SST as a Perspective: New Approaches to Communication Studies in the Digital Media Context (Postprint)

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Abstract

【Purpose】This paper explores new approaches to communication studies in the digital media environment through the perspective of "Social Shaping of Technology" (Sociology of Scientific and Technical Knowledge, SST) within Science and Technology Studies (STS). 【Method】Employing theoretical analysis methods, this study first briefly reviews the theoretical foundations and core concepts of SST, analyzing how its constructivist approach views the evolution of science and technology as a process of joint action by multiple social forces, revealing the non-neutrality of technology, its multi-dimensional attributes as a social product, and its complex interactions within social relational networks. 【Results】This paper further discusses how the SST perspective can provide new research pathways in communication studies, particularly its potential to reveal how digital technology is dynamically shaped by social structures, cultural backgrounds, and user feedback in aspects such as information dissemination, audience behavior, and public opinion. 【Conclusion】By integrating the core ideas of SST theory with the research paradigms of communication studies, this paper proposes a new framework for understanding the production and dissemination of media content through the analysis of technology-society interactions against the backdrop of rapid digital media development, providing a multi-level social perspective for future communication research.

Full Text

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Abstract

[**Purpose**] This paper explores new approaches to communication studies in the digital media environment through the lens of the Social Shaping of Technology (SST), a framework derived from Science and Technology Studies (STS). [**Method**] Employing theoretical analysis, the paper first reviews the theoretical foundations and core concepts of SST, examining how its constructivist approach frames technological evolution as a process shaped by multiple social forces, thereby revealing technology' s non-neutrality, its multidimensional attributes as a social product, and its complex interactions within networks of social relations. [**Results**] The discussion further elaborates on how the SST perspective offers novel research pathways for communication studies, particularly in illuminating how digital technologies are dynamically shaped by social structures, cultural contexts, and user feedback in the domains of information dissemination, audience behavior, and public opinion. [**Conclusion**] By integrating the core tenets of SST theory with communication research paradigms, this paper proposes a new framework for understanding media content production and dissemination through the analysis of technology-society interactions in the context of rapid digital media development, providing a multi-layered social perspective for future communication research.

Keywords: Social Shaping of Technology; constructivist approach; new pathways in communication studies; technology-society interaction; dynamic shaping

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1. Theoretical Foundations and Core Content of SST

1.1 Theoretical Foundations: The Development of Science and Technology Studies (STS)

Against the backdrop of rapid modern technological development, Science and Technology Studies (STS) has emerged as an interdisciplinary field examining the interactive relationship between science, technology, and society, increasingly becoming a global research concern. The theoretical evolution of STS began in the 1970s with the Sociology of Scientific Knowledge (SSK), which introduced the core concept of the social construction of scientific knowledge. This perspective argues that scientific knowledge is not a purely objective outcome of nature but rather a product shaped by social environments, cultural influences, and power relations. Building upon this foundation, STS scholars have sought to investigate how science and technology emerge, develop, and are applied within social contexts, forming the contemporary theoretical framework

for the sociology of scientific and technological knowledge.

During the 1980s, STS scholars further deepened their examination of the relationship between science and technology, advocating for constructivist approaches to technology studies. During this period, European and American sociologists of technology began critiquing traditional views of technology and society, drawing upon Marxist theories of technology, social interactionism, and other research traditions to develop the "Social Construction of Technology" (SCOT) framework and a series of related theoretical contributions. This marked the extension and expansion of STS into the domain of technology studies. The SCOT framework advocates studying the formation and evolution of technologies to reveal the social forces underlying technological development, arguing that the invention, selection, optimization, and popularization of a technology are typically co-shaped by the interests, values, and cultural backgrounds of various social groups. This perspective not only challenges traditional technological determinism but also enriches our understanding of the dynamic relationship between science and technology.

Building upon SCOT, SST (Sociology of Scientific and Technical Knowledge) represents a continuation of this intellectual trajectory, dedicated to further exploring the actual processes through which technology is shaped within society. SST employs a distinctive constructivist methodology that views science and technology not merely as objective products of the material world, but as entities constructed within specific social relations and historical contexts. The theory transcends both traditional technological determinism and pure social determinism, emphasizing the mutual interaction between technology and society. In other words, the development and application of a new technology depend not only on its technical performance but also on user needs, social policies, economic resources, and other multifaceted influences. By examining different actors—including users, stakeholders, and policymakers—SST theorists understand the formation and dissemination of technology as a dynamic social practice, thereby enabling a more comprehensive and profound understanding of technology.

Core concepts in SST' s theoretical development also include "technological systems" and "actor-networks." The "technological systems" approach focuses on the interwoven relationships between technology and relevant social, economic, and political systems, while "Actor-Network Theory" (ANT) goes further by introducing non-human actors (such as technological devices and infrastructure) as units of analysis, thereby dismantling traditional subject-object dichotomies and revealing the complex interactions among technological devices, users, and social environments. This analytical approach emphasizes that technology is not an isolated tool within society but rather a crystallization of multiple intersecting forces within social systems. By attending to the fluidity and dynamism of technological and social roles, ANT further enriches the SST theoretical framework.

Representative scholars in the STS field include Bruno Latour and Steve Wool-

gar, among others. Through empirical studies such as laboratory research and technological innovation analysis, they have revealed that the processes of scientific and technological development are deeply embedded in specific social structures and cultural environments. Latour' s research is particularly notable for emphasizing that the production of scientific knowledge and technological innovation are not unidirectional natural processes but rather outcomes of interactions among multiple social forces, with each step of technological development profoundly influenced by its social context. In his actor-network theory, Latour argues that the formation and dissemination of science and technology result not only from human actions but also from the participation of various non-human factors—scientific instruments, data, and equipment all constitute part of the "actor-network." In this way, STS theory positions science and technology as products of social interaction, providing profound insights for analyzing sociocultural factors in technological development and offering a multidimensional perspective for understanding the relationship between technology and society.

1.2 Core Content: Technological Non-Neutrality, Technology as Social Product, and Multi-Stakeholder Participation

First, SST opposes traditional technological determinism by denying that any specific technology represents an inevitable phenomenon. Instead, it views technology as emerging from the formation of "new combinations" of production factors and as shaped by various social factors and conditions during its integration into production systems to obtain "excess profits." In SST research, technology is regarded as the result of mutual influence among social and cultural factors. A series of technological and social choices are involved at every stage of technological design and innovation, with these choices influenced not only by narrow technical considerations but also by broad social factors such as politics, economics, organization, and culture. For instance, different interest groups and social communities play crucial roles in technological selection and implementation processes, with their interests and power relations directly influencing the final form and application of technology.

The irreversibility of technological choices represents another key aspect of technological non-neutrality. Once a technological choice is established and widely adopted, reversing it becomes extremely difficult. This "lock-in" effect demonstrates that early technological selections not only influence current technological configurations but also profoundly shape future technological development paths. Large-scale investments and the construction of existing technological infrastructure mean that once a particular technology is adopted, the costs and difficulties of substituting or altering it increase substantially.

Second, SST argues that technology is not determined by inherent technical logic but rather constitutes a social product defined by the conditions of its creation and use. The emergence and development of each new technology involves a set of choices among technical alternatives. A range of "social" factors, beyond narrow "technical" considerations, influence which options are selected, thereby

affecting both the content of technology and its social impacts. The perspective of technology as a social product suggests that technological development is not an isolated process of technical logic but rather the result of combined forces from social, economic, political, and other dimensions. The core concept of SST is that "choice" exists in the direction or trajectory of innovation projects. If technology does not emerge from a predetermined logic or single determining factor, innovation becomes a "garden of forking paths" where different paths may lead to different technological outcomes. These choices may have varying impacts on society and specific social groups, raising questions about the characteristics of technology and their social consequences for exploration.

SST research also reveals the social negotiability of technology. Beyond the work of technical experts, technology design and implementation involve negotiation among numerous social forces. The role of users in technological innovation has become increasingly important, with user feedback and needs incorporated into technological design and development processes. This multi-stakeholder interaction model breaks the traditional linear model of technological innovation, as technological social negotiability and multi-party participation are mutually reinforcing. When viewing technology as a social product, its form and content reflect pathways of social power relations and cultural values. Technology serves as both a tool and a carrier of social relations and cultural values, reflecting and reinforcing specific social structures and power relations. Therefore, the perspective of technology as a social product holds significant importance for understanding how society operates.

In the context of rapid technological development, SST' s theoretical perspective reveals the intricate interplay of social and cultural factors in technological development. These choices are not limited to strict technical considerations but encompass all participants in the technological development process—that is, the entire community involved. In other words, the technological innovation process is one of collaborative cooperation among multiple stakeholders. Traditional models of technological decision-making have often been dominated by a small number of technical experts and decision-makers, neglecting the voices and needs of broader social groups. However, the SST theoretical framework emphasizes that technological innovation requires participation from multiple actors and constitutes a complex social process. On one hand, users play an increasingly important role in technological innovation, with user needs and feedback influencing not only technological design and development but also critically affecting practical application and social impact. Through interaction with users, technology providers can better understand and satisfy user needs, thereby improving practical application effects and social acceptance. On the other hand, technological development involves collaboration across different organizations, fields, and professions, making it both a technical and a social issue. During technological innovation, different actors—technical experts, managers, policymakers, users, and others—mutually influence the form and application of technology.

Simultaneously, the role of policy and institutions in technological innovation cannot be overlooked. Technology policy not only affects research, development, and application but also involves the social impact and governance of technology. For example, technology policy can promote interaction between users and suppliers and encourage exploration of different choices and pathways, thereby advancing the socialization of technological innovation. Social scientists too frequently take technology for granted and attempt to assess its social "impacts," viewing technology as providing reliable tools for organizational change while ignoring the difficulties of implementation and the frequent failures of technology in achieving expected and anticipated outcomes. In summary, recognizing that technology is not neutral, that technology constitutes a social product, and that multiple stakeholders participate are key perspectives for grasping the core of technological innovation and development. These viewpoints highlight the complexity and social nature of technological development, clarifying the roles played by different social forces in technological innovation and the dynamics of interaction throughout the innovation process. Through the social shaping perspective on technology, we can more profoundly understand the socialization process of technology. Technology serves as both a tool that maps and reinforces specific social structures and power relations and a medium that transmits and reinforces social relations and cultural values. Multi-stakeholder participation is indispensable on the path of technological innovation, as through extensive social interaction and cooperation, the social value and public interest of technology can be better realized.

2. The Intersection of SST and Communication Studies: The Social Construction of Technology and Communication Research

2.1 From Technological Determinism to Social Construction: SST' s Implications for Communication Research

Understanding the intersection of Social Shaping of Technology (SST) and communication studies provides an entry point for re-examining the complex relationship between technology and society. SST' s core proposition holds that technological development and application are not driven purely by technology itself but rather result from the combined effects of multiple social factors. This perspective reveals that technology does not exist completely independently of society; on the contrary, it is largely shaped by social, economic, cultural, and other forces. This socialized understanding of technology aligns with the trend of media technology socialization within communication studies. Based on this framework, technology dissemination is no longer a simple instrumental process but rather embeds deep-level social contexts.

This interdisciplinary perspective injects important theoretical value into communication research, enabling it to go beyond analyzing the effects of technology dissemination and further explore technology' s multiple roles in society and its

shaping effects on the communication environment. Taking social media platforms as an example, their algorithms and functional designs embody specific commercial and social logics, which in turn profoundly influence user behavior and information dissemination patterns. For communication scholars, understanding this helps better analyze how media technologies participate in social interaction and information propagation.

Technological determinism has long dominated communication studies, viewing technology as an independent force driving social change and arguing that technology itself can autonomously guide social progress. However, the social constructivism advocated by SST places greater emphasis on the dynamic interaction between technology and society. Through this perspective, technology is no longer considered the sole force transforming society but rather a product of multi-party interactions among society, culture, and economy. As van Dijck' s research suggests, the design of social media technology not only addresses technical needs but also profoundly influences and transforms social behavior patterns, including people' s information reception, dissemination methods, and social habits. For communication scholars, understanding this helps better analyze how media technologies participate in social interaction and information propagation.

2.2 The Social Construction of Media Technology and the Participatory Role of Users

Within the SST framework, the dissemination and use of technology represent not only the embodiment of social norms but also direct reflections of user behavior and needs. The redefinition of user roles in communication studies further deepens this understanding: users are not merely passive recipients of technology but active participants who drive technological development through feedback and interaction. In today' s digital media environment, user behavior can directly influence technological design and dissemination processes. Woolgar points out that before being widely accepted, technologies often undergo multiple "re-design" processes by users—that is, technologies need to continuously adapt to user needs to improve, and user choices and feedback constitute the core of this process. In digital media, user feedback continuously influences platforms through technological feedback loops, thereby changing information dissemination methods and media ecology.

On social media, users form a feedback system by participating in interactions, sharing content, and consuming information, which in turn drives adjustments to social media platform algorithms. Communication scholars can leverage this to analyze how users become key factors in media dissemination, for example, by examining user interactions' impact on platforms to reveal their underlying social significance. Furthermore, algorithms not only influence user behavior but also affect information visibility and dissemination pathways, thereby participating in information selection and filtering processes. Wyatt further argues that technological choices reflect interactions between social structures and cul-

tural environments, particularly when certain technologies prioritize the needs of specific groups, a process that can exacerbate information gaps between social groups. For communication studies, this means not only focusing on the dissemination effects of technological content but also understanding users' multiple roles in technological selection and dissemination.

For instance, user behavior on social platforms often drives algorithm optimization, a process particularly common in platform operations. The decentralization and personalized design of digital communication enable users to influence information circulation patterns through likes, comments, and other actions, making social platforms carriers that reflect user needs in information dissemination. Therefore, when analyzing the dissemination pathways of media technologies, communication scholars should pay special attention to how users actively shape information flows and platform design through their own behaviors. Specifically, SST-informed communication research can examine user interaction and feedback mechanisms on social platforms to understand the participatory characteristics of media ecology, thereby revealing users' unique roles in technological socialization.

2.3 Interdisciplinary Integration of SST and Communication Studies: Social Feedback and Power Structures of Media Technology

SST provides communication studies with an interdisciplinary analytical framework that enables scholars to deeply understand the multiple roles of media technology in society. Flichy points out that the social feedback function of media technology operates not only in technological applications but also significantly influences the distribution of social power. This feedback affects not only information dissemination effects but also shapes users' cognitive patterns and social behaviors. By introducing SST' s analytical framework, communication studies can more comprehensively understand the social feedback mechanisms of media technology. For example, social media algorithms are not mere tools but information regulation mechanisms deeply embedded in social power structures that influence the visibility of specific information and consequently exert certain guiding effects on public opinion.

Furthermore, communication scholars can more deeply reveal information selection and social biases in technology dissemination by analyzing how technology embeds power structures during social propagation. For instance, communication research can examine algorithmic selection mechanisms to explore how digital platforms shape public opinion through information flows. Algorithmic curation on social media not only controls information visibility but also, to some extent, restricts expression by different social groups. This trend has become particularly evident in the development of global social media, especially during social emergencies or major news events. Communication scholars can analyze algorithmic interventions on social platforms to deeply investigate how digital media potentially influence public cognition and social interaction.

The SST perspective offers communication studies a new analytical lens, allowing researchers to critically examine the multiple roles digital media play in social communication. Specifically, by focusing on how media technologies shape information flows and social cognition through technological design and algorithmic selection, communication scholars can gain deeper insights into the interactions between technology and society. Simultaneously, this analytical approach injects new theoretical foundations into communication research, helping it better address the profound impacts of digital technologies on society. In this context, communication research must not only focus on technology' s communication functions but also deeply explore how technology is endowed with specific power structures in social interaction.

3. Developments and Challenges of SST

3.1 The Impact of Technological Globalization and Cultural Differences

Against the backdrop of rapid digital media dissemination, the Social Shaping of Technology (SST) perspective reveals the processes of technological adaptation and transformation across different sociocultural contexts. While technological globalization promotes scientific and technological sharing among countries, it also intensifies the complexity of how technologies are redefined and reshaped in different cultural environments. Sheng Guorong notes that the same technology may produce different "effects" in different social scenarios and cultural contexts. In the context of globalization, the complexity of technological social shaping manifests not only in differences in technology dissemination and adoption but also in the formulation of global technology governance and norms. Countries often have divergent regulations regarding technical standards, intellectual property, and data protection. While globalization accelerates cross-border technology flows, it also creates significant differences in technology acceptance and application patterns across different cultural backgrounds.

Cultural differences particularly influence technological development. People' s varying degrees of technology acceptance and usage habits across different cultural contexts directly impact technology design and market promotion. For example, consumers in Western countries may place greater emphasis on privacy protection, while consumers in Eastern countries may prioritize technological convenience and social functions. Such cultural differences require technology developers to consider user needs in different cultural contexts when designing and promoting technology products. Therefore, "cross-cultural adaptation" becomes a key research issue in technology dissemination within the globalized context, and SST theory provides a new perspective for analyzing technology dissemination pathways and intercultural conflicts in this globalized environment.

3.2 Integration of SST with Emerging Technologies and Related Ethical and Social Responsibility Controversies

With the rapid development of emerging technologies such as artificial intelligence, big data, and biotechnology, SST theory faces new challenges and developmental demands in the context of digital media and emerging technologies. In recent years, AI technology has been widely applied in social media, healthcare, and other fields, but it has also sparked extensive ethical and social responsibility controversies. For example, social media platforms' algorithmic recommendation systems deliver customized content to users, which, while enhancing user experience, may lead to "filter bubble" phenomena. SST theory can not only help explain such technological influences but also analyze how technology reshapes social structures in social interaction and public discourse.

By emphasizing multi-stakeholder participation in technological development, SST encourages the public and policymakers to pay attention to social ethics and potential risks in the early stages of technology, thereby promoting more transparent and equitable technology development models. Within the SST framework, addressing ethical issues arising from emerging technologies requires joint participation from government, industry, academia, and the public. Technology ethics is not a static concept but one that continuously evolves with technological development. Under SST guidance, ethical governance frameworks for technology can be adjusted through cross-domain cooperation to ensure technological development aligns with society' s long-term interests and moral principles. To ensure technological progress and social justice, technology developers and policymakers must fully consider social values and cultural traditions during technology development and application processes. The SST perspective provides us with a theoretical framework to more comprehensively understand the profound impacts new technologies may have on society as we respond to their rapid development.

In summary, SST not only provides new perspectives for social research on digital media and emerging technologies but also offers theoretical support and guidance for ethical and social responsibility controversies in the context of globalization. SST research can further explore the multidimensional interconnections among technological globalization, cultural differences, and ethical issues, providing new solutions for cross-cultural technological adaptation and global technology governance.

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