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Research Progress on the Mobile Digital Divide (Postprint)

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Abstract

[目的/意义] With the advent of the mobile internet era, the proportion of mobile devices—particularly smartphones—accessing the internet has increased significantly. As discussions regarding the impact of mobile internet and mobile devices on the digital divide are burgeoning, this study examines how the connotation, scope, and root causes of the traditional digital divide have evolved in the mobile era. [方法/过程] Content analysis was employed to code existing literature on the mobile digital divide, thereby summarizing the current state of research. [结果/结论] Through a systematic literature review, the development trajectory and connotation of the mobile digital divide were delineated, distinguishing it from the traditional digital divide. The study summarizes four major dimensions of manifestation and eight categories of influencing factors of the mobile digital divide, thereby comprehensively revealing its research status and characteristics, and providing a theoretical foundation for promoting digital equity in the new environment.

Full Text

Preamble

Mobile Digital Divide Research Progress

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Abstract: [Purpose/Significance] With the advent of the mobile Internet era, the proportion of mobile devices—particularly smartphones—used for Internet access has increased significantly. As discussions about the impact of mobile Internet and mobile devices on the digital divide emerge, this study examines

how the connotation, scope, and root causes of the traditional digital divide have changed in the mobile era. [Method/Process] This paper employs content analysis to code existing literature on mobile digital divide and summarizes the current research status. [Result/Conclusion] Through literature review, this paper traces the development and meaning of mobile digital divide, distinguishing it from traditional digital divide. It identifies four manifestation dimensions and eight categories of influencing factors, thereby comprehensively revealing the research status and characteristics of mobile digital divide and providing a theoretical basis for promoting digital equity in the new environment.

Keywords: mobile digital divide; digital divide; mobile Internet; mobile devices; digital equity

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1. Origins and Meaning of Mobile Digital Divide

Since the term “digital divide” was coined in 1989, it has received extensive attention and research worldwide. Scholars have observed that with the development of information and communication technology (ICT), divisions, gaps, and even chasms have emerged between digital and non-digital users, as well as among digital users themselves. Traditional digital divide research examined the quantitative and qualitative changes that wired connections brought to people’s lives, finding that those with ICT access could better adapt to the digital world, while non-users could not obtain equivalent information, thereby exacerbating social inequality. Today, as we transition from the PC era to the mobile Internet era—with declining network costs and a substantial increase in smartphone usage—the traditional digital divide framework appears to lack explanatory power for understanding usage differences among people. As mobile devices have gradually become integral to daily life, they have fundamentally transformed how people access and use information, profoundly changing individual and societal production and lifestyle patterns. This raises critical questions: Does the digital divide still exist in the mobile Internet era? If so, what aspects of the traditional digital divide does it inherit, and how does it differ?

According to our investigation, J. Wareham et al. incorporated mobile phones into digital divide research in 2002, exploring which socioeconomic factors decisively influence the diffusion of mobile communications, and some scholars recognized that mobile devices could play a role in either bridging or widening the digital divide. L. Puspitasari et al. specifically studied the differences between mobile Internet adopters and non-adopters who bypassed wired connections altogether—a phenomenon termed “mobile leapfrogging”—highlighting how mobile devices substitute for wired connections in the digitalization process. Subsequently, an increasing number of studies have focused exclusively on mobile devices such as feature phones, smartphones, and wearable devices,

further expanding the depth and breadth of mobile digital divide research on usage and impact.

Statistics reveal that 95% of Internet users worldwide own smartphones, a figure that has shown stable growth since 2015, while PC/laptop ownership has declined by 18 percentage points during the same period. According to the 2019 Global Web Index, which tracked 45 countries and regions, smartphones outperformed personal computers and laptops in all markets—a trend particularly pronounced in emerging developing countries. As of June 2021, China’s mobile Internet user base reached 1.007 billion, with 99.6% of netizens accessing the Internet via mobile phones. These changes challenge the traditional digital divide’s connotation and extension, suggesting the emergence of a new gap: even at the same level of digital access, different populations have unequal opportunities to interact with information. The traditional device-access level digital divide no longer fully captures these disparities.

Building upon the traditional digital divide, this paper defines mobile digital divide as: digital divide related to mobile devices in the mobile Internet era. Using search terms including “digital divide,” “new digital divide,” “smartphone,” “mobile Internet,” “digital inclusion,” and their English equivalents, we conducted a combined search in CNKI and Web of Science databases. As of October 2021, we identified 20 Chinese journal papers on mobile digital divide and new digital divide themes, and 65 directly relevant English journal papers. Topics covered mobile access and usage gaps, mobile literacy divides, mobile adoption gaps, intra- and inter-country mobile divides, educational mobile divides, health mobile divides, urban-rural mobile divides, mobile divides among specific populations (teachers, families, rural populations, migrant workers, elderly, youth), and the role of libraries in bridging mobile divides. We manually screened these results and employed content analysis for data analysis. Our initial coding framework included traditional digital divide dimensions—access divide, skills divide, and usage effects divide—while adding a mobile-specific adoption divide dimension based on relevant literature, with secondary dimensions including Internet adoption, function adoption, and application adoption. The access divide dimension was expanded to include mobile-specific aspects, and the traditional usage effects divide evolved into mobile usage effects divide encompassing impacts on social capital and human capital. For influencing factors, we drew upon demographic, economic, cultural, technical, and social factors from traditional digital divide research, while adding psychological, capability, and contextual factors based on relevant literature.

2. Manifestation Dimensions of Mobile Digital Divide

Mobile digital divide research generally follows the dimensional framework of traditional digital divide studies. Through systematic review, this paper categorizes mobile digital divide into four primary dimensions: access divide, skills

divide, adoption divide, and usage effects divide, as shown in Table . Some researchers argue that these dimensions have a progressive relationship, where entry-level dimensions such as access and skills divides serve as prerequisites for more advanced dimensions like adoption and usage effects divides.

Specifically, the **access divide** refers to differences in access conditions faced by countries, regions, or specific populations when accessing ICT devices, using access functions, and obtaining digital information resources. In mobile digital divide research, ICT devices typically refer to portable devices capable of accessing mobile Internet, such as smartphones, feature phones, and wearable devices. Internet access divide measures differences in mobile Internet access, connection speed, and stability, while digital information resource acquisition divide refers to disparities in obtaining, creating, and exchanging information relevant to one's needs, including differences in information quality and impact. Most existing research reaches consistent conclusions about the access divide: with the popularization of mobile phones and declining network costs, the access divide in the mobile Internet era is gradually narrowing, showing minimal differences across countries, regions, and populations.

The **skills divide** encompasses both digital skills and information literacy required for operating mobile devices. Digital skills refer to the ability to benefit from operating and controlling mobile devices, while information literacy manifests as users' capacity to express needs, search, acquire, process, and utilize information on mobile platforms. In traditional digital divide research, populations with broadband usage skills and experience served as primary subjects; in mobile digital divide research, the same populations attract attention for their digital evolution across both contexts.

The **adoption divide** dimension includes secondary dimensions based on adoption intensity. Internet adoption refers to the intensity of Internet access on mobile phones, including usage time, frequency, and purpose. Function adoption refers to the adoption of basic mobile services such as making/receiving calls and sending/receiving text messages. Application adoption refers to the degree to which users accept and use different types of mobile applications according to their information needs—for socializing, entertainment, learning, work, etc. Current mobile digital divide research focuses on adoption gaps, examining differences among populations in their selection and use of mobile Internet products, skills, and content.

The **usage effects divide** refers to changes in users' digital or non-digital lives resulting from ICT access and utilization, emphasizing differences in usage quality. With further ICT development and exponential information growth, digital capability becomes particularly important. This capability is reflected not only in mastery and usage duration of ICT but also in information search and utilization abilities that can alter one's economic, political, and social status, specifically manifested through changes in social capital and human capital.

During literature review, we found some studies suggesting that mobile phones

can bridge access or usage gaps at the group level. For instance, Tang Jingtai and Li Xingli found that rural areas have higher mobile Internet penetration rates than traditional Internet, significantly narrowing the urban-rural access divide. In terms of specific functions and Internet usage, urban and rural residents show diversified demands due to different information needs, with the urban-rural adoption gap also showing a narrowing trend. Jin Zhenyin noted that increasing smartphone users correspond with a decreasing access divide trend. However, other scholars reached opposite conclusions: L. Puspitasari et al. found that individuals with PC Internet experience were more likely to own smartphones, indicating that the traditional digital divide is rapidly shifting toward mobile digital divide, with higher education levels and younger age facilitating smartphone and mobile network adoption. Regarding post-adoption usage differences, most studies identify skills and usage gaps as the core of mobile digital divide. Smartphones become “smarter” through users’ intelligent operations, as demonstrated by J. Jung et al.’ s research on how smartphone app usage impacts users’ social capital and human capital.

The manifestation forms of mobile digital divide are more diversified compared to traditional digital divide in computer and Internet contexts, and their differences warrant careful consideration. Although common sense suggests that declining mobile communication technology costs mean the access divide no longer exists in typical form, the access divide in the mobile world has evolved in both connotation and extension—from PC devices and fixed networks to mobile devices and mobile networks, and from technical access to acquisition and utilization of digital information resources. The mobile skills divide parallels information literacy with digital literacy (operational literacy of digital devices) as integral components. While traditional digital divide emphasizes usage based on ICT access, mobile digital divide focuses more on the positive effects that mobile devices bring to life, production, social capital, and human capital—this represents the practical value of mobile digital divide research. Significantly different from traditional digital divide research, mobile digital divide incorporates adoption discourse, encompassing mobile Internet adoption, function adoption, and application adoption from the technology adoption perspective, with application adoption being particularly typical. Whether various mobile APPs are used has become a hallmark of mobile digital divide, representing an era-specific feature generated after digital divide evolution. This fusion combines micro-level technology adoption research perspectives with macro-level digital divide research perspectives, where psychological factors prominent in technology adoption and social factors prominent in digital divide jointly highlight the tension of mobile digital divide.

3. Influencing Factors of Mobile Digital Divide

This paper categorizes mobile digital divide influencing factors into eight types: demographic, economic, cultural, technical, capability, contextual, psychologi-

cal, and social factors, as shown in Table . These factors have similar but not identical meanings at individual or group levels.

Demographic factors include conventional variables such as gender, age, and occupation, as well as race, nationality, and residential area. Demographic factors are among the most frequently examined variables, evident in research on age divide, gender divide, race divide, global divide, and urban-rural divide.

Economic factors encompass both absolute values of individual or group economic capacity and affordability at the micro level, and the overall economic environment at the macro level. Income is a crucial indicator for measuring economic levels of individuals, households, regions, and even countries. Cost includes mobile device expenses, network access fees, and spending on network services and activities. Socioeconomic status reflects comprehensive economic strength and position of individuals or families as direct influencing factors. Urbanization level, market size, and GDP indirectly affect users' mobile digital behaviors by reflecting regional economic development and consumption levels.

Cultural factors include education level (micro-level personal education, macro-level social quality, education ratios, etc.) and language factors (particularly in racially mixed or immigrant countries where language proficiency serves as a cultural indicator). Notably, Internet experience emerges as a variable absent in traditional digital divide research, encompassing individuals' or households' prior wired or wireless Internet experiences, feelings, and expertise that influence subsequent mobile Internet usage behaviors.

Technical factors comprise device availability (ownership, quantity, type, function, and characteristics of mobile devices, such as differences between feature phones and smartphones), application availability, substitute availability (availability of devices substitutable for mobile devices like fixed telephones and computers), complementary goods availability (availability of devices complementary to mobile devices like wireless Internet services), and infrastructure (communication facilities, network construction, and communication service quantity and quality).

Capability factors include various skills related to mobile ICT skills and literacy. Current research involves: creative ability (capacity to create content expressing group or self-identity, such as expressing ideas in user-generated content or using image editing software); instrumental ability (capacity to use Internet tools like uploading files or searching online); social ability (replying, commenting, sharing, contributing to Wikipedia); and computer keyboard skills.

Contextual factors describe situation-related variables. Due to mobile devices' portability and pervasiveness, usage has become routine and contextualized, showing distinct patterns across work, study, life, and entertainment scenarios. Specific usage needs (including routine and situation-specific needs), purposes, and locations all influence individual or group behaviors.

Psychological factors draw upon innovation diffusion theory and technology

acceptance models to predict mobile device usage behaviors. Beyond perceived usefulness, perceived ease of use, perceived price, perceived value, and perceived popularity of mobile devices and network services, individual personality traits, self-esteem, sense of belonging, and self-identity are also examined. Self-esteem and sense of belonging are social motivations derived from personal needs and desires, typically related to group relationships and others' feedback. Since mobile devices emphasize connection with others, these factors may predict mobile device usage. Innovation interest and willingness refer to personal readiness to adopt new technologies early.

Social factors include guarantees and constraints individuals receive as social members, such as social structure, social norms, social security, and social culture—both tangible and intangible—that collectively shape personal mobile digital behaviors. Social structure relates to indicators like population size, urban-rural population ratios, and age ratios. Social norms, derived from social identity theory, suggest that when people perceive value in group membership, they incorporate group-shared characteristics into their self-concept, making them comply with group norms as reference points for beliefs, attitudes, and behaviors. Social culture exhibits clear regional and ethnic characteristics, such as collectivism and interdependent cultures, and can influence other factors to exert effects.

Overall, compared with traditional digital divide research, current mobile digital divide research on influencing factors primarily represents adaptive validation of traditional factors in new environments and forms, essentially proving that traditional influencing factors continue to create gaps across access, skills, and usage dimensions in mobile contexts. Meanwhile, traditional digital divide factors also affect new characteristics of mobile digital divide such as adoption and usage effects. Additionally, mobile digital divide research begins to examine the roots of usage effects-level differences, incorporating contextual factors and personalized capabilities, treating usage needs, purposes, and locations of mobile digital devices as contextual dimensions, and creativity, instrumental skills, and social ability as capability factors. This approach both continues the macro, meso, and micro factors behind traditional digital divide and innovatively identifies more micro-level factors that profoundly influence digital divide in the mobile era, particularly encompassing psychological characteristics of digital individuals and incorporating micro-level psychological influencing factors of mobile technology adoption behavior into the explanatory variables of mobile digital divide, thereby enriching the digital divide influencing factor system.

This paper focuses on new changes in digital divide research in the mobile era, organizing existing mobile digital divide dimensions into four categories: access divide, skills divide, adoption divide, and usage effects divide. Among these, skills divide, adoption divide, and usage effects divide are the primary research foci, while whether the access divide still exists remains debated. Adoption divide and usage effects divide represent new dimensions of mobile digital divide. The adoption issue has more profound individual impact than access and

skills issues; current research is based on the foundation of mobile Internet access, moving beyond the question of overall presence or absence to focus on micro-level individual differences in mobile technology usage. Mobile digital divide influencing factors extend beyond traditional demographic, economic, social, cultural, and technical factors to include psychological, contextual, and personalized capability considerations.

The emergence of mobile digital divide is an inevitable outcome of the mobile era, differing from traditional digital divide in several aspects. First, **research emphasis differs**: traditional digital divide focuses primarily on access and skills, whereas mobile digital divide emphasizes adoption and usage quality differences, with studies showing that how technology is used matters more than whether it is accessed. Second, **research breadth differs**: mobile devices have brought profound societal transformations and unprecedented phenomena such as “phubbing” and mobile payment, expanding research from computer science, telecommunications, communication studies, and library and information science to psychology, sociology, and management science. Third, **variable relationships are more complex**: mobile digital divide dimensions and their influencing factors are more diversified than traditional ones, with more intricate relationships among variables. Traditional dimensions like access and skills divides are influenced not only by classic factors but also by new mobile-era factors like individual capability, context, and psychology; new mobile digital divide characteristics like adoption and usage quality gaps are shaped by traditional demographic, economic, social, cultural, and technical factors while also being influenced by individual psychology and usage context. Fourth, **research levels differ**: traditional digital divide emphasizes macro-level group inequalities, whereas mobile digital divide includes more micro-level empirical studies focusing on niche groups and even individual differences. Overall, mobile digital divide represents both a deepening of digital divide in new environments and a core indicator in measuring mobile digitalization levels.

With the arrival of the 5G era, society will inevitably develop toward intelligence and efficiency, warranting greater attention to mobile digital divide. Compared with international scholarship, domestic research on mobile digital divide remains limited in both methodology and content. We should view mobile digital divide through the lens of digital equity and development, neither exaggerating nor ignoring it. Although mobile digital divide inherits classic dimensions and influencing factors from traditional digital divide, the mobile era’s collective and individual differences demonstrate diversity and refinement. Studying mobile digital divide can both address traditional digital divide’s limitations in the new era and provide evidence for improving digital inequality and advancing digital China from new perspectives.

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Author Contributions

Yan Hui: Responsible for topic selection, research design, core framework design, and manuscript revision.

Zhang Yuhao: Literature review and initial draft writing.

Han Leiqian: Literature review and initial draft writing.

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

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