
AI translation · View original & related papers at
chinaxiv.org/items/chinaxiv-202405.00157

Analysis of Farmers' Information-Seeking Behavior Toward Digital Inclusion: Population Focus and Practical Concerns Postprint

Authors: Cui Kai

Date: 2024-05-15T00:00:00+00:00

Abstract

Purpose/Significance In the mobile internet era, mobile phones serve as the primary information access tools. This study examines and reveals farmers' information acquisition behavior from the perspective of mobile phone usage, provides insights into the information divide in rural areas, analyzes the characteristics of information acquisition behavior among key demographic groups, and offers implications for improving information acquisition behavior and narrowing the information divide. **Methods/Process** Based on a nationwide rural sampling survey, this study employs principal component analysis and RIF regression analysis methods to measure farmers' information acquisition behavior and identify the effects of key influencing factors on enhancing and improving such behavior. **Results/Conclusion** The "long-tail" group with relatively low evaluation scores in farmers' information acquisition behavior exists among populations such as the elderly and those with education below junior high school level, highlighting the information divide phenomenon in rural areas. The marginal effect of key explanatory variables is more pronounced for groups with evaluation results below the median. Improving mobile phone usage effectiveness among key groups such as the elderly and those with lower education levels makes a significant contribution to narrowing the information divide, which reflects the essential requirement of the digital inclusion concept. On the basis of improving network infrastructure conditions, attention must also be paid to mobile phone function usage and information content acquisition among key groups, strengthening the precision of information supply, activating the information demand of key groups, and enhancing the adaptability of these groups in the digital environment.

Full Text

Preamble

Analysis of Farmers' Information Acquisition Behavior for Digital Inclusion: Group Focus and Practical Concerns

CUI Kai^{1,2}

(1. Rural Development Institute, Chinese Academy of Social Sciences, Beijing 100732; 2. Research Center of Agricultural and Rural Modernization, Rural Development Institute, Chinese Academy of Social Sciences, Beijing 100732)

Abstract: [Purpose/Significance] In the mobile Internet era, mobile phones are the primary tools for information access. This study examines and reveals farmers' information acquisition behavior from the perspective of mobile phone usage, explores the information gap in rural areas, analyzes the characteristics of information acquisition behavior among key groups, and proposes insights for improving information acquisition behavior and narrowing the information gap. [Method/Process] Based on a national-level rural sampling survey, principal component analysis and RIF regression analysis were employed to measure farmers' information acquisition behavior and identify the role of key influencing factors in enhancing and improving this behavior. [Results/Conclusions] The evaluation results of farmers' information acquisition behavior show that a low-scoring "long tail" group exists among the elderly and those with education levels below junior high school, highlighting the information gap phenomenon in rural areas. Key explanatory variables have a more pronounced marginal effect on groups with low evaluation scores (below the median). Improving mobile phone usage effectiveness among key groups such as the elderly and those with lower education levels makes an important contribution to narrowing the information gap, reflecting the essential requirements of the digital inclusion concept. Beyond improving network infrastructure conditions, attention must also be paid to mobile phone function usage and information content acquisition among key groups, strengthening the precision of information supply, activating the information needs of these groups, and enhancing their adaptability in digital environments.

Keywords: digital inclusion; information acquisition; information gap; information demand; digital literacy

1 Literature Review

Individuals perceive and adapt to information environments, exercising subjective agency and utilizing various information resources to engage in information behaviors. In the mobile Internet era, mobile phones are not only technological devices but also important carriers of social resources, becoming a vital means for the masses to express their demands and conduct social activities. Many

studies have begun to focus on the role of mobile phones in network access, adoption, and usage effectiveness among different population groups. Most research examines information acquisition and utilization behaviors in rural areas, with a consistent conclusion being that many farmers still cannot proactively use mobile phones to access information and meet their needs, making it difficult for them to utilize and master these tools. This deficiency in farmers' mobile phone usage behavior stems not only from constraints in individual education levels and information environments but also from disadvantages in feasible capabilities regarding information access and use. The information gap can be traced back to early literature on information inequality, which examined differences in computer and Internet access and penetration among different groups. Information inequality caused by information access, as well as constraints from information resources and assets, are the main manifestations. Information gaps are reflected in mobile phone users' usage and behavioral outcomes, with some groups able to enjoy more complex and advanced mobile software applications. Whether residents can use mobile phones to meet personal needs and optimize behavioral methods and outcomes determines their ability to fully enjoy the information dividends brought by mobile Internet, making it significant to bridge the information gap.

The concept of digital inclusion aims to resolve digital divides and improve the situation of vulnerable groups in the digital age, providing universal and equal access to demand fulfillment. Digital inclusion seeks to achieve an inclusive social form where everyone can access and use modern information technology. In 2019, the International Telecommunication Union defined digital inclusion as ensuring that everyone has equal opportunities and appropriate skills to benefit from digital technologies and systems. Practicing digital inclusion helps address broader social and economic inequality issues and is crucial for promoting economic prosperity and social equality. In the Internet environment, mobile phones and other digital tools facilitate people's lives while also exacerbating information gaps. Advancing digital inclusion means bridging and narrowing information gaps to prevent them from widening. Attention to digital inclusion should not be limited to computers and the Internet but requires a comprehensive examination of individuals' and groups' ability to access information and communication technologies and their capacity to use online content and services.

From the perspective of mobile phone usage behavior, group differences in information acquisition and utilization behaviors are important manifestations of the rural information gap. Since farmers have different demands for information channels and tools, existing literature has paid insufficient attention to farmers' subjective needs and feelings from a combined subjective-objective perspective. Few studies have examined the effectiveness of farmers' mobile phone applications based on large-sample surveys to depict group characteristics. These limitations in understanding micro-level subjective feelings and behavioral grasp have constrained comprehension of important issues such as information acquisition behavior and information gaps. This study combines the background of

widespread mobile phone adoption, examines farmers' information acquisition behavior from the perspective of mobile phone usage, and analyzes the micro characteristics of the information gap in rural areas.

2 Methodology

2.1 Index Design and Evaluation

Farmers' contact with mobile phones and expression through information behaviors reflect their ability to conduct information activities via mobile phones and their perception of information environment adaptability. In interactions with mobile phones, users' subjective cognition and perception are shaped, providing a basis for analyzing individual information behavior differences and the causes of rural information gaps. This study uses principal component analysis to quantify farmers' information acquisition behavior. Regarding the evaluation and measurement of information behavior, while the scope of information behavior is broad, information acquisition is the prerequisite and foundation of information behavior. This study focuses on information acquisition behavior, designing 8 questions to measure farmers' information acquisition behavior. In question design, full consideration is given to individuals' beliefs about their own information acquisition behavior, comprehensively considering existing research attention to information acquisition channels and combining research concerns about information acquisition behavior in the mobile Internet context.

The 8 measurement items in underwent applicability tests, showing a KMO value of 0.7 and significant Bartlett's sphericity test results, indicating suitability for principal component analysis. Three principal components were extracted with variance contribution rates of 45.58%, 18.89%, and 16.15%, respectively, with a cumulative variance contribution rate reaching 80.62%. The weight of each indicator was determined through the principal component analysis method, with normalization processing applied to obtain the final weights and principal component evaluation results detailed in .

2.2 Quantile Regression Analysis

Based on the evaluation results of farmers' information acquisition behavior, this study employs quantile regression methods to identify key explanatory variables affecting information acquisition behavior across different groups. The Recentered Influence Function (RIF) is defined to analyze the differential impacts of individual, household, village, and other level explanatory variables. The unconditional quantile regression model is constructed as:

$$RIF\{y_i, \tau(F_Y)\} = \beta_i X_i + \epsilon_i$$

where X_i represents explanatory variables and ϵ_i is the random disturbance

term. When the statistic τ is selected as inequality indicators such as the Gini coefficient, this analysis can reveal how changes in the average values of different explanatory variables X_i affect group differences. The analysis yields the impacts of explanatory variables on different groups, identifying key groups that should be targeted to narrow the information gap.

2.3 Data Sources

The research data comes from the China Rural Revitalization Survey conducted by the Rural Development Institute of the Chinese Academy of Social Sciences in 2020. The target sample covered 3,600 rural households in 150 townships across 10 provinces. The final collected sample included 3,117 valid farmer samples. Over 90% of farmer households owned at least one 4G/5G mobile phone, with 57.38% having three or more 4G/5G phones. The median of the total sample score was slightly higher than the mean, but the difference between the mean and minimum values was large, indicating many samples with low information acquisition behavior evaluation results. The mean mobile phone usage time was 2.79 hours per day.

3 Evaluation Results of Farmers' Information Acquisition Behavior

Based on the information acquisition behavior evaluation results, comparisons were made across groups with different individual and location characteristics. The density functions after grouping all showed right-skewed distributions, with significant inter-group variations in age and education level. The low-scoring “long tail” group in the evaluation results exists primarily among the elderly and those with education levels below junior high school, highlighting the information gap phenomenon in rural areas.

As shown in , the weights from the principal component analysis indicate that information acquisition tools, self-efficacy evaluation, personal information transmission, and information acquisition satisfaction have relatively high weights. The evaluation results show that the mean is 2.49 with a standard deviation of 0.57. The kernel density map of evaluation results by subgroup is presented in [Figure 1: see original paper].

presents the information gap across different groups using three inequality measures: coefficient of variation, Theil index, and P90/P10 ratio. The results show that the information gap narrows with increased education level but widens with age. While higher household income levels help slightly improve the information gap situation, the gap becomes more pronounced among higher-income groups. The information gap is manifested at both inter-group and intra-group levels, with intra-group differences showing that regardless of the overall sample, there are many farmers with low information acquisition abilities within each group.

These farmer groups, as the “long tail” in the evaluation results, are the key focus for narrowing the rural information gap.

4 Targeting Groups to Narrow the Information Gap

4.1 Factors Influencing the Information Gap

Using quantile regression methods, key explanatory variables affecting information acquisition behavior across different groups were identified. presents the RIF regression results for the information gap measured by the ratio of the 90th to 10th percentiles, 90th to 50th percentiles, and 50th to 10th percentiles. Education level, household income level, mobile phone usage time, and household network conditions maintain high significance. Comparing columns 2 and 3 of , the marginal effects of key explanatory variables such as education level, household income level, and household network conditions are more pronounced for reducing the internal information gap (the ratio of the 50th to 10th percentiles), particularly for groups with low information acquisition behavior evaluation results. Improvements in information acquisition behavior among low-quantile groups contribute more significantly to narrowing the information gap.

The coefficients indicate that each unit increase in mobile phone usage time and improvements in household network conditions have positive effects on reducing the information gap. The marginal effects are more prominent for groups with low evaluation results, meaning that improving mobile phone usage among key groups makes a greater contribution to narrowing the information gap. This supports the digital inclusion concept, requiring active changes to the internal and external constraints facing groups with low information acquisition behavior evaluation results to enable them to equally enjoy the information dividends brought by mobile phones.

4.2 Basic Characteristics of Key Groups

Comparing the basic characteristics at individual, household, and village levels between the low information acquisition behavior evaluation result group (30th percentile) and the overall sample, shows that the key group has primary school education as the main level, with most individuals over 55 years old and lower household income levels. These groups have shorter mobile phone usage times and face difficulties in using information acquisition tools, with lower satisfaction in information acquisition. In behavioral terms, their use of mobile phones for information transmission and social participation is limited, exposing skill gaps and usage gaps in mobile phone utilization.

5 Concern for Information Needs of Key Groups

Affected by age structure, education level, and socio-economic status, farmers with low information acquisition behavior evaluation results often have lower cultural quality and limited social resources, making it difficult to form reasonable information needs. However, this does not mean these groups have no information needs; rather, their insufficient capabilities in information perception and behavior constrain the formation and transformation of information needs.

As the quantile changes, structural changes occur in both mobile phone usage functions and information needs. Among lower quantile groups, the proportion of people using mobile phones primarily for making calls is significantly higher than the full sample, while the proportion using them for chatting and socializing is noticeably lower. This indicates that although mobile phone ownership is widespread, usage effectiveness varies, and ownership does not necessarily represent a match between information acquisition and individual needs. For groups with low information acquisition ability, their information needs generation and behavioral transformation are suppressed.

[Figure 2: see original paper] shows the functions with the most daily use time on mobile phones and the corresponding population proportions across different quantile groups. [Figure 3: see original paper] presents the important information concerned via mobile phones and the corresponding population proportions. As quantiles increase, the proportion of people concerned with real-time news, village affairs, and life knowledge increases significantly. The information needs structure optimization becomes an important manifestation of improved information acquisition behavior. The discussion on information needs of key groups indicates that group differences in information acquisition behavior are closely related to changes in farmers' information needs.

6 Conclusions and Recommendations

Starting from the mobile Internet context, this study quantitatively evaluates farmers' information acquisition behavior and proposes recommendations. Based on national survey research, the findings indicate that the sample contains many farmers with low information acquisition ability, primarily among the elderly and those with education levels below junior high school, highlighting the rural information gap. Key explanatory variables such as education level, mobile phone usage time, household income level, and household network conditions play positive roles in narrowing the information gap. In terms of marginal contributions, key explanatory variables have more prominent effects on groups below the median.

Policy recommendations:

1. **Improve information supply channels and conditions:** On the basis

of improving rural network infrastructure, actively enhance mobile phone usage effectiveness for groups with low education and income levels. Utilize mobile phones and other modern information tools to actively disseminate culture and knowledge, and promote their positive role in village affairs.

2. **Address farmers' own needs and willingness:** Starting from farmers' own needs and willingness, cultivate and enhance user behavioral adaptability and matching. Provide more targeted information that matches villagers' diversified needs for production and life, improving the usefulness and effectiveness of mobile phone usage through precision policies, guidance, and education.
3. **Encourage online participation in village public affairs:** Use digital cultural and entertainment facilities to activate the information needs of elderly groups, encouraging them to experience digital life and communication methods through mobile phones. Enable all villagers to effectively perceive, acquire, and utilize information, particularly addressing the significant deficiencies in using mobile phones for information exchange.

The group corresponding to the 30th percentile is the target for narrowing the information gap. This group is primarily characterized by elementary school education, mostly over 55 years old, with low household income levels, limited information perception, and mobile phone usage confined mainly to basic functions like calling. Achieving digital inclusion requires not only clarifying multi-dimensional information acquisition content but also paying attention to the emotional meaning and content expression reflected in rural communication environments and tool application scenarios.

References

- [1] LI H Y. Mobile phone: The construction of social relations in information exchange—A study on the mobile phone behavior of the new generation of migrant workers[J]. *China youth study*, 2011(5): 60-64, 47.
- [2] SWEETLAND J H. Information poverty—Let me count the ways[J]. *Database*, 1993, 16(4): 8-10.
- [3] van DIJK J. Digital divide research, achievements and shortcomings[J]. *Poetics*, 2006, 34(4/5): 221-235.
- [4] YAN H, ZHANG Y H, HAN L Q. Research advances of mobile digital divides[J]. *Library and information service*, 2021, 65(22): 143-150.
- [5] QIU Z Q, ZHANG S Q, LIU S D, et al. From digital divide to dividend difference—From the perspective of Internet capital[J]. *Social sciences in China*, 2016(10): 93-115, 203-204.
- [6] YUAN L X, SHANG Q. The influence of mobile media on the information

gap in China urban and rural areas—An investigation and analysis based on the information dissemination of mobile media in rural areas[J]. *Modern communication (journal of communication university of China)*, 2012, 34(6): 105-108.

[7] DING J J, ZHAO Q Z. Causes and countermeasures of rural information poverty in Wuling Mountain Area[J]. *Library and information service*, 2014, 58(2): 75-78, 108.

[8] CUI K, FENG X. Rural information dissemination from a supply-demand perspective: A literature review and prospects for research[J]. *China rural survey*, 2017(1): 127-139, 144.

[9] CHEN T, WANG P. Information gap and practical symptoms of digital village construction[J]. *E-Government*, 2020(12): 2-12.

[10] YUN L T. The research of the agriculture information supply problems based on farmers demand perspective[J]. *Journal of modern information*, 2015, 35(10): 27-31, 37.

[11] PARK E A. The smartphone divide and information gaps: Multi-dimensionality of the future divide[J]. *SSRN electronic journal*, 2013, 17(2): 45-57.

[12] LV P S. Digital village and information empowerment[J]. *Social sciences in Chinese higher education institutions*, 2020(2): 69-79, 158-159.

[13] MAY J D. Digital and other poverties: Exploring the connection in four east African countries[J]. *Information technologies & international development*, 2012, 8(2): 33-50.

[14] YE M R. Research on Internet innovation diffusion in rural areas from the perspective of users subjective perception[J]. *Modern communication (journal of communication university of China)*, 2013, 35(4): 116-120.

[15] YU L Z. How poor informationally are the information poor?[J]. *Journal of documentation*, 2010, 66(6): 906-933.

[16] YANG Q Y, LIANG S L, YANG D. Digital inclusion: Practical exploration and experience reference in developed countries[J]. *Information studies: Theory & application*, 2022, 45(3): 194-201.

[17] NEWMAN L, BROWNE-YUNG K, RAGHAVENDRA P, et al. Applying a critical approach to investigate barriers to digital inclusion and online social networking among young people with disabilities[J]. *Information systems journal*, 2017, 27(5): 559-588.

[18] DU P, HAN W T. Digitally inclusive aging society: Connotation, significance, and realization approach[J]. *Journal of Beijing administration institute*, 2023(2): 40-47.

[19] LI X L, LIU D H. Fallacy of the knowledge gap hypothesis: The structural

paradox of knowledge acquisition in social media[J]. *Journalism & communication*, 2018, 25(12): 5-20, 126.

[20] LIN W S, FENG J. A study on the measurement of “digital divide” of urban village residents in Beijing and its influencing factors[J]. *Human geography*, 2021, 36(5): 63-72.

[21] YU L Z. The information worlds of individuals: The discovery and exposition of a concept for information inequality[J]. *Journal of library science in China*, 2013, 39(1): 4-12.

[22] KATZ V S, GONZALEZ C. Toward meaningful connectivity: Using multilevel communication research to reframe digital inequality[J]. *Journal of communication*, 2016, 66(2): 236-249.

[23] PUSPITASARI L, ISHII K. Digital divides and mobile Internet in Indonesia: Impact of smartphones[J]. *Telematics and informatics*, 2016, 33(2): 472-483.

[24] RICE R E, KATZ J E. Comparing Internet and mobile phone usage: Digital divides of usage, adoption, and dropouts[J]. *Telecommunications policy*, 2003, 27(8/9): 597-623.

[25] COMPEAU D R, HIGGINS C A. Computer self-efficacy: Development of a measure and initial test[J]. *MIS quarterly*, 1995, 19(2): 189.

[26] TSETSI E, RAINS S A. Smartphone Internet access and use: Extending the digital divide and usage gap[J]. *Mobile media & communication*, 2017, 5(3): 239-255.

[27] KVASNY L, KEIL M. The challenges of redressing the digital divide: A tale of two US cities[J]. *Information systems journal*, 2006, 16(1): 23-53.

[28] KIM D, CHUN H, LEE H. Determining the factors that influence college students adoption of smartphones[J]. *Journal of the association for information science and technology*, 2014, 65(3): 578-588.

[29] LEE H, PARK N, HWANG Y. A new dimension of the digital divide: Exploring the relationship between broadband connection, smartphone use and communication competence[J]. *Telematics and informatics*, 2015, 32(1): 45-56.

[30] FIRPO S, FORTIN N M, LEMIEUX T. Unconditional quantile regressions[J]. *Econometrica*, 2009, 77(3): 953-973.

[31] ZHU P F, ZHANG Z Y. Unconditional quantile regression: Literature review and empirical example[J]. *Statistical research*, 2012, 29(3): 88-96.

[32] YUAN X H, XIAO Y C. Information accessibility, cognition level and consumer trust of organic agricultural products[J]. *Journal of management*, 2021, 34(5): 92-108.

[33] MAO Y H, PENG A D, HUANG S Q. Comparative study of rural residents information needs and behavior: A case study in Jiangsu Province[J]. *Library and information service*, 2012, 56(12): 49-53, 80.

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

Source: ChinaXiv – Machine translation. Verify with original.