

Capability and Endogenous Motivation: A Grounded-Theory Study of Factors Influencing the Digital Inclusion of Older Adults Migrating with Their Children

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Abstract

Migrating older adults are a special vulnerable group of mobile older adults formed against the backdrop of China's urban-rural dual structure, and their digital inclusion concerns both individual quality of life and inclusive urban governance. This article selects 15 migrating older adults as research participants, collects data through semi-structured interviews, and uses grounded theory to code and analyze the interview materials. The results show that capabilities and endogenous motivation are the two core factors affecting the digital inclusion of migrating older adults. To resolve the difficulties faced by migrating older adults in digital inclusion, it is necessary not only to enhance their capabilities through material and economic assistance, community network support, digital literacy improvement, and health improvement, but also to activate their endogenous motivation by eliminating age bias, reshaping social roles, and reducing family members' substitution of tasks.

Full Text

[Users · Services]

Capability and Endogenous Motivation:

A Grounded-Theory Study of Factors Influencing the Digital Inclusion of Older Adults Migrating with Their Children

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Abstract Older adults who migrate with their children are a special vulnerable group of mobile older people formed against the background of China's urban-rural dual structure. Their digital inclusion is related to individual quality of life and urban inclusive governance. This article selects 15 older adults who migrated with their children as research participants, collects data through semi-structured interviews, and uses grounded theory to code and analyze the interview materials. The results show that capability and endogenous motivation are the two core factors influencing the digital inclusion of these older adults. To overcome their difficulties in digital inclusion, efforts should be made not only to improve their capability through material and economic assistance, community-network support, enhancement of digital literacy, and improvement of health status, but also to activate their endogenous motivation by eliminating age prejudice, reshaping social roles, and reducing family members' doing things on their behalf.

[Keywords] older adults migrating with their children; digital inclusion; capa-

bility; endogenous motivation; grounded theory

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Introduction

The overlapping and interweaving of population aging and digitalization is a prominent feature of China's current social development. Data from the National Bureau of Statistics show that, by 2024, people aged 60 and above accounted for 22.0% of China's total population^[1], indicating that the country has entered a moderately aging society. At the same time, digital technologies are developing rapidly and undergoing iterative renewal, gradually building a highly connected digital society. The deep penetration of digital technology into various sectors and fields of society is reshaping the modes of production and daily life of the public. While "adding intelligence and empowerment" to the construction of a better life, it has also given rise to a series of practical problems. Because of physiological, psychological, and other constraints, the digital divide among older adults has become increasingly prominent; they face the risk of being marginalized or even excluded from the development process of digital society, becoming the most typical vulnerable group in that society. Accelerating the digital inclusion of vulnerable older groups has become an urgent practical issue for China in implementing active aging and healthy aging.

Older adults who migrate with their children, also known as the "elderly drifter" group, are a special vulnerable group of mobile older people formed during the transformation of China's urban-rural dual structure. In recent years, with the acceleration of China's urbanization process and the increasing normalization of population mobility, together with the arrival of marriage and childbearing peaks among those born in the 1980s, 1990s, and 2000s, large numbers of older people have left their registered places of residence for reasons such as caring for grandchildren and aging in another locality. They move with their children to the cities where the children have settled, forming "new three-generation families" or "temporary stem families," and displaying a family pattern of cross-regional co-residence. In the entirely new field of urban life, they face multiple difficulties involving physical and mental health, family relations, urban adaptation, and social integration; among these, difficulties in digital inclusion are especially prominent against the background of digital social transformation. Compared with older adults left behind in their places of origin, after entering cities these migrating older adults directly confront highly digitized living spaces, smart products, and public-service scenarios, and it is difficult for them to detach themselves from a digitalized living environment. Compared with

local urban older adults, they have fewer opportunities to encounter digital scenarios and to use digital products and public services, and their foundation for digital inclusion is inherently weak^[2]. The difficulties faced by these older adults in digital inclusion not only directly constrain the satisfaction of basic daily-life needs such as consumption, transportation, and medical treatment, but also profoundly affect their degree of social participation and the establishment of a sense of urban belonging; they are also an important inducement that aggravates other difficulties.

Based on this, this article takes older adults who migrate with their children as the research object, collects data through semi-structured interviews, and uses grounded theory to code and analyze the interview materials. It deeply explores the key factors affecting the digital inclusion of these older adults and, on this basis, discusses targeted digital-inclusion strategies, in order to provide a reference for overcoming their difficulties in digital inclusion and for promoting urban inclusive governance and active aging work.

1 Research Design

1.1 Research Methods

Grounded theory is a bottom-up qualitative research method. It gradually extracts and abstracts concepts from existing empirical materials, then summarizes categories by establishing associations among concepts, thereby generating a theoretical analytical framework^[3]. This theory was first proposed by Barney Glaser and Anselm Strauss

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proposed in the 1960s and was later further revised and refined by Juliet Corbin and others^[4]. The core of grounded-theory analysis lies in repeatedly and continuously coding and organizing research materials, mainly including three stages: open coding, axial coding, and selective coding. After coding is completed, the logical connections among original statements, concepts, subcategories, main categories, core categories can be clearly presented, on the basis of which researchers can construct a new theoretical analytical framework and theoretical model. To ensure the completeness and rigor of the theory, it is often necessary to reserve part of the materials for testing theoretical saturation, until no new concepts or categories emerge.

1.2 Research Subjects and Interview Design

1.2.1 Research Site

To gain an in-depth understanding of the digital inclusion of migrant-accompanying older adults, the author selected Haiyuan Community in Kunming as the research site. Haiyuan Community is located in the suburbs of Kunming. Within its jurisdiction, there are many migrant-accompanying older adults from diverse places of origin, whose main characteristics are cross-regional inflow from rural household-registration areas and caring for grandchildren; the group is therefore relatively representative. The community has dense digital-application scenarios, and the difficulties faced by migrant-accompanying older adults in digital inclusion are pronounced, giving it the characteristics of a typical research setting. At the same time, the community showed a high degree of cooperation, making fieldwork convenient and sample acquisition accessible. In addition, as Kunming is a major population-inflow city in Yunnan Province, the conclusions of this study have certain reference value for similar cities in Southwest China.

1.2.2 Research Sample

On the basis of determining the research site, the author conducted semi-structured interviews from September to November 2025 with migrant-accompanying older adults in three residential compounds under the jurisdiction of the community. Among them, one compound each was selected from high-, medium-, and low-end residential communities, with five interviewees from each, for a total of 15 interviewees. The inclusion criteria for the sample were: aged 60 or above; rural place of origin and non-local household registration; having lived in the destination city for at least half a year; clear consciousness, normal communication ability, and voluntary participation in the interview. Each interview lasted 30–45 minutes. This study used snowball non-probability sampling to identify interviewees. Existing interviewees recommended potential research participants with similar backgrounds who were willing to be interviewed, and the sample size was gradually expanded in this way until information saturation was reached. Ultimately, 15 valid interviewees were identified. Their basic information is shown in Table 1.

Table 1 Basic Information of Interviewees

Code	Gender	Age/years	Duration of Migra- tion/years	Inflow Identity	Migration Pattern	Occupation Before Migra- tion
N1	Female	62	6	Paternal grand- mother	Migrated alone	Farmer

Code	Gender	Age/years	Duration of Migration/years	Inflow Identity	Migration Pattern	Occupation Before Migration
N2	Female	65	2	Maternal grand- mother	Migrated alone	Farmer
N3	Female	71	5	Paternal grand- mother	Migrated alone	Farmer
N4	Male	74	3	Maternal grandfa- ther	Couple mi- grated to- gether	Retired teacher
N5	Female	63	1	Paternal grand- mother	Migrated alone	Farmer
N6	Male	62	4	Paternal grandfa- ther	Migrated alone	Worker
N7	Female	64	6	Paternal grand- mother	Migrated alone	Farmer
N8	Female	75	5	Maternal grand- mother	Migrated alone	Farmer
N9	Male	73	6	Paternal grandfa- ther	Migrated alone	Farmer
N10	Female	68	5	Paternal grand- mother	Migrated alone	Self- employed house- hold
N11	Female	69	9	Paternal grand- mother	Migrated alone	Farmer
N12	Male	63	4	Paternal grandfa- ther	Migrated alone	Farmer
N13	Female	62	5	Paternal grand- mother	Couple mi- grated to- gether	Self- employed house- hold

Code	Gender	Age/years	Duration of Migra- tion/years	Inflow Identity	Migration Pattern	Occupation Before Migra- tion
N14	Male	70	8	Paternal grandfa- ther	Migrated alone	Farmer
N15	Female	63	10	Paternal grand- mother	Couple mi- grated to- gether	Farmer

1.3 Basis and Outline of Interview Design

1.3.1 Design Basis

The interview outline was systematically designed on the basis of findings from the literature^[5-20], in combination with real-world characteristics, research questions, the research paradigm, and practical feasibility. Specifically, the overall interview framework was determined by drawing on literature related to digital inclusion among older adults; interview content was set in light of the mobility attributes of migrant-accompanying older adults and urban digitalization scenarios; and the design closely focused on the core questions of this study. At the same time, following the grounded-theory research logic of “bottom-up inquiry without preset theory,” the study adopted accessible, open-ended, and progressive interview questions, providing authentic and rich original research materials for subsequent coding analysis, category refinement, and theoretical construction.

1.3.2 Interview Outline

This study developed a semi-structured interview outline around dimensions including the basic information of migrant-accompanying older adults, use of smart devices, level of digital skills, real-life integration difficulties, help-seeking channels, willingness to learn, and training needs. The outline mainly used open-ended questions to comprehensively collect interviewees’ digital inclusion the current situation, behavioral characteristics, and deeper influencing factors (see Table 2).

Table 2 Semi-Structured Interview Outline

No.	Interview question
1	How old are you this year? How long have you lived in Kunming?
2	Are you currently using a smartphone or a senior phone? Which functions do you commonly use in daily life?
3	In terms of purchasing devices, paying phone bills and data fees, and repairing devices, do you experience financial pressure?
4	Which digital operations can you complete independently, and which still require help from others?
5	What are your main channels for learning digital skills, and how effective has the learning been?
6	What is the greatest difficulty you encounter when using digital devices?
7	When you encounter digital problems, whom do you usually ask for help? Do family members mostly do it directly for you, or do they use the opportunity to teach you how to operate it?
8	Are you willing to take the initiative to learn new digital skills? What are your main concerns?
9	Do you think improving digital skills is important for integrating into urban life?
10	If relevant training were offered, what content would you most like to learn, and what suggestions would you have?

2 Grounded Analysis of the Digital Inclusion of Elderly Migrants Accompanying Their Families

2.1 Open Coding

The author first randomly selected 12 of the 15 interviewees and organized the interview recordings into textual materials. Then, according to the principles of open coding, the corpus texts were repeatedly read and interpreted; meaningless sentences were deleted and abstract concepts were extracted. After removing low-frequency and repetitive concepts, a total of 39 initial concepts were obtained. Finally, the 39 initial concepts were further sorted and integrated, yielding 19 subcategories. The open-coding results are shown in Table 3.

Table 3 Examples of Partial Open-Coding Results

Subcategory	Initial concept	Example original statement
A1 Digital device acquisition	a1 Ability to purchase new devices	“This one is a new phone I bought last year for more than 2,000 yuan; it does not lag at all when I use it” (N10)
A1 Digital device acquisition	a2 Dependence on second-hand devices	“I used to use a senior phone all the time; after my daughter changed to a new phone, she simply left her old phone for me to use” (N5)
A1 Digital device acquisition	a3 Ability to afford Internet fees	“Video calls and scrolling through Douyin use too much data; one month my phone bill was even higher than my son’ s” (N9)

Subcategory	Initial concept	Example original statement
A2 Digital-use costs	a4 Device maintenance costs	“When using a phone in daily life, problems such as lagging and the battery draining too quickly often occur. I neither know how to clean up and debug it nor understand basic repairs, so I can only bother my family to help handle it. When the problem is serious, I still have to pay someone to repair it; if it really cannot be used, I can only replace it with a new phone” (N2)
A2 Digital-use costs	a5 Pension support	“I have a bit of pension every month; it is enough for buying a phone and paying Internet fees, so I do not need to bother my children” (N4)
A3 Economic stability	a6 Dependence on basic old-age pension	“My hometown is in the countryside; my stable monthly income is the state pension of less than 200 yuan paid every month” (N1)
A3 Economic stability	a7 Dependence on children’ s financial support	“They give me some money every week to buy vegetables and snacks for the children; if there is no money for phone bills, I also ask my son to top it up” (N7)
...	...	...

Subcategory	Initial concept	Example original statement
A17 Frequency range of proxy assistance	a34 High-frequency proxy-assistance behavior	“Paying phone bills, taking taxis, buying tickets online—these operations are all handled by my son for me; I completely do not know how to operate them myself” (N11)
A18 Adaptation of proxy-assistance methods	a35 Dependence on full-process proxy assistance	“From buying the phone to installing all kinds of apps, my family members help with everything. I neither have to worry about it nor can I learn how to operate it” (N7)
A18 Adaptation of proxy-assistance methods	a36 All-inclusive proxy assistance	“My son is afraid I will make operational mistakes, so he adjusts all the phone settings in advance. I only use it to answer calls, and he will not let me touch the other functions” (N12)
A18 Adaptation of proxy-assistance methods	a37 Guided proxy assistance	“When my grandson teaches me to use the phone, he first demonstrates once, then lets me try it myself. If I make a mistake, he corrects me; gradually I learn it” (N4)
A19 Psychology of dependence on proxy assistance	a38 Actively seeking proxy assistance	“I cannot shop online. I usually ask the neighbor next door to buy things for me, and after I receive the items I give him the money” (N9)

Subcategory	Initial concept	Example original statement
A19 Psychology of dependence on proxy assistance	a39 Passively accepting proxy assistance	“My children say I cannot learn it, so they directly handle things on the phone for me. I am also too lazy to learn; in any case, there has always been someone to help handle them” (N14)

2.2 Axial Coding

According to the research objectives and the logical associations among the subcategories, this study further refined and integrated the subcategories on the basis of sorting and induction. Ultimately, seven main categories were identified: economic conditions, community networks, digital literacy, health status, age bias, role regression, and family substitution. The results of axial coding are shown in Table 4.

Table 4 Results of Axial Coding

Main Category	Subcategory	Category Connotation
B1 Economic conditions	A1 Digital-device acquisition	Older adults' financial support capacity for purchasing, using, and routinely maintaining digital devices directly affects their conditions for terminal access, long-term device-use costs, and level of economic security; it is the material foundation for digital inclusion.

Main Category	Subcategory	Category Connotation
B1 Economic conditions	A2 Cost of digital use	Older adults' financial support capacity for purchasing, using, and routinely maintaining digital devices directly affects their conditions for terminal access, long-term device-use costs, and level of economic security; it is the material foundation for digital inclusion.
B1 Economic conditions	A3 Economic stability	Older adults' financial support capacity for purchasing, using, and routinely maintaining digital devices directly affects their conditions for terminal access, long-term device-use costs, and level of economic security; it is the material foundation for digital inclusion.
B2 Community networks	A4 Community digital support	The social capital, support networks, and digital atmosphere of the communities in which older adults live provide social support for their digital inclusion through neighborhood assistance, guidance by opinion leaders, community activities, and other forms.

Main Category	Subcategory	Category Connotation
B2 Community networks	A5 Guidance by opinion leaders	The social capital, support networks, and digital atmosphere of the communities in which older adults live provide social support for their digital inclusion through neighborhood assistance, guidance by opinion leaders, community activities, and other forms.
B2 Community networks	A6 Community digital atmosphere	The social capital, support networks, and digital atmosphere of the communities in which older adults live provide social support for their digital inclusion through neighborhood assistance, guidance by opinion leaders, community activities, and other forms.
B3 Digital literacy	A7 Basic operational skills	The digital-operation, technology-application, and information-processing abilities that older adults develop through accumulated education constitute the core skill support for their use of digital technologies.

Main Category	Subcategory	Category Connotation
B3 Digital literacy	A8 Information-processing ability	The digital-operation, technology-application, and information-processing abilities that older adults develop through accumulated education constitute the core skill support for their use of digital technologies.
B3 Digital literacy	A9 Adaptation to digital learning	The digital-operation, technology-application, and information-processing abilities that older adults develop through accumulated education constitute the core skill support for their use of digital technologies.
B4 Health status	A10 Physiological functional status	The physiological conditions that support older adults' learning and use of digital technologies—including physiological functioning, ability to care for themselves in daily life, and a stable state of health—constitute the bodily guarantee for their digital inclusion.

Main Category	Subcategory	Category Connotation
B4 Health status	A11 Ability for daily self-care	The physiological conditions that support older adults' learning and use of digital technologies—including physiological functioning, ability to care for themselves in daily life, and a stable state of health—constitute the bodily guarantee for their digital inclusion.
B4 Health status	A12 Health sustainability	The physiological conditions that support older adults' learning and use of digital technologies—including physiological functioning, ability to care for themselves in daily life, and a stable state of health—constitute the bodily guarantee for their digital inclusion.
B5 Age bias	A13 Internalization of stereotypes	Age stereotypes about older adults formed by society, as well as negative cognitions internalized by older adults themselves—such as self-denial and insufficient confidence in learning—are core psychological factors that inhibit their willingness for digital inclusion.

Main Category	Subcategory	Category Connotation
B5 Age bias	A14 Sense of self-efficacy	Age stereotypes about older adults formed by society, as well as negative cognitions internalized by older adults themselves—such as self-denial and insufficient confidence in learning—are core psychological factors that inhibit their willingness for digital inclusion.
B6 Role regression	A15 Regression of social roles	After retirement, older adults experience regression of social roles, changes in levels of life needs, and intergenerational social estrangement, which lead to low perceived digital needs and weak willingness to be included, thereby affecting their initiative in digital inclusion.
B6 Role regression	A16 Adaptation of life needs	After retirement, older adults experience regression of social roles, changes in levels of life needs, and intergenerational social estrangement, which lead to low perceived digital needs and weak willingness to be included, thereby affecting their initiative in digital inclusion.

Main Category	Subcategory	Category Connotation
B7 Family substitution	A17 Frequency and scope of substitution	The frequency and manner in which children and other relatives handle digital affairs on behalf of older adults, together with older adults' own dependency psychology, can easily cause them to form passive habits over the long term, weaken their willingness for autonomous learning, and inhibit the endogenous motivation for digital inclusion.
B7 Family substitution	A18 Adaptation of substitution methods	The frequency and manner in which children and other relatives handle digital affairs on behalf of older adults, together with older adults' own dependency psychology, can easily cause them to form passive habits over the long term, weaken their willingness for autonomous learning, and inhibit the endogenous motivation for digital inclusion.

Main Category	Subcategory	Category Connotation
B7 Family substitution	A19 Dependency psychology regarding substitution	The frequency and manner in which children and other relatives handle digital affairs on behalf of older adults, together with older adults' own dependency psychology, can easily cause them to form passive habits over the long term, weaken their willingness for autonomous learning, and inhibit the endogenous motivation for digital inclusion.

2.3 Selective Coding

On the basis of inductively forming seven main categories, this study further clarified the logical threads through selective coding and ultimately distilled two core categories: feasible capability and endogenous motivation. The results of selective coding are shown in Table 5.

Table 5 Results of Selective Coding

Core Category	Action Path	Path Relationship	Connotation of the Action Path
Feasible capability	Economic conditions → feasible capability	Constructive relationship	Economic conditions provide the material foundation for feasible capability. The accessibility of digital devices and the cost of digital use directly determine the threshold for older adults' digital access and the sustainability of their use.
Feasible capability	Community networks → feasible capability	Constructive relationship	Community networks provide social support for feasible capability. Community digital support, guidance by opinion leaders, and the community digital atmosphere promote older adults' access to digital-technology assistance and learning opportunities.

Core Category	Action Path	Path Relationship	Connotation of the Action Path
Feasible capability	Digital literacy → feasible capability	Constructive relationship	Digital literacy provides skill support for feasible capability. Basic operations, information-processing ability, and related factors directly determine the efficiency and effectiveness of older adults' use of digital technologies.
Feasible capability	Health status → feasible capability	Constructive relationship	Health status provides bodily security for feasible capability. Physiological functioning and ability for daily self-care determine the sustainability of older adults' digital learning and device use.
Endogenous motivation	Age bias → endogenous motivation	Causal relationship	Age bias inhibits endogenous motivation. Internalization of stereotypes and insufficient self-efficacy weaken older adults' subjective initiative in digital learning.

Core Category	Action Path	Path Relationship	Connotation of the Action Path
Endogenous motivation	Role regression → endogenous motivation	Causal relationship	Role regression reduces endogenous motivation. Loss of roles and low perceived needs reduce older adults' recognition of the necessity of digital inclusion.
Endogenous motivation	Family substitution → endogenous motivation	Causal relationship	Family substitution weakens endogenous motivation. Long-term substitution can easily foster dependency psychology, thereby inhibiting older adults' willingness for autonomous learning and their initiative in digital inclusion.

2.4 Saturation Test

After completing the three stages of coding, in order to test whether the theory had reached saturation, this study additionally invited one university teacher to conduct independent coding analysis of the remaining three interview texts. The results show that what was extracted from the remaining texts

These concepts could all be incorporated into the existing coding system; no new concepts, categories, or associative relationships emerged. It was therefore determined that the coding obtained had reached a state of saturation.

3 Analysis of Factors Influencing the Digital Inclusion of Older Adult Migrants

This paper uses grounded theory to code the interview content level by level. By sorting out the contextual relationships among original statements, concepts, subcategories, main categories, and core categories, it constructs a theoretical analytical framework for the digital inclusion of older adult migrants (see Figure 1). As can be seen from the figure, capability and endogenous motivation are the two key factors affecting the digital inclusion of older adult migrants. Capability focuses on individuals' "substantive freedom" and "functional activities"; it is the substantive freedom to realize combinations of multiple functional activities^[21]. Its core lies not in "more" but in "substance," aiming to expand people's substantive freedom^[22]. "Endogenous motivation," meanwhile, derives from individuals' internal needs and autonomous willingness. It is manifested as the subjective driving force by which individuals, based on their own values and developmental goals, independently choose their lifestyles and development paths.

Older adults' digital capability includes digital cognitive ability, digital participation ability, and digital living ability, reflecting their freedom of action and substantive equality in the interwoven contexts of a digital society and an aging society^[23]. The digital inclusion of older adults embodies their opportunities, willingness, and ability to participate digitally^[24]. In essence, it is an important functional activity through which older adults obtain information, experience services, and participate in social life within digital society. The degree to which it is realized depends not only on external resources and personal conditions, but is also constrained by individual motivation, willingness, and psychological state. J. A. G. M. van Dijk^[25] pointed out that older adults' digital abilities include such dimensions as psychological acceptance of digital technology, physical possession, skill access, and diversified use. Amartya Sen also emphasized that capability and endogenous motivation are open concepts that need to be constructed in relation to specific contexts^[26].

On this basis, combining the actual circumstances of older adult migrants with grounded-theory analysis, this paper constructs a capability set influencing the digital inclusion of older adult migrants from four aspects: economic conditions, community networks, digital literacy, and health status. It also constructs an endogenous-motivation set for the digital inclusion of older adult migrants from three aspects: age bias, role regression, and family members acting on their behalf. Capability belongs to objective resources and personal conditions, determining "whether one can be included"; endogenous motivation belongs to psychological cognition and behavioral willingness, addressing the questions of "whether one is willing to be included" and "whether effective transformation can be achieved."

Figure 1. Theoretical analytical framework for the digital inclusion of older adult migrants

Visible labels in the figure: “Digital inclusion of older adult migrants”; “Capability”; “Endogenous motivation”; “Moderating relationship”; “Activating relationship”; under capability: “Economic conditions,” “Community networks,” “Digital literacy,” “Health status”; under endogenous motivation: “Age bias,” “Role regression,” “Family members acting on their behalf.”

3.1 Capability: The Set of Objectively Existing Resources and Conditions of Older Adult Migrants

3.1.1 Economic conditions provide the material foundation for capability Economic conditions such as the accessibility of digital devices and the cost of digital use directly determine the threshold for older adults’ digital access and the sustainability of their use. The purchase, daily use, and subsequent maintenance of digital devices all generate corresponding expenses, while network packages and communication fees also require long-term continuous investment. Limited by economic conditions, most older adult migrants find it difficult to afford, or are subjectively unwilling to bear, the additional expenditures of digital life. For example, “My hometown is in the countryside, and my only stable monthly income is the pension of less than 200 yuan issued by the state each month” (N1). It can thus be seen that the inability to pay or insufficient willingness to consume brought about by economic constraints largely restricts the accessibility of digital inclusion for older adult migrants.

3.1.2 Community networks provide social support for capability By constructing diversified support networks and a positive learning atmosphere, community networks provide key social support for the digital inclusion of older adults and directly affect the availability and convenience of their digital learning. The interviews found that neighborhood mutual assistance, the guidance of opinion leaders, and participation in digital activities within communities have formed a mutually supportive and scenario-based environment that facilitates digital inclusion. In particular, the digital-activity practices of peer groups can stimulate older adult migrants’ active willingness to learn so as “not to fall behind.” At the same time, because rural-urban mobility has led to the rupture of older adult migrants’ original social networks, new community networks happen to fill this gap. The emotional support and technical assistance they provide help alleviate feelings of digital loneliness and frustration in learning. For example, “Grandma Zhang next door knows how to use a mobile phone better than I do. Last time I didn’ t know how to connect to Wi-Fi, and she came over to help me set it up” (N3).

3.1.3 Digital literacy provides skills support for capability Digital literacy is the key link connecting economic conditions and community networks and promoting digital-inclusion behavior. It can positively regulate the sense of gain among older adults with weak digital literacy and positively regulate the participation of older adults with high digital literacy[²⁷]. Without support from core skills, even sufficient economic security and social support are difficult

to transform into effective digital-inclusion practice. The interviews found that some older adult migrants have skills deficiencies such as difficulty with registration and login operations and an inability to distinguish online fraud from pop-up advertisements. They can only use basic functions such as answering and making phone calls and receiving messages, making it difficult to achieve deep digital inclusion. For example, “Turning on the phone is still all right, but I don’t know how to register or log in. Important passwords have to be written down in a little notebook and typed in while looking at it” (N1). It is not difficult to see that insufficient digital skills directly limit the autonomy and depth of older adult migrants’ digital inclusion, affecting their ability to use digital tools to meet daily needs and achieve social participation.

3.1.4 Health status provides physical 保障 for capability Health status is the physiological basis for older adults’ digital learning and use. Physiological functions such as vision, memory, and reaction ability directly affect the accuracy with which older adults operate digital devices; the ability to take care of oneself in daily life determines whether older adults can independently carry out digital learning; and the sustainability of health is related to older adults’ digital...

duration and stability of digital use. The interviews found that health problems—such as blurred vision making it difficult to read text on a mobile phone, forgetting operations immediately after being taught, and feeling dizzy after looking at a phone for a long time—are important physical factors constraining the digital inclusion of older adults who have moved with their families. For example, “My eyesight is very poor. Even when I set the phone font to the largest size, I still cannot see it clearly. After scrolling for a while my eyes hurt, so I can only use it less” (N8). Thus, the decline of physiological functions has become an important constraint on digital learning and operation among these older adults.

3.2 Endogenous motivation: Motivational and regulatory mechanisms at the subjective level among older adults who have moved with their families

3.2.1 Age bias suppresses endogenous motivation Age bias directly reduces older adults’ initiative and persistence in digital learning by internalizing stereotypes, triggering digital anxiety, and weakening self-efficacy; it is the core psychological factor suppressing the endogenous motivation for older adults’ digital inclusion. Relevant studies show that older adults’ cognition plays an important mediating role among external stimuli, usable capabilities, and the outcomes of participatory behavior[28], thereby affecting their willingness to participate digitally. The interviews found that some older adults who had moved with their families held a self-identity as “outdated people who cannot learn new things when old,” regarded smartphones as belonging exclusively to the young, and psychologically denied the possibility of their own digital learn-

ing. For example, “I’m old now, and learning things is hard. Those functions on the phone are too complicated. I definitely cannot learn them, so I might as well not use them” (N1). This profoundly reflects that age bias and fear of technology together constitute a psychological barrier hindering the digital inclusion of older adults who have moved with their families.

3.2.2 Role regression reduces endogenous motivation Role regression directly reduces older adults’ endogenous motivation for digital inclusion by weakening their perception of digital needs and intensifying social isolation. After retirement, older adults who have moved with their families leave the work setting, and their original digital skills gradually deteriorate due to a lack of usage scenarios; at the same time, urban-rural mobility disrupts their original social networks, while social circles in the new city have not yet been established, creating a predicament of digital social isolation. For example, “After coming to the city, I don’t know anyone, and I don’t know how to use WeChat. Even contacting old friends is difficult” (N15). This indicates that role weakening and insufficient perception of needs directly undermine the internal drive of older adults who have moved with their families to actively participate in digital life. Coupled with the superimposed effect of social isolation, they lack the internal impetus for digital inclusion.

3.2.3 Family members acting on their behalf weakens endogenous motivation When family members handle everything for them, older adults are deprived of opportunities to practice operating digital devices independently, which reinforces psychological dependence and thereby directly weakens their endogenous motivation for digital inclusion. The interviews found that family members’ assistance shows characteristics of whole-process and high-frequency substitution. From purchasing mobile phones and installing applications to paying phone bills, hailing rides online, and buying tickets, some older adults who have moved with their families rely entirely on family members to handle digital operations for them, gradually forming a passive dependent mentality of “if someone helps me, I do not need to learn.” For example, “Operations such as paying phone bills, hailing rides, and buying tickets online are all handled by my son for me. I completely do not know how to do them myself” (N11). It can thus be seen that long-term substitution by family members continuously erodes the endogenous motivation of older adults who have moved with their families to learn actively and operate digital tools independently. The key to digital inclusion lies in practice. Older adults are not merely passively adapting to intelligent technologies; rather, they also hope to be able to use digital media independently to participate in daily life. Although family members acting on their behalf can temporarily meet older adults’ digital needs, it deprives them of opportunities to improve skills and accumulate confidence through practice. Once older adults become accustomed to having others act on their behalf, their willingness to learn independently gradually disappears; even if they possess the basic conditions of capability, these are still difficult to transform into actual

digital inclusion behavior.

4 Research conclusions and recommendations

4.1 Research conclusions

Taking older adults who have moved with their families in Haiyuan Community, Kunming, as the research subjects, this study uses grounded theory to conduct qualitative analysis and reveals the deep mechanisms of their digital inclusion. The following conclusions are drawn. First, capability is the foundational constraint and resource-support system for the digital inclusion of older adults who have moved with their families. Capability is jointly constituted by economic conditions, community networks, digital literacy, and health status. These respectively determine the practical threshold, behavioral foundation, and sustainability of older adults' digital inclusion from the levels of material accessibility, social support, skill reserves, and physiological 保障; they are the prerequisite conditions for the occurrence of digital behavior among older adults who have moved with their families. Second, endogenous motivation is the key regulatory and activating mechanism through which capability is transformed into digital inclusion behavior. Endogenous motivation is mainly manifested in insufficient self-efficacy caused by age bias, weakened needs resulting from the regression of social roles, and behavioral dependence formed through excessive substitution by family members. Together, these suppress the willingness to learn, reduce motivation to participate, and significantly affect the efficiency with which resources and capabilities are converted. Third, capability and endogenous motivation do not exert one-way effects; rather, they display a relational pattern of bidirectional mutual construction and cyclical reinforcement. Stronger capability helps enhance confidence and activate motivation; sufficient endogenous motivation can, in turn, promote skill learning, resource acquisition, and capability improvement. The two jointly determine the level of digital inclusion. Fourth, the predicament of digital inclusion among older adults who have moved with their families is the result of the dual superposition of insufficient capability support and the absence of endogenous motivation activation. Compared with local urban older adults and older adults left behind in their places of origin, those who have moved with their families are at a breaking point between urban and rural contexts and in a period of social-network reconstruction. They must adapt to high-density urban digital scenarios, yet they lack stable support systems and prior digital accumulation. With the additional effects of physiological decline and age stereotypes, they are more likely to fall into a vicious cycle of "weak capability, low motivation, and low participation," presenting more prominent barriers to digital inclusion.

4.2 Recommendations

Older adults' individual characteristics and the social environment in which they are situated jointly shape their level of digital inclusion[29]. To resolve the digital-inclusion predicament of older adults who have moved with their families,

it is necessary to act precisely from two major aspects: enhancing capability and activating endogenous motivation. Through empowerment and the activation of subjectivity[30], a comprehensive, multi-level support system for digital inclusion should be constructed. As the size of China's older population continues to grow, the role of public libraries in meeting older adults' cultural needs and promoting their social participation has become increasingly prominent[31]. Based on the practical needs of older adults who have moved with their families, this study proposes the following targeted recommendations from the perspective of public libraries.

- (1) Enhance capability and consolidate the foundational support for digital inclusion.

Grounded in the public-welfare service role and cultural-front function of public libraries, these efforts should be advanced collaboratively in four areas: material assistance, community support, skills training, and health adaptation. Relying on the public-welfare platform of libraries, social forces should be mobilized to provide public-interest services for smart devices, including device adaptation, debugging and maintenance, and guidance on using affordable communication packages, so as to make up for shortcomings in hardware equipment and digital access. Age-friendly public cultural spaces can be used to build neighborhood mutual-aid platforms, establish neighborhood mutual-aid groups and senior learning groups, and compensate for the rupture of older migrants' original social networks. Libraries should give full play to their strengths in information-literacy education, provide hierarchical and categorized guidance for older migrants, and carry out three levels of digital literacy and skills training—basic, advanced, and enhancement—according to need[32], helping them internalize digital skills into digital capabilities[33]. Library digital services should also be organically integrated with health services for older adults, embedding services such as eye-use and eye-care guidance, fatigue-prevention popular science, and health-information inquiry, thereby alleviating use constraints caused by physiological decline and ensuring the sustainability of older migrants' digital learning.

- (2) Activate endogenous motivation and cultivate older migrants' subjective willingness to integrate independently. The essence of digital inclusion for older adults lies in the realization of their subjectivity in digital society. Advancing this process requires a shift from rigid technological penetration to the flexible internalization of technology acceptance, strengthening subject cultivation and activating endogenous motivation[34]. Public libraries should rely on their functions of cultural empowerment and social service and proceed from three aspects: cognitive guidance, role reshaping, and family feedback. By making use of library publicity platforms, they should break the stereotype that "when one is old, one cannot learn," build trust between older adults and digital technology[35], and enhance their sense of self-efficacy. Through library volunteers and reading-promotion platforms, outstanding older migrants should be recruited to

serve as digital ambassadors, reshaping their social roles and value identification through service. Family digital classrooms should be organized to guide children to shift from doing everything on behalf of their parents to companion-based teaching, thereby creating a supportive family environment.

- (3) Improve collaborative mechanisms and build a long-term service system. Libraries should incorporate digital-inclusion services for older migrants into normalized age-friendly service programs, actively link up with enterprises, educational institutions, research bases, hospitals, and other social actors, and build a multi-actor collaborative mechanism[36]. By providing continuous, systematic, and precise information services, all parties can jointly form a positive interaction of “capability enhancement—endogenous motivation strengthening—further capability enhancement” [37]. At the same time, libraries should continuously optimize their spatial facilities and curriculum design, establish a closed-loop mechanism of “needs collection—service provision—effect feedback,” and develop libraries into learning bases for the digital inclusion of older migrants.

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Capability and Endogenous Motivation: A Grounded Theory Study on Influencing Factors of Digital Integration of Migrant Elderly

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Abstract Migrant elderly are a special vulnerable group of mobile elderly formed by China's urban-rural dual structure, and their digital integration is critical to individual quality of life and urban inclusive governance. This study selected 15 migrant elderly as research subjects, collected data through semi-structured interviews, and conducted coding analysis on the interview corpus using grounded theory. The results show that capability and endogenous motivation are the two core factors affecting the digital integration of migrant elderly. To address the predicament of their digital integration, efforts should be made to improve capability through material and economic support, community network assistance, digital literacy enhancement, and health condition improvement, and to activate endogenous motivation by eliminating age bias, reshaping social roles, and reducing family substitution.

Keywords Migrant elderly; Digital integration; Capability; Endogenous motivation; Grounded theory

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Algorithmic Profiling and Privacy Safeguarding: Research on Influencing Factors and Path of User Privacy Boundaries in Library Intelligent Services

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Abstract Exploring the factors influencing user privacy boundaries in library intelligent services in the era of digital intelligence helps safeguard users' privacy rights and improve the quality of intelligent services. This study constructs a conceptual model based on Communication Privacy Management (CPM) theory and adopts the fuzzy-set Qualitative Comparative Analysis (fsQCA) method to analyze the factors influencing user privacy boundaries in library intelligent services. The study finds that user privacy boundaries are influenced by multiple factors, including privacy value orientation, perceived privacy risk, perceived privacy control, algorithm appreciation, algorithm aversion, algorithm bias, and privacy policy. Among these, perceived privacy control is a key variable influencing user privacy boundaries in library intelligent services. User privacy boundary management strategies exhibit diverse characteristics.

Keywords Library intelligent services; Communication Privacy Management theory; Privacy boundary

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

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