development laws does it follow; how do innovations and evolution in news media technology promote the evolution and iteration of communication media, what development stages has Chinese news media technology experienced, and what are the expectations for future development trends; how does progress in media technology drive the transformation and development of news media, thereby promoting economic and social development and the advancement of human civilization; and in the long history of communication media evolution and media technology development, what regular patterns or experiences can be drawn upon as reference for today.

Full Text

A Review of Media Evolution History: Centered on *A History of Science and Technology Development in Chinese News Media*

Abstract

A History of Science and Technology Development in Chinese News Media (hereinafter referred to as "Media History") approaches its subject through the lens of technology to address several fundamental questions: How has media evolved, where did it come from, where is it heading, and what processes has

it undergone? What internal logic and developmental laws govern media evolution? How do innovations and advancements in news media technology drive the evolution and iteration of communication media? What stages has Chinese news media technology experienced, and what future trends can we anticipate? How does progress in media technology leverage reforms in news media, thereby advancing economic development and human civilization? And what regular patterns or lessons from this historical trajectory of media evolution and technological development can inform our present circumstances?

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Interpreting Media Evolution from an Evolutionary Perspective

Like living organisms, media is in a constant state of evolution. But does media evolution follow discernible patterns? What is the underlying historical logic of media evolution? To explore these questions, *Media History* adopts an evolutionary research methodology. The theory of evolution, centered on natural selection and pioneered by British biologist Charles Darwin, first outlined a basic evolutionary schema for organisms in Darwin's mid-19th century publication *On the Origin of Species*. Darwin argued that all species share common ancestors and that during reproduction, organisms continually generate variations, many of which are heritable. These ongoing heritable variations form the basis of biological evolution. Despite various defects and criticisms, Darwin' s theory remains foundational in biology, with no biologist denying that species evolve.

Evolutionary theory extends beyond biological evolution to serve as a philosophical framework and research tool. Its influence on social sciences today far exceeds its impact on biological sciences, making it entirely appropriate to examine media evolution through an evolutionary lens. According to biological evolution theory, morphological evolution primarily originates from genetic mutation. This raises a natural question: Does media evolution similarly stem from mutation in media "genes"? And what exactly are media "genes"? Our answer is affirmative: media "genes" are replicable information symbols. Symbols serve as the material carriers of human thought transmission, the most basic elements of human communication activity, and the smallest units for loading and transmitting information. Without symbols, the world would remain chaotic and incomprehensible. Only through symbolic systems could human thought transcend the concrete experiential world and enter a conceptual relational world. After millions of years of evolution, humans developed the capacity to emit and receive symbols, mastering the skills to encode, transmit, receive, store, and utilize them. We can transform our thoughts, experiences, and emotions into

symbols for others, and through interpreting symbols from others, reconstruct their intended meanings—enabling interpersonal communication and information exchange through symbols. A fundamental attribute of humanity is that we are symbol-using animals.

Just as genetic mutation drives biological evolution, "mutation" in media genes (information symbols) serves as the source of media evolution and iteration. Throughout human communication history, every major transformation in communication media and activity has been initiated by "mutation" in symbolic systems. Early humans used facial expressions and gestures for information exchange, creating body language symbols. When bodily symbols proved insufficient for expressing complex ideas, linguistic symbols emerged. Spoken language' s ephemeral nature prevented it from transcending time and space, leading to the creation of written symbols. Written symbols couldn' t travel fast or far enough, prompting the invention of electromagnetic symbols. Electromagnetic signals struggled with diversified, efficient, and intelligent communication, giving rise to digital symbols. Thus, media evolution represents a process of continuous symbolization of human thought and continuous strengthening of symbolic systems. In this sense, humanity' s unique symbolic system is the key to unlocking the labyrinth of media evolution.

Scientists have also discovered "whole genome duplication" in biology, demonstrating that improved genetic information replication mechanisms constitute another evolutionary driving force. Similarly, improvements in the replication mechanisms of media genes (information symbols) propel media evolution. From textual to print media, and from digital to network media, the media genes (information symbols) remained unchanged while improvements in their replication mechanisms drove media advancement. Bi Sheng in China' s Northern Song Dynasty invented movable type printing based on woodblock printing, and Gutenberg in Germany later developed lead movable type and printing presses, transforming character symbol replication from manual copying to machine printing—from individual to batch replication—thereby advancing media progress. American ARPA experts developed ARPAnet, which evolved into the Internet, transforming information dissemination from floppy disk reading/writing and physical delivery to network communication, and shifting the mechanism from one-way transmission to two-way interaction, triggering a disruptive transformation in information communication.

Biological evolution includes both macroevolution (above-species level) and microevolution (within-species level). Media evolution follows a similar pattern. The media evolution triggered by information symbol mutation or improved replication mechanisms constitutes macroevolution, characterized by "generational upgrading" and leading to iterative media advancement. In contrast, media evolution resulting from "media hybridization," "transgenosis," and "gene editing" represents microevolution, characterized by "variety expansion" and leading to media form diversification.

In biology, hybridization is a traditional breeding method that produces indi-

viduals with recombined parental genes through mating between different genotypes. In media ecology, "hybridization" serves as a common method for transforming old media and creating new media by blending two media forms (i.e., "cross-fertilization"), absorbing quality genes from both to achieve genetic recombination and produce new media forms. As Marshall McLuhan observed, "The moment of hybridization or meeting of two media is a moment of truth and revelation from which a new form is born." Examples abound: mobile phones hybridized with newspapers produced mobile newspapers; networks hybridized with television produced Internet TV.

Transgenosis technology, a modern biotechnology, refers to transferring one or more exogenous genes into a specific organism to produce predictable, directed genetic changes and create new species. In media ecology, the "transgenosis" model describes how old media, driven by new information and sensory demands and enabled by technological conditions, capture and conquer new natural phenomena, incorporate new technological elements (i.e., introduce "exogenous genes"), and generate new media forms that compensate for previous functional deficiencies. Film' s evolution from silent to sound, color, and 3D exemplifies media advancement through the transgenosis model. As Sergei Eisenstein wrote in *Notes of a Film Director*, "Silent film cried out for sound, and sound film cried out for color," an observation that can be systematically and universally applied to studying all media.

Gene editing technology, developed in recent years, enables precise, targeted modification of genomes by editing and reorganizing target genes—such as knocking out or inserting specific DNA segments—to alter genetic sequences, allowing organisms to retain desirable traits while acquiring new ones. In media ecology, we can similarly modify disadvantageous genes of existing media through "editing" and "modification" without introducing foreign genes (different information symbols), enabling media to acquire superior characteristics and achieve self-evolution. For example, Virtual Reality (VR) uses multimedia, sensor, simulation, and computer graphics technologies to create and experience interactive, three-dimensional dynamic virtual environments superimposed onto live news scenes, allowing users to participate in news events and delivering immersive news consumption experiences and emotional resonance.

When implementing these three modes of media form innovation, we must avoid falling into the "grafting mode" trap. In biology, grafting is an artificial asexual reproduction method that joins a bud or branch (scion) from one plant onto another plant stock, allowing them to grow into a complete plant without involving genetic recombination or change, instead relying on the stock' s nutrient tissue for quality improvement. China Mobile Multimedia Broadcasting (CMMB) utilized satellite signals for nationwide coverage and ground relays to cover blind spots, while using wireless mobile communication networks only as return channels—much like using the stock merely as a nutrient pipeline for the scion without achieving true integration ("genetic recombination") between one-way broadcasting and mobile communication. This represents the primary

reason for CMMB' s failure.

Natural selection refers to the phenomenon where organisms better adapted to their environment survive and reproduce while less adapted ones are eliminated. Darwin considered natural selection a crucial factor driving biological evolution. Similarly, in media evolution, different media continuously compete for human attention and audience engagement, and the birth of new media intensifies this competition. New media must be superior to survive; old media must evolve or decline. Audience preference plays a key role as the "natural environment" in media natural selection. Cases of new media being eliminated immediately after emergence are not uncommon—the "telephone newspaper" that appeared in Europe in the late 19th century being one example. However, new media' s emergence doesn' t necessarily mean old media' s death. Old and new media maintain not a "zero-sum relationship" but a "coopetitive relationship," creating today' s media ecosystem where diverse media forms both compete and depend on one another.

Theoretical Exploration: The Three Constituent Elements of Media

People typically consider communication media to consist of information symbols and transmission media. However, human communication involves another crucial element: the "channel." A channel refers to the connection point linking sender and receiver or the pathway for information flow and diffusion during communication. It shares similarities with "media" but encompasses broader meanings. While "media" generally refers to physical "entity connections," "channel" includes both physical entity connections and non-physical "interpersonal connections."

Perhaps due to these similarities and because pre-Internet channels emphasized physical entity connections, people have long conflated channels with media, failing to treat channels as an independent component of communication media. However, in the mobile Internet era, non-physical interpersonal connections (such as "friend circles" and "fan groups") play increasingly prominent roles in information dissemination. Industry insiders have attempted explanations: "In the mobile era, communication media are breaking cognitive boundaries. Today, the term 'connection' appears more frequently in our vision. Modern communication is no longer limited by any physical 'medium' but rather involves infinite connections among information, terminals, and human bodies. Therefore, any connection point and channel within this 'pan-connection circle' can be called communication media." This interpretation, however, contradicts the material nature of communication media.

We argue that rather than subsuming "any connection point and channel" under "communication media," it is better to separate "channel" as one of the

three constituent elements of communication media, alongside symbols and media. This approach clarifies channels' role in information dissemination. Indeed, the importance of channels is self-evident and increasingly critical. Whoever controls communication channels today commands users, regardless of whether they own the physical media— "online influencers" provide clear evidence of this reality.

Macro Perspective: The Broader Context of Media Transformation

The evolution of communication media is intimately connected to the broader context of human social development, aligning with contemporary economic and social development requirements, people' s information needs, and the prevailing state and level of productive forces. The three major communication revolutions in human history occurred alongside the three industrial revolutions, paralleling energy revolutions.

Just as the circulatory system (providing substances and energy for survival) and central nervous system (controlling all behavioral information and integrating the body into a unified organism) are the most supportive among the human body' s nine major systems, energy supply and information communication systems constitute the two most fundamental systems of human society. The former serves as society' s power system, the latter as its central nervous system —if either fails, society cannot function normally.

Historically, each industrial revolution has been pioneered by innovations in energy and communication technologies, triggering profound economic and social transformations and major media reforms that together drive human society forward. The First Industrial Revolution, beginning in the 1760s, featured an energy revolution powered by coal and steam engines, preceded by a communication revolution centered on print media, ushering humanity into the "Steam Age." The Second Industrial Revolution, starting in the 1860s-70s, involved an energy revolution powered by electricity and petroleum, preceded by a communication revolution centered on electromagnetic media, bringing humanity into the "Electrical Age." The Third Industrial Revolution, beginning in the 1940s-50s, featured an energy revolution dominated by atomic and renewable energy, preceded by a communication revolution centered on digital and network media, propelling humanity into the "Information Age." The emerging Fourth Industrial Revolution will be pioneered by an energy revolution led by clean and smart energy, and a communication revolution centered on green and intelligent media, heralding an "Intelligent Age."

In short, media serves as an intermediary between humans and society, a product of human historical development that connects historical processes, constitutes social structures, and influences people' s lives. When a new communication

medium emerges and its supporting technology becomes widely applied, it profoundly impacts human society' s politics, economy, military affairs, science, technology, culture, and even people' s lifestyles, work patterns, and thinking modes. Regarding media' s social impact, attention often focuses on content effects while neglecting impacts from the media themselves and their supporting technologies. Canadian communication scholar Marshall McLuhan argued that media' s impact on human senses and social behavior is far more profound and significant than content effects, leading to his conclusion: "The medium is the message."

Take media' s relationship with politics: media has always been both a symbol and practical manifestation of political power. U.S. presidents have consistently employed the latest media to achieve political objectives, significantly influencing America' s political trajectory. Some presidents earned media-derived epithets: Lincoln as the "Photography President," Cleveland the "Newspaper President," Roosevelt the "Radio President," Kennedy the "Television President," Obama the "Internet President," and Trump the genuine "Twitter President."

Regarding media and military affairs: media has often been wielded by warmongers as a tool to initiate wars. Hitler' s rise to power and launch of World War II was directly related to his use of radio broadcasts to address the public, triggering radio' s first "electronic implosion." Conversely, media development has often been constrained by major international military activities—World War I severely delayed radio's progress, while World War II greatly hindered television development.

As for media and human relations: media development history is essentially a history of communication subjects continuously developing and differentiating, a history of redistributing and reassigning communication rights, and a history of continuously changing and improving social equity. The profound impact of media on individuals' work styles, lifestyles, and thinking patterns requires no elaboration.

Therefore, we cannot discuss media in isolation. We must examine media evolution and technological development within broader socioeconomic contexts and consider them within the historical process of human civilization development, evaluating media' s role in civilization' s progress and exploring the profound impacts of communication media and technology on political ecology, cultural forms, and the spiritual world.

Using History as a Mirror to Address New Media Challenges

History serves as a mirror, and studying it aims to inform the present. Reviewing and exploring the historical trajectory of media evolution from a historiographical perspective, and rationally re-examining familiar stories of confusion,

controversy, response, and innovation from media' s long river of development, allows us to absorb nourishment and wisdom, discovering regular patterns and lessons to draw upon. This undoubtedly benefits our understanding of today' s rapidly changing media landscape and our ability to address major transformations in news media while driving media innovation and development.

Reviewing media evolution history reveals that whenever a new medium emerges, confusion and concerns arise, with many predicting the demise of old media. The telegraph' s appearance caused Victorian-era newspaper editors to worry about "newspapers meeting their doom," believing "newspapers would eventually be replaced by telegraph." Television' s birth led many radio professionals to think broadcasting' s winter had arrived, predicting its imminent disappearance. The Internet' s rise terrified many media practitioners, who believed new media sounded the death knell for traditional media. However, media evolution history teaches us that new media' s emergence doesn' t necessarily mean old media' s death. When new media appear, old media either adjust their position to adapt to the new media ecological environment or change their survival mode to meet new human information needs.

Take the telegraph: when new communication methods like teleprinters and fax machines emerged, telegraphy didn' t disappear. It remains active among amateur radio enthusiasts and has successively "transformed" into pager signals, email, mobile text messages, and WeChat, continuing to serve users in new forms. Similarly, in the Internet era, newspapers' position in the media ecosystem will change, and their media form may evolve—for instance, into thin, lightweight, foldable electronic paper displaying multimedia content—but newspapers won' t vanish completely.

Reviewing media evolution history also shows that each new medium' s birth results from "hybridization" (or "cross-fertilization") among different media, technologies, and creative ideas—the outcome of media gene (information symbol) recombination. Language media emerged from hybridizing human thought with vocal functions; written media from hybridizing language media with visual functions; print media from hybridizing written media with mechanical technology; telegraphy from hybridizing print media with electromagnetic technology. After the electromagnetic media era, media hybridization became increasingly frequent. In the digital and network media age, hybridization has intensified like a storm, transforming information perception and communication patterns, influencing work, study, life, and thinking modes, and driving social reform and development. Media evolution is a continuous process of media hybridization and evolution.

The process of media hybridization is essentially media convergence. Therefore, the integration of old and new media represents the primary direction of current media reform and the main path of innovation. In fact, only through mutual integration and genetic recombination ("hybridization")—rather than simple addition without genetic involvement ("grafting")—can old and new media leverage and absorb each other' s quality resources (quality genes) to maximize

respective advantages and achieve win-win outcomes. As General Secretary Xi Jinping pointed out: "The key to integrated development lies in becoming one, moving as soon as possible from the 'addition' stage to the 'integration' stage, transforming from 'you are you, I am me' to 'you contain me, I contain you,' and further to 'you are me, I am you,' striving to create a batch of new mainstream media."

In the long term, the space for human technological development is limitless, and media evolution has not stopped. In fact, digital networks are not the last mile of human communication, nor are digital symbols the final information carrier for that last mile. The true last mile of human communication is the neural network, with neural signals as the information carrier. We can boldly envision that once humanity deciphers the secrets of the natural human brain, understands the symbolic codes of neural signals and the conduction mechanisms of neural networks, we could construct a human "neural network system," enabling direct information transmission between computers and human brains, and among different human brains. This would dramatically improve information transmission and knowledge storage efficiency, greatly enhancing human learning capacity and intellectual development, ushering humanity into an era of neural signal communication.

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Postscript

As a veteran news technology worker, I participated in China' s news informatization construction for nearly three decades around the Reform and Opening Up period, witnessing the rapid development of Chinese news media technology in the new century' s first two decades and accumulating precious materials about

predecessors' painstaking pursuits of media technology progress. With an irrepressible passion for news media technology development, after more than three years of collection, organization, conceptualization, and compilation, I have finally completed this *History of Science and Technology Development in Chinese News Media*, hoping to leave some historical materials and personal reflections for future generations. I dedicate this book as an 80th birthday gift to my lifelong beloved cause of Chinese news media technology and to my motherland' s 70th anniversary.

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