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Design-Driven Intergenerational Integration: A Co-Creation and Service Design Framework for Community Education in Aging Societies

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ABSTRACT

Demographic aging and expanding early childhood care demands have generated a structural challenge for contemporary urban communities: conventional service systems address elderly and young populations in parallel, age-segregated siloes that foreclose the complementary intergenerational exchanges capable of serving both groups simultaneously. This problem is especially acute in China, where rapid urbanization, housing redevelopment, and the transition beyond the one-child policy have simultaneously intensified both the social isolation of elderly residents and the caregiving pressures on young families, while eroding the informal intergenerational bonds that historically mediated between them. Grounded in multi-case research across two primary field sites—Xinguang Community (Wuxi) and Hongqiao Community (Shanghai)—and three international reference cases, and drawing on participatory observation, in-depth interviews, co-creation workshops, and service blueprint analysis conducted with over 200 community residents, this paper presents a Design-Driven Intergenerational Integration (DDII) framework that systematically combines service design methodology, co-creation practice, and intergenerational integration theory to address this challenge in Chinese urban community education contexts, constructing a three-stage "Senior-Youth Pairing" service model and a Community 4.0 governance architecture featuring a graded volunteer cultivation system (Community Expert 1.0–3.0) that demonstrate how service design and co-creation can function not merely as tools for service improvement but as institutional catalysts for sustainable intergenerational community infrastructure—generating the governance conditions, relational bonds, and collective ownership that enable intergenerational programs to become endogenous community practices rather than externally facilitated projects.

Keywords: intergenerational integration; co-creation; service design; community education; Senior-Youth Pairing; aging society; service blueprint; participatory design; Community 4.0

1. Introduction

The simultaneous acceleration of population aging and the expansion of early childhood care demands constitutes one of the defining structural challenges of contemporary urban life. In China, the proportion of residents aged 65 and above is projected to exceed 20% of the total population by 2035, a demographic transition driven by rising life expectancy and the legacy of the one-child policy (Zhu et al., 2023). Concurrently, the policy shift from single- to multi-child families has generated fresh and growing demands on community-level childcare and educational infrastructure. These two pressures converge in the neighborhood: the community setting that houses both populations and is theoretically best positioned to serve their complementary needs is also the site where the institutional inadequacy is most visibly expressed.

Despite these converging demographic pressures, existing community service frameworks continue to treat the needs of elderly and young populations as categorically separate, producing parallel organizational structures—elderly care centers and childcare programs running independently, often in adjacent but unconnected spaces—that neither reflect the complementary nature of their demands nor leverage the relational resources embedded in intergenerational exchange. The costs of this fragmentation are both human and social. Social isolation is among the strongest predictors of poor health outcomes in elderly populations (Moreno, 2010); elderly residents who lack meaningful intergenerational contact experience higher rates of cognitive decline, depression, and reduced engagement with community life. Conversely, children who lack regular contact with older adults lose access to the experiential wisdom, cultural memory, and relational diversity that intergenerational exchange uniquely provides (Weckström et al., 2017). Communities that remain structurally age-segregated therefore forfeit the natural complementarity of generational knowledge that, if cultivated, could sustain both populations more effectively and at lower institutional cost.

Design research has increasingly identified community-level social challenges as appropriate domains for design intervention (Manzini, 2015). Service design, with its systematic attention to the full arc of service journeys, organizational backstage processes, and governance arrangements (Holmlid & Evenson, 2008), and co-creation practice, with its emphasis on distributed design agency and the empowerment of community members as active co-designers of their own environments (Sanders & Stappers, 2008), together offer methodological resources well-suited to the complexity of intergenerational community transformation. However, a critical gap remains: existing scholarship has not produced an integrated framework that combines these two methodologies with a governance architecture robust enough to sustain intergenerational programs beyond single project cycles and without continued dependence on external facilitation.

This paper is organized around a single guiding research question: what stage-differentiated service design strategies can cultivate genuine intergenerational integration across the full temporal arc of program delivery—from initial consensus-building through in-service co-learning to post-service institutional consolidation? Addressing this question requires first synthesizing the conceptual foundations of intergenerational integration, co-creation, and service design into a coherent analytical framework, a task undertaken in the theoretical review that follows. It equally demands sustained attention to the conditions under which intergenerational programs transcend their initial facilitated form and become endogenous community practices—a concern that

surfaces throughout the empirical analysis and is taken up directly in the concluding discussion. The paper proceeds through a synthesized theoretical and literature review, a methodological account, cross-case empirical analysis, a detailed presentation of the DDII framework, and a discussion of theoretical contributions, practical implications, and limitations.

2. Theoretical Grounding and Literature Review

This section reviews scholarship on intergenerational integration, co-creation, and service design, articulating the theoretical synthesis that motivates and structures the DDII framework. Rather than treating each concept as a parallel theoretical input, the review traces the conceptual convergences among them and identifies the precise gap in existing scholarship that this paper addresses.

2.1 Intergenerational Integration: From Contact to Structural Conditions

Intergenerational integration denotes the cohesive social state formed between generational groups through positive interdependence, mutual resource sharing, and reciprocal participation in the activities of community life (Vacca & Bianchi, 2024). The international evidence base on well-designed intergenerational programs is broadly positive, demonstrating reduced ageist attitudes in both directions, improved social connectedness, and benefits for cognitive, emotional, and behavioral outcomes across both cohorts (Cheng, 2024; Martin, 2007; Hernandez & Gonzalez, 2008).

Programmatic content research has identified several especially productive formats. Narrative and storytelling-based approaches, in which elderly residents share life histories and cultural memories with young participants, have proven particularly effective in generating empathetic understanding across generational lines (Liang & Shen, 2019). Structured role-reversal activities—deliberately positioning elderly residents as cultural knowledge authorities and children as active stewards and transmitters of that knowledge—produce durable relational outcomes by creating genuine, non-tokenistic forms of cross-generational mutual recognition (Sánchez-Cazalla, 2025). Craft and artistic co-production formats, in which elderly and young participants collaborate on tangible shared products, leverage complementary knowledge assets—elderly technical skill and cultural memory alongside young creative energy and digital fluency—to produce the authentic interdependence that sustains meaningful contact beyond initial encounters (Zhong, 2025).

Two persistent limitations, however, characterize the existing intergenerational integration literature. First, the overwhelming majority of studies evaluate short-term program outcomes rather than the structural conditions for sustainable intergenerational social infrastructure (Cheng, 2024). Programs achieve positive effects during operation but remain continuously dependent on external facilitation; when the facilitating institution withdraws, programs dissolve (Cossu, 2025). The question of how to design the institutional conditions under which intergenerational programs become self-sustaining community practices has not been systematically addressed. Second, research has focused disproportionately on programmatic content—what activities to offer—rather than on the service design and governance architectures that determine how activities are organized across time and who takes ownership of them. These two gaps, taken together, motivate the paper's theoretical turn to co-creation and service design as complementary frameworks for addressing the sustainability problem at both program and governance levels.

2.2 Service Design: From Service Optimization to Systemic Community Innovation

Service design is an approach that orchestrates people, processes, environments, and temporal flows to create coherent, meaningful, and sustainable service experiences (Holmlid & Evenson, 2008). Its principal methodological contribution to community education contexts is the systematic mapping of service journeys: tracing users' and providers' experiences across the complete temporal arc of a service, making visible both the onstage interactions that users directly encounter and the backstage processes, roles, and institutional infrastructure that enable them. The service blueprint (Shostack, 1984), which maps service processes across the dual axes of time and organizational visibility—distinguishing user actions, front-stage employee interactions, back-stage operational processes, and support systems—is particularly valuable in community education contexts because it exposes the temporal complexity and multi-stakeholder interdependence of community service provision that conventional program planning, focused narrowly on in-service activity design, tends to render invisible.

Applied to community contexts, service design has evolved well beyond service-level optimization of commercial services toward systemic social innovation (Meroni & Sangiorgi, 2011), with productive applications in healthcare transformation, neighborhood revitalization, and community education provision across multiple national contexts (Xin & Wang, 2018; Zhang & Hu, 2018). In intergenerational settings specifically, service design contributes a structured temporal language—pre-service, in-service, post-service—for conceptualizing the stages of service delivery, and a set of visualization tools that function as boundary objects in co-creation workshops, enabling elderly residents, young parents, community managers, and government officials with very different knowledge and institutional positions to collaborate around shared representations of the service system (Maddali, 2023).

What remains inadequately theorized in the existing service design literature, however, is the relationship between service-level program design and governance-level institutional design. Service design studies typically treat governance arrangements as background conditions for service delivery rather than as design objects in their own right. Conversely, community governance scholarship rarely engages with service design methodology as a resource for governance transformation. The DDII framework bridges this gap by treating governance architecture—the "who governs, how, and through what structures"—as both a product of and an ongoing context for service design activity.

2.3 Theoretical Synthesis: The DDII Framework Logic

Reviewing these three bodies of scholarship together reveals a coherent and consequential theoretical gap. The intergenerational integration literature identifies the social goal—mutual recognition, reciprocal knowledge exchange, and shared governance among elderly and young community residents—but lacks the design methodology to address it at the systems level or to solve the sustainability problem. The co-creation literature provides the relational methodology—a collaborative practice that simultaneously produces better-designed services and enacts integration through the process itself—but lacks the service lifecycle structure needed to deploy that methodology across the full temporal complexity of multi-stage community programs.

The service design literature provides that structure—a stage-differentiated lifecycle framework with powerful visualization and analytical tools—but has not theorized the governance implications of applying it to intergenerational community transformation, treating governance as background rather than foreground.

3. Research Design and Methodology

This study adopts a constructivist, qualitative multi-case research design (Yin, 2014) that combines interpretive empirical investigation with participatory design practice—an approach we term participatory design research. The research team did not function as detached observers of community processes but as embedded design practitioners generating knowledge through iterative cycles of intervention, observation, reflection, and theoretical revision conducted in genuine partnership with the communities studied. This dual role—as researchers generating valid social science knowledge and as designers contributing beneficial community change—reflects the epistemological position that social innovation research is most productive when knowledge generation and practice are mutually informing rather than sequentially ordered (Foster-Fishman & Behrens, 2007).

Two primary Chinese field sites were selected for intensive, longitudinal investigation. Xinguang Community (Wuxi, Jiangsu Province) is a mid-scale urban residential community experiencing the social consequences of rapid redevelopment, including disrupted place-attachment bonds, intergenerational knowledge loss, and weakened community cohesion across age cohorts. Hongqiao Community (Shanghai) is a larger, more diverse urban community marked by high residential density, compressed public space, and overt cross-generational conflict in shared outdoor areas. Three international reference cases—Saint Vincent's Intergenerational Learning Center (Seattle, USA), Denmark's Co-housing intergenerational communities, and Germany's TOY (Together Old and Young) Project—were included for comparative analysis of alternative service models and governance architectures. Case selection followed theoretical sampling logic (Eisenhardt, 1989), choosing cases representing meaningfully diverse service models, co-creation depths, and sustainability arrangements to test theoretical propositions across contrasting empirical settings rather than to claim statistical representativeness （Zheng, 2025）.

Primary data collection was conducted across an eight-month field research period and combined multiple qualitative methods in an integrated mixed-methods design. In-depth semi-structured interviews were conducted with 42 community stakeholders, including 15 elderly residents aged 65–82, 11 middle-aged parents, 8 community managers and neighborhood council members, 5 local government officials, and 3 social organization representatives; all interviews were audio-recorded with consent and fully transcribed. Participatory observation was conducted during 23 community events, including regular activities, community meetings, and organized festivals, with detailed fieldnotes maintained throughout. A scenario-embedded survey was administered to 200 community residents in Xinguang Community to generate baseline data on community belonging, intergenerational attitudes, and perceived service gaps. Three rounds of co-creation workshops were organized across both primary field sites, involving 68 total participants in structured activities including participatory needs mapping, future visioning exercises, service blueprint co-construction sessions, and concept evaluation activities. Service

blueprint analyses were conducted for each primary case, systematically mapping service journeys, user touchpoints, onstage service encounters, backstage processes, and governance structures across the pre-service, in-service, and post-service stages (Liu, 2025).

Data analysis followed an iterative thematic analysis approach (Braun & Clarke, 2006) combined with comparative case logic. Initial inductive coding of interview transcripts and fieldnotes generated emergent categories, which were subsequently organized into theoretically grounded thematic frameworks corresponding to service stage concerns, co-creation depth dynamics, and governance dimensions. Cross-case comparison (Miles & Huberman, 1994) systematically identified convergent patterns across cases—forming the empirical basis for theoretical propositions—and divergent patterns that qualified or bounded those propositions. Member-checking with community residents and managers at multiple points in the analysis process validated interpretive claims and ensured that the resulting framework reflects genuine community-grounded knowledge rather than externally-imposed academic categories.

4. Empirical Findings: Cross-Case Analysis

4.1 Structural Barriers to Intergenerational Integration

The most consistent finding across all five cases—domestic and international—is that the physical co-presence of elderly and young people in community spaces does not automatically generate positive intergenerational relationships and may, in the absence of facilitated mixed-age activities and shared governance mechanisms, generate conflict instead. In Hongqiao Community, the concentration of intergenerational activity in an undersized public square had created chronic, recurring conflict between elderly residents practicing square dance in the mornings and families using the same space for children's play. Neither group possessed institutional channels for negotiating shared use on terms acceptable to both; the result was resentment, avoidance, and mutual stereotyping that actively deepened, rather than attenuated, intergenerational social distance. This friction was structurally produced—by spatial scarcity, absence of facilitated mixed-age activities, and lack of shared governance mechanisms—not by individual attitudes, and it therefore required structural rather than purely attitudinal intervention (Krzeczkowska, 2021).

In Xinguang Community, a qualitatively different but equally consequential structural barrier predominated: rapid urban redevelopment had severed the informal intergenerational bonds of shared place-attachment that had historically mediated intergenerational contact in Chinese urban neighborhoods. Long-term elderly residents possessed rich repositories of local historical knowledge and embodied cultural memory—the names of demolished landmarks, oral histories of neighborhood transformation, traditional craft knowledge, and local ritual practices—that younger residents neither accessed nor recognized as educationally valuable. This mutual invisibility—each generation failing to perceive the other as a potential resource—represents precisely the absence of intergenerational connection that the DDII framework must address, and it is a design problem that neither attitude-change programming nor space renovation alone can solve. It requires a designed service encounter that makes complementary generational knowledge assets mutually visible and creates structured conditions for their exchange.

4.2 Comparative Case Analysis

After clarifying the core value of intergenerational integration for community education services and current research gaps, this research analyzes typical cases of 'Senior-Youth Pairing' community education by examining and comparing innovative practices at home and abroad, focusing on their service stages, models, and purposes, laying a solid foundation for subsequently constructing a community education service design model from the perspective of intergenerational integration (Table 1).

Table 1. Comparative Analysis of Intergenerational Education Service Cases

Case	Service Model	Co-Creation Depth	Integration Outcomes	Sustainability Mechanism	Key Limitation
Saint Vincent's ILC (Seattle, USA)	Childcare embedded within elderly care facility; structured workshop model with daily cross-age interactions	*Designing for*: professionally-led programming; residents as participants	Sustained daily interaction; significant reduction in elderly isolation; affective gains in both cohorts	Institutional embedding; professional staffing; multi-organizational partnership funding	High cost; replicability limited outside well-resourced institutional contexts
Denmark Co-housing	Spatial co-habitation; daily shared life and mutual assistance across generations	*Designing by*: residents collectively govern shared spaces, schedules, and community norms	Deep normative and affective integration; strong shared identity; spontaneous mutual assistance without institutional facilitation	Ownership structure; democratic collective governance; strong place-based identity	Requires purpose-built or substantially redesigned built environment; not readily deployable in existing urban neighborhoods
Germany TOY Project	Cross-cultural elder–child joint creative production facilitated by NGO	*Designing with*: participants co-develop content with NGO facilitation and methodological support	Strong affective gains during project period; effective cross-cultural and intergenerational bridging through shared	External project funding; NGO facilitation capacity	Limited endogenous sustainability; program dissolves when NGO support is withdrawn

Case	Service Model	Co-Creation Depth	Integration Outcomes	Sustainability Mechanism	Key Limitation
			creative work		
Xinguang Community (Wuxi, China)	Memory-based co-creation: cultural archive, exhibition, ongoing volunteer-led governance	*Designing with* → *Designing by*: volunteer team progressively self-initiates follow-on programs	All integration dimensions progressively addressed; 2,000+ exhibition visitors; 186 residents proactively contributed cultural materials	Graded volunteer system (Expert 1.0–3.0); four-party governance mechanism; institutionalized cultural platform	Transition from external facilitation to self-governance is resource-intensive and requires sustained expert accompaniment
Hongqiao Community (Shanghai, China)	Conflict-mediated co-governance: structured public space negotiation and shared governance charter	*Designing with*: NGO-facilitated multi-stakeholder negotiation producing shared governance norms	Structural and normative integration achieved; significant cross-group trust development; community governance charter produced and ratified	Self-organization plan; trained volunteer mediators; embedded community governance norms	Trust gains are fragile without ongoing governance reinforcement mechanisms

Three cross-case findings stand out as theoretically significant. First, co-creation depth is the strongest differentiator between programs generating durable intergenerational integration and those producing short-term engagement without structural community change. Programs operating at "designing with" or "designing by" levels consistently reported more endogenous sustainability and more profound relational outcomes than "designing for" programs, even when the latter were better resourced and more institutionally established. This finding suggests that the quality of community participation in the design process matters more for long-term outcomes than the quality of professional expertise applied to program content—a direct challenge to the dominant "best practice" logic in intergenerational programming. Second, service design's systematic attention to pre-service and post-service stages is consistently underemphasized in all five cases' existing practice; programs invest the vast majority of their design attention in in-service activity design while neglecting the consensus-building work that determines whether diverse community members engage genuinely and the post-service empowerment work that determines whether

communities can sustain programs independently. Third, and most consequentially, the most sustainable cases—Denmark's Co-housing and the Xinguang Community project—share a defining characteristic: the deliberate integration of governance co-design within educational programming, treating the co-design of community management structures as itself a transformative intergenerational activity rather than a separate administrative function.

4.3 The Xinguang "Time Museum" Initiative: A Generative Case

The research team conducted the ‘Xinguang Li · Time Museum’ learning course and co-creation plan using Wuxi Xinguang Community as a carrier, with strong support from the street and community. Currently, the Xinguang Li community population structure shows obvious aging characteristics, and physical space reconstruction caused by demolition has seriously triggered problems such as community cultural memory rupture, lack of intergenerational communication, and weak sense of community identity. Addressing these issues, the project aims to promote intergenerational integration through design-driven educational service provision and model innovation, establishing a sustainable community teaching environment.

(1) Practice of Community Education Service Design for‘Senior-Youth Pairing’

Multi-stakeholder Identification and Demand Mining

The team conducted a one-month field investigation in Xinguang Community using ethnographic research methods. Through in-depth interviews, participatory observation, focus groups, and other qualitative research methods, systematic research was conducted on 200 community residents of different age levels and residential backgrounds. According to research analysis, different community groups showed differentiated demand characteristics. Among them, elderly groups generally showed strong nostalgia and cultural heritage willingness, with some expressing ‘hope that the younger generation understands the history of the old street’; while youth groups had vague understanding and cognition of community history and could not accurately describe the basic situation of Wangzhuang Old Street; middle-aged and young adult groups were more concerned with how to enhance neighborly relationships through cultural activities.

(2) Common Topic Construction and Collective Consensus Formation

Based on demand mining, the team organized three ‘Memory Roundtable Meetings’,inviting 20 community resident representatives of different backgrounds and age groups to participate, encouraging participants to independently propose related topics. After full discussion, three core consensuses and learning goals were formed: first, reconstructing collective memory using ‘old objects’ as carriers; second, achieving cultural heritage and educational progress through intergenerational interaction; third, establishing normalized community cultural activity mechanisms (Fig 1）.



Figure 1. Home visits and discussions.

(3) Mid-service: Process Deepening of Knowledge Transfer and Mutual Benefit

1) Knowledge Archaeological Practice of Old Object Collection

Based on the above topics, through a three-dimensional collection model of 'door-to-door collection + fixed-point collection + online registration', 50 old objects were collected, with each item establishing archival records containing four dimensions: basic information, historical background, usage scenarios, and emotional stories. It is worth noting that old objects are not only material cultural heritage but also materialized forms of social memory. For example, the old television set provided by a resident surnamed Chen carries the older generation's economic life, memory epitome, and social relationship networks. Indeed, through object narrative methods, connecting micro individual experiences with macro social changes better achieves concrete presentation of historical memory （Fig 2).



Figure 2. Collection of old items in the community.

2) Teaching Innovation in Intergenerational Learning Workshops

Based on sociocultural learning theory and narrative pedagogy principles, the team designed and implemented the 'Old Objects · New Stories' series of intergenerational learning workshops. The workshops adopted a narrative structure of 'object-person-event-emotion', using 'objects' as carriers, 'people' as subjects, 'events' as clues, and 'emotions' as bonds, designing an intergenerational knowledge transfer model based on life history narrative. Community elderly people transformed implicit life experiences into explicit educational resources through demonstration, narration, and operational demonstration. Young groups transformed abstract historical knowledge into concrete bodily perception through embodied cognition (Fig 3).



Figure 3. Narrative and operational demonstration of old objects.

3) Xinguang Li Memory Story Museum Exhibition

Meanwhile, the research team also planned the ‘Xinguang Li · Time Story Exhibition’, placing the exhibition in community corridors. Specifically adopting participatory curatorial concepts, inviting children to serve as "little docents" to introduce the stories behind old objects to visitors. This role reversal transformed children from knowledge receivers to cultural disseminators, deepening practical learning effects and achieving organic integration of cultural memory and daily life. During the exhibition period, more than 2,000 visitors were received, with 186 residents actively providing new old objects and story clues, forming a virtuous cycle of cultural memory collection and generating good social evaluation (Fig 4).



Figure 4. Stories in Time Exhibition.

(4) Post-service Design: Systematic Optimization from Individual Participation to Community Empowerment

The success of this design practice project could not have been achieved without the support of multiple stakeholders, and a multi-stakeholder collaborative governance mechanism gradually formed during implementation. Specifically, during project implementation, a four-party collaborative mechanism of ‘government guidance, community leadership, social organization collaboration, and resident participation’ has been established. At the government level, policy support and financial guarantees were provided, and the project was incorporated into street cultural construction; at the community level, ‘school-community collaboration’ was conducted with universities, with communities collecting related resources and providing good teaching spaces and environments, while universities provided technical support, designing curriculum systems, thematic activities, and activity formats; at the community member level, a volunteer team including 15 elderly people and 10 youth was actively organized to ensure orderly conduct

of thematic teaching and learning activities. Additionally, the team is still further exploring what design paths can achieve value transformation of community cultural capital.

5. The DDII Framework: Service Design Model and Community 4.0 Governance

The DDII framework integrates a three-stage "Senior-Youth Pairing" service design model with a Community 4.0 governance architecture into a unified co-creation system for intergenerational community education. These two components are mutually constitutive rather than parallel or sequential: the service design model provides the experiential and relational logic through which intergenerational integration is cultivated at the program level, while the governance framework provides the institutional conditions through which program-level relational changes consolidate into durable community practices capable of self-sustaining reproduction. Together they describe a closed-loop system of design-driven community transformation oriented toward the progressive development of genuine community self-governance capacity （Fig 5).

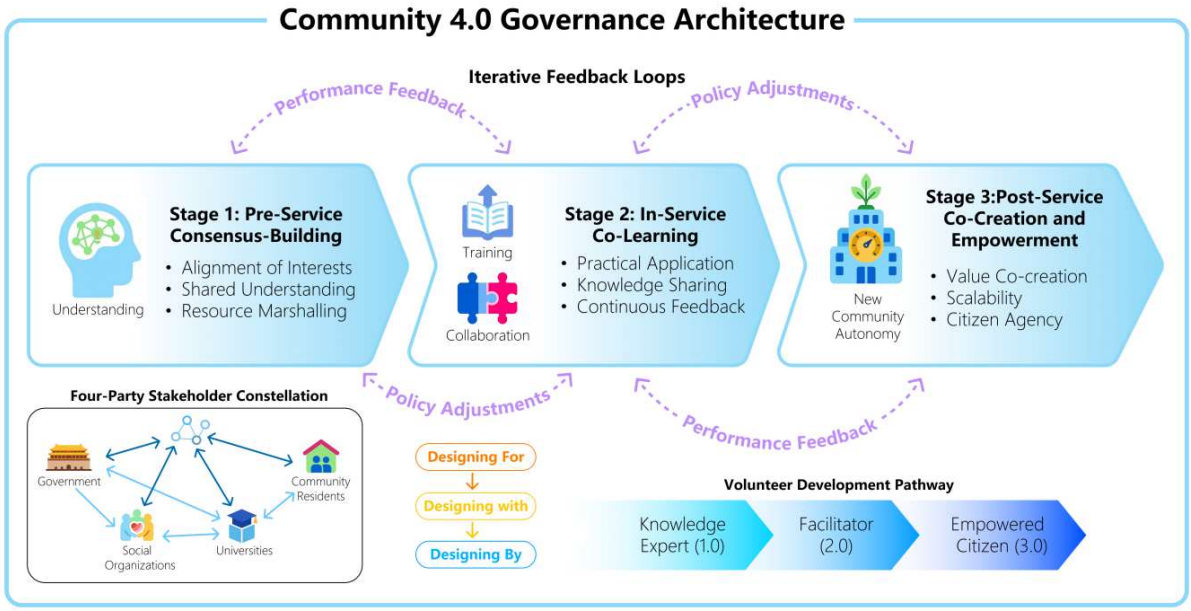


Figure 5. The Design-Driven Intergenerational Integration (DDII) Framework: Service Design Model and Community 4.0 Governance Architecture

5.1 Stage 1 — Pre-Service: Establishing Consensus Through Participatory Research

The pre-service stage addresses the most consistently neglected dimension of intergenerational community education design: the deliberate cultivation of shared purpose, mutual trust, and relational foundation without which co-learning activities risk remaining superficial, tokenistic, or actively counterproductive. The operative design principle of this stage is equal dialogue: creating conditions in which diverse community members across generational, occupational, and experiential positions encounter one another as equally knowledgeable stakeholders in their community's future rather than pre-assigned as providers or recipients, experts or beneficiaries.

This principle has both ethical and instrumental dimensions—it is the right way to treat community members, and it also produces substantially better program design by ensuring that the knowledge most relevant to community needs actually enters the design process.

Participatory community research constitutes the primary service design activity of this stage. Scenario-embedded survey instruments—which integrate questionnaire content with real community environments and culturally familiar scenarios to enhance accessibility across age and literacy levels—simultaneously generate actionable data and enact early cross-generational dialogue, functioning as both research tools and co-creation touchpoints before formal workshops begin. Participatory community forums structured as democratic dialogue rather than expert consultation or government information sessions enable the development of shared community agendas representing genuine multi-generational consensus rather than the preferences of whichever stakeholder group is most institutionally vocal. The strategic identification and engagement of community key opinion leaders (KOLs) across generational groups—elderly residents with established neighborhood trust, young parents with social network reach, community managers with institutional access—is particularly important for bridging the credibility gaps that design research teams inevitably face as external actors entering established community social networks.

In Xinguang Community, "Memory Roundtable Meetings" structured as open, facilitated dialogue produced three actionable consensuses around cultural memory preservation, cross-generational mutual care, and shared public space management—consensuses that structured the entire subsequent project design and ensured that activities addressed concerns community members had genuinely prioritized. This pre-service investment demonstrably accelerated subsequent co-creation engagement and produced a level of resident ownership over program outcomes that externally-designed programs consistently failed to achieve.

In fact, the foundation for establishing consensus is achieving frequency synchronization of consciousness between old and young or multiple parties, namely forming common focus and creating common topics for old and young. To this end, designers need to immerse themselves deeply in communities, identifying community key opinion leaders (KOLs). Community opinion leaders possess good appeal and can mobilize the enthusiasm of surrounding groups. Designers can use opinion leaders as ‘community assistants’, translating and optimizing information through local assistants, encouraging and guiding community old and young to achieve more efficient communication and exchange, thereby better obtaining the real needs of elderly and children groups, and gradually establishing stable emotional relationships in this process (Fig 6).

Additionally, ‘everyone speaks’ forms and methods can be designed to encourage old and young participation and exploration of common community topics. Under the guidance of government, community managers, and opinion leaders, elderly people, children, and even all age groups in the community are encouraged to raise questions, discover topics, and organize discussions to jointly derive valuable ideas. Meanwhile, topics of interest to ‘Senior-Youth Pairing’, such as thematic courses, interest content, and learning methods, can be explored at this stage, which will help establish learning goals for old and young and effectively build consensus and form closed loops of agreement.

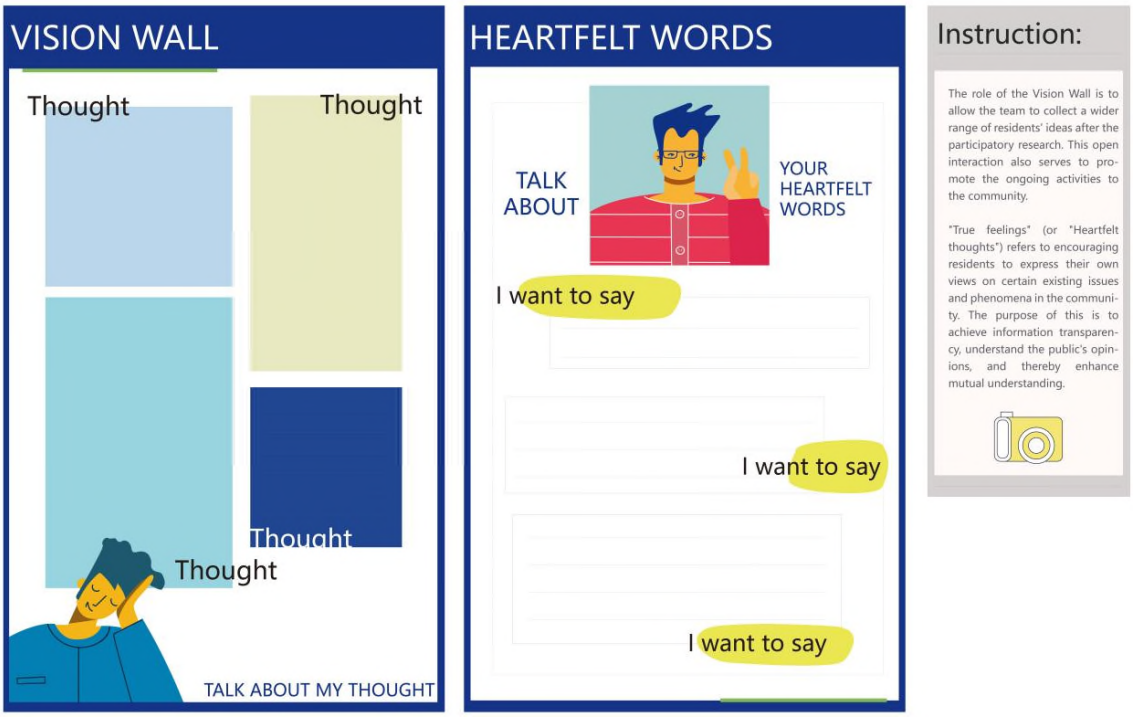


Figure 6. Participatory Research on Community Needs.

Participatory community research is an important research method and approach for community education and innovative practice. Participatory research combines investigative methods with "community capacity-building strategies" to bridge the gap between knowledge generated through research and community practice. For example, research formats used in practical processes such as "Truth or Dare" activities are designed to explore residents' use of local community spaces and neighborhood relationships. To uncover residents' deeper needs, survey questionnaire content can be integrated with the actual environment and placed in corresponding scenarios to simulate real situations. This helps participants quickly understand the designers' intentions, enhancing recognition and aligning with the cognitive levels of a wide age range of community members (Fig 7).

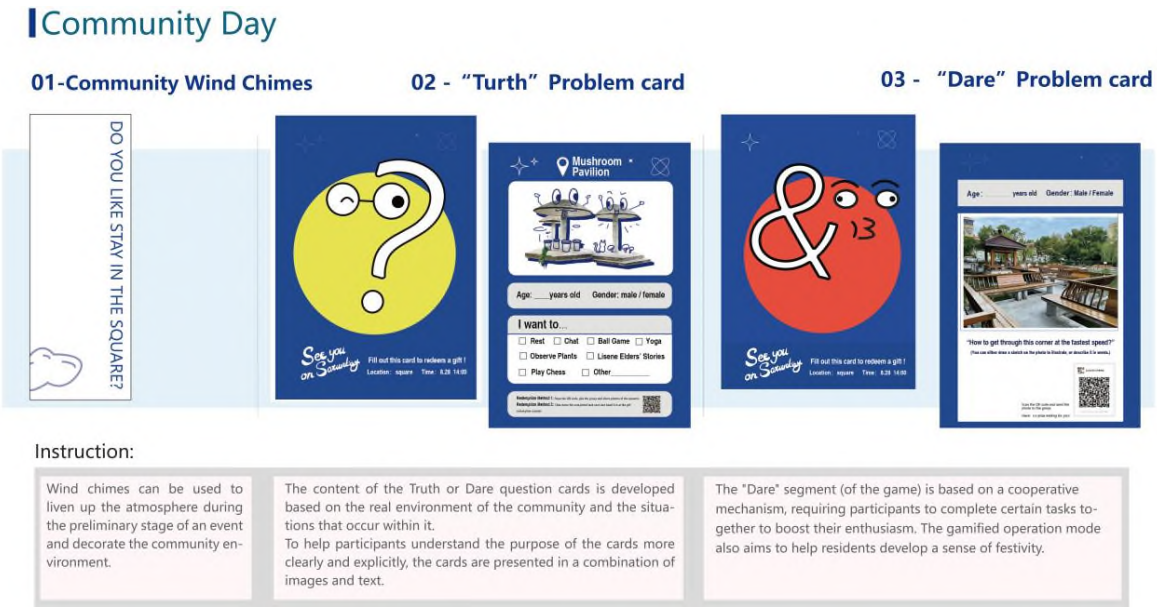


Figure 7. Community Day Participatory Activity.

5.2 Stage 2 — In-Service: Promoting Co-Learning Through Complementary Curriculum

The in-service stage is where intergenerational integration is most directly enacted through designed service encounters. Its core design challenge is moving beyond the deficit model implicit in much intergenerational programming—in which one generation is positioned as knowledge-holder and the other as learner, producing inherently asymmetric relationships that limit genuine integration—toward a genuinely bidirectional model grounded in complementary advantage: the systematic identification and exploitation of non-overlapping knowledge asymmetries between elderly and young populations that, by design, create genuine mutual dependency rather than simulated reciprocity.

Four curriculum dimensions operationalize the complementary advantage principle across diverse content domains. The personal construction dimension encompasses life narrative sharing and structured intergenerational dialogue activities, leveraging elderly residents' depth of experiential authority and young participants' fresh perspectives and receptive curiosity. The cultural heritage dimension covers traditional craft, material culture, and community memory activities in which elderly residents hold irreplaceable historical knowledge that young participants can document, translate, and amplify through contemporary communication media, creating genuine knowledge partnership rather than one-way transmission. The technological capability dimension deliberately reverses the typical knowledge hierarchy of intergenerational programs by structuring digital literacy exchanges in which young participants serve as mentors and guides for elderly residents navigating smartphones, social media, and online public services—simultaneously building elderly digital competency and generating cross-generational role reversal that transforms mutual perceptions. The ecological connection dimension encompasses healthy living practices, traditional food knowledge, and environmental stewardship activities that draw on elderly residents' embodied ecological knowledge while engaging young participants' environmental concerns and energy. Their combination across a program cycle creates a service design in which both generations occupy, across different activities, the

simultaneous roles of teacher and learner—generating the sustained reciprocal knowledge exchange that is the experiential hallmark of genuine intergenerational integration rather than structured charity.

Spatial and atmospheric design is analytically prior to programmatic design at this stage of service delivery: physical environments must actively invite cross-generational interaction rather than merely accommodate it. Communities that have invested in genuinely age-friendly, flexible, and symbolically inclusive shared learning environments—spaces that signal belonging to all age groups equally through their scale, furnishing, and symbolic content—consistently report significantly higher rates of spontaneous intergenerational interaction occurring outside formally structured program time, confirming the service design principle that backstage environment design fundamentally conditions onstage encounter quality. Co-creation-oriented activity design—incorporating gamified challenges that require genuine cross-generational collaboration to succeed, structured moments of generational role reversal, and designed "resonance touchpoints" at which each generation's complementary contributions become mutually visible and publicly acknowledged—amplifies the integrative effects of shared activities and facilitates the development of intergenerational bonds that persist beyond the immediate service encounter into ongoing community relationships.

5.3 Stage 3 — Post-Service: Stimulating Co-Creation and Collective Empowerment

The post-service stage addresses the fundamental sustainability challenge that the cross-case analysis identifies as the primary structural weakness of existing intergenerational community education programs: their dependence on continuous external facilitation, which prevents them from generating the endogenous community design capacity necessary for programs to sustain themselves as living community practices rather than managed services. The operative design principle of this stage is collective empowerment: the systematic, structured cultivation of community members' own design capacity—their ability to identify needs, generate ideas, facilitate collaborative processes, and govern shared programs—in ways that progressively reduce dependence on external expertise and increase the community's self-governance capability.

Three mutually reinforcing co-creation strategies operationalize this principle. First, digital-physical hybrid platform design extends the temporal and spatial reach of intergenerational learning networks well beyond scheduled program activities, enabling ongoing cross-generational connection through community archive platforms, social media groups, and online storytelling channels. Critically, the service design priority here is relational functionality rather than technological sophistication: platforms should amplify and sustain the embodied, place-based relational bonds cultivated during in-service activities rather than replace them with mediated interaction that lacks the depth of face-to-face encounter. Second, multi-stakeholder collaborative governance design distributes governance functions and responsibilities across government agencies, community organizations, social institutions, universities, and resident volunteer teams in a structure that provides sufficient institutional stability to sustain programs across leadership transitions, funding cycles, and demographic shifts while continuously building endogenous community governance capacity. Technology can also make it easier for grandparents and grandchildren to engage with each other. For example, doing activities together in virtual reality can help them find more topics to discuss and keep the conversation flowing.

Third, and most importantly for long-term sustainability, shared community value vision cultivation converts intergenerational educational encounters into durable community narratives and collective aspirations—the stories communities tell about who they are and what they are building together—that transform co-creation from a designed program into an endogenous community practice driven by collective identity investment rather than external facilitation.

Additionally, attention should be paid to the multidimensional experiential aspects among intergenerational groups. Multidimensional community experiences tend to develop horizontally, as human relationships are filled with complexity and diversity. From a design perspective, diversity involves identifying various touchpoints along people's life pathways and using them as breakthrough points. The richness of forms also stems from the community's framework system, as singular traditional research methods do not align with the actual living conditions of community groups. Local community residents often view research teams as external groups and typically maintain a certain level of wariness and vigilance.

Therefore, participation should emphasize connections between groups and more meaningful feedback. As social media fatigue drives a preference for actual 'face-to-face' interactions, to enhance the deep experience of intergenerational audiences, targeted interactions based on group interests and preferences should be considered. Multi-generational shared experiences can also be created to encourage participation across all age groups. Intergenerational social spaces should be established in comfortable, culturally appropriate settings for communication and interaction. New technologies and innovative elements can be introduced to provide interactive and immersive experiences for groups. This fully mobilizes the subjective agency of intergenerational groups, enabling transformation of core value recognition related to self-fulfillment, pleasure, and expression among different generational groups. For elderly groups, the emphasis is on being recognized and understood, while simultaneously reexamining and elevating their self-worth (Fig 8).

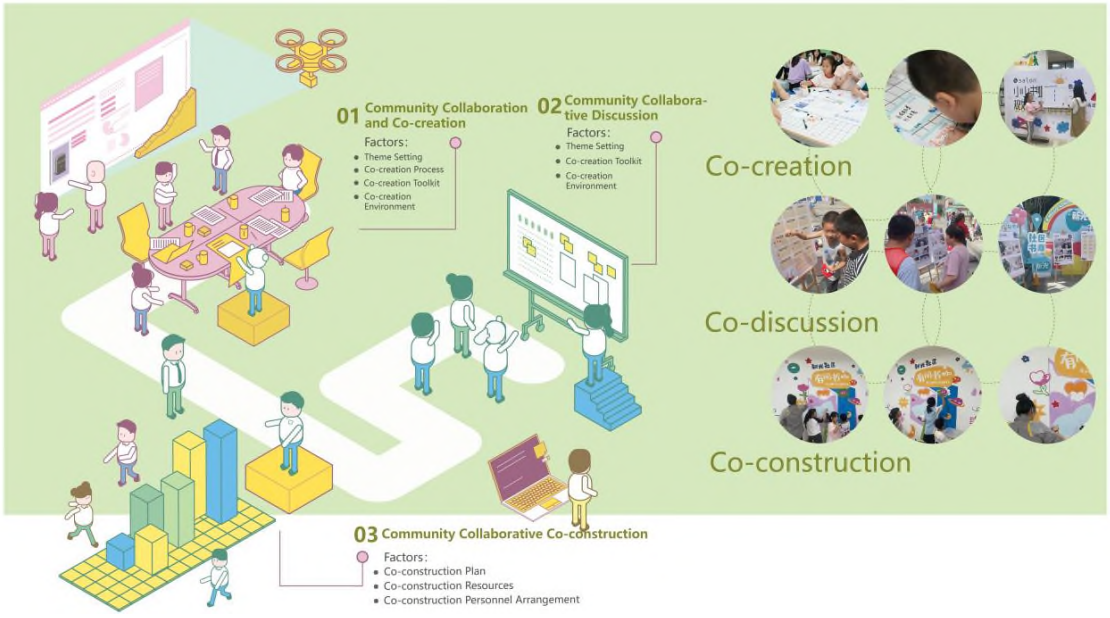


Figure 8. Co-creation, Co-consultation, Co-construction' Community Collaborative Vision.

5.4 Community 4.0: The Governance Architecture

The Community 4.0 governance framework provides the institutional architecture within which the three-stage service design model operates over time. The "4.0" designation reflects a developmental trajectory through four stages of community evolution: Community 1.0 designates the hardware infrastructure renovation phase focused on physical environment improvement; Community 2.0 denotes the immersive resident participation programs phase in which activities are designed for community members; Community 3.0 represents the collaborative relationship-building phase in which programs are designed with community members; and Community 4.0 represents the emergence of an all-age-friendly, resilient community system integrating physical, social, digital, and cultural dimensions into a self-sustaining intergenerational environment governed endogenously by community members themselves. Each prior stage is incorporated rather than superseded in Community 4.0; the framework presupposes the physical infrastructure of 1.0, the participatory culture of 2.0, and the collaborative relationships of 3.0, combining them within a governance architecture capable of sustained self-directed evolution.

The governance architecture proposes a "one-main-multiple" stakeholder structure. "One-main" designates the anchoring strategic role of government and community party organizations, which provide policy direction, institutional legitimacy, and continuity of commitment across electoral and administrative cycles without monopolizing operational decision-making or displacing community initiative. "Multiple" designates a complementary and evolving constellation of partners: social organizations contribute specialized program development expertise and external facilitation capacity; universities provide methodological knowledge, research support, and design practitioner resources; third-party service agencies manage operational and logistical functions; and community residents—particularly through the graded volunteer cultivation system described below—progressively assume greater and more substantive governance responsibility as their collective competency develops. This distribution of responsibilities is designed to evolve dynamically over time, shifting from externally-facilitated co-governance in the early stages of Community 4.0 development toward genuinely endogenous community self-management as the volunteer architecture matures and community design capacity deepens (Table 2).

Table 2. Community Expert Volunteer Classification and Competency Development System

Level	Role Title	Core Competencies	Primary Community Functions	Characteristic Activities	Development Pathway
Expert 1.0	Community Connector	Cross-generational communication; information bridging; community mobilization; basic facilitation; trust-building across community social	Community needs collector; participation recruiter; trust bridge between residents and institutions; early co-creation	Door-to-door participatory research; scenario-embedded survey facilitation; resident recruitment for co-creation workshops; community event	Participates as peripheral legitimate participant in research and early workshop activities; competency built through guided practice with Expert 2.0/3.0 mentoring

Level	Role Title	Core Competencies	Primary Community Functions	Characteristic Activities	Development Pathway
		networks	activity support	participation coordination	
Expert 2.0	Community Facilitator	Workshop facilitation; activity co-design; conflict mediation; service blueprint co-construction; stakeholder coordination; volunteer team management	Co-creation workshop facilitator; intergenerational activity planner and deliverer; volunteer coordinator; inter-group mediator; community event organizer	Facilitation of co-creation workshops; intergenerational activity design, delivery, and evaluation; community forum organization; volunteer Expert 1.0 supervision and mentoring	Progresses through direct co-facilitation experience with Expert 3.0 mentoring; demonstrates sustained facilitation effectiveness and conflict resolution capacity across multiple program cycles
Expert 3.0	Community Innovator	Community resource integration; sustainable program development; governance system co-design; design thinking application; multi-stakeholder partnership building; community brand stewardship	Program innovator and independent developer; governance mechanism co-designer; institutional liaison; mentor to Expert 1.0 and 2.0 volunteers; community development strategist	Independent governance mechanism design; multi-stakeholder coordination and partnership development; new program concept development and launch; Expert 1.0/2.0 mentoring system management; democratic evaluation facilitation	Emerges from Expert 2.0 through accumulated governance experience, demonstrated independent program development capacity, and sustained mentoring contribution to community volunteer ecosystem

The three-level progression reflects a theoretically coherent developmental logic grounded in legitimate peripheral participation theory (Bjerknes & Bratteteig, 1995): volunteers begin as peripheral participants (Expert 1.0) gaining competence through supported engagement in community research and basic facilitation, before progressing through full co-creation facilitation (Expert 2.0) to the status of community innovators capable of independently designing governance systems and building the next generation of community design capacity (Expert 3.0). Critically, this progression is not merely individual competency development but the systematic building of a community co-design infrastructure—a distributed, multi-generational reservoir of design knowledge and facilitation practice that sustains intergenerational programming independently of any individual volunteer's continued participation or any external institution's ongoing involvement (Fig 9).

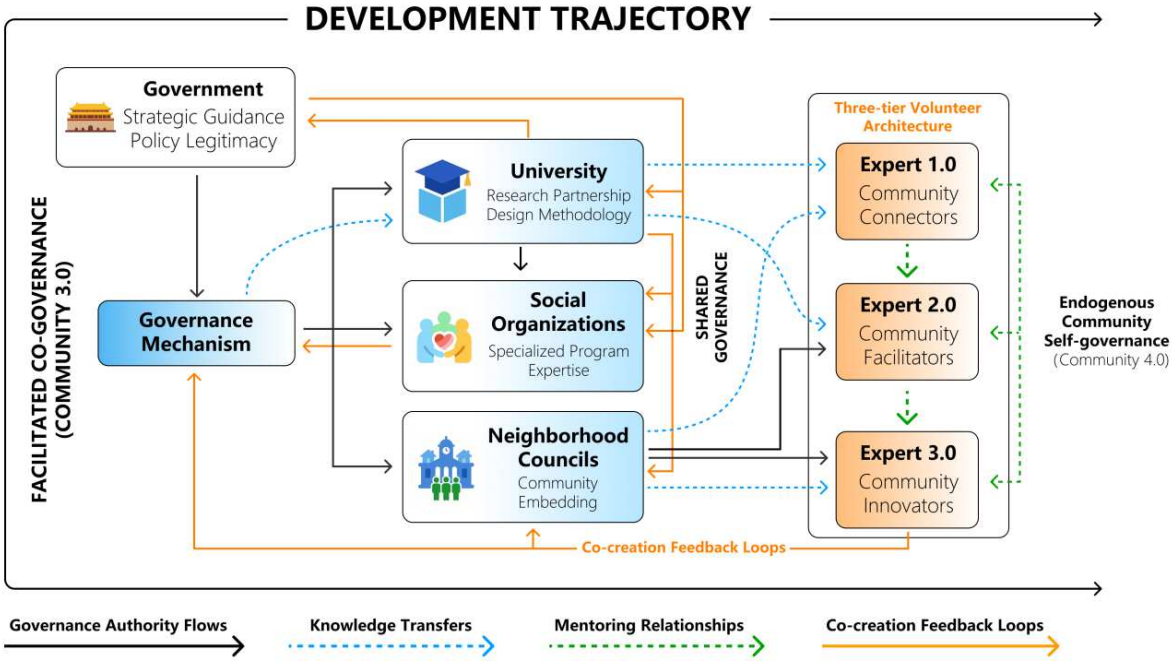


Figure 9. Community 4.0 Collaborative Governance Architecture and Graded Volunteer Development System

6. Discussion

6.1 Service Design as Intergenerational Infrastructure-Building Practice

The most theoretically significant finding of this study is that service design, when systematically applied across the full service lifecycle—including the typically neglected pre-service consensus-building and post-service empowerment stages—functions not merely as a tool for improving individual service encounters but as an infrastructure-building practice for sustainable intergenerational community life. This finding reinforces and substantially extends the emerging position in service design scholarship that the appropriate boundary of the design object should encompass institutional arrangements, governance processes, and community capacity-building rather than only user touchpoints and service delivery flows (Meroni & Sangiorgi, 2011). When community managers and residents are invited to co-construct service blueprints of their own intergenerational programs—mapping not only the activities they want to offer but also the backstage governance processes, role distributions, and temporal sequences that must be organized for those activities to function and persist—they engage in a form of institutional imagination that conventional program planning never generates.

The empirical evidence further demonstrates that service design visualization tools—particularly the service blueprint and participatory journey map—function effectively as boundary objects in intergenerational co-creation workshops. These representations are accessible enough for elderly residents with limited formal education, young parents with limited institutional literacy (Cameron, 2025), community managers with operational orientations, and government officials with policy frames to engage with collaboratively, yet structured enough to guide productive design conversation across considerable differences in knowledge, authority, and institutional position (Jaja, 2025). This boundary object function of service design tools in intergenerational co-creation contexts is a methodological contribution not yet systematically

documented in the community education literature, and it has direct implications for the design of co-creation workshop processes in both research and practice contexts.

6.2 Co-Creation Depth as the Primary Mechanism of Sustainable Intergenerational Integration

The cross-case comparative analysis establishes co-creation depth as the strongest single differentiator between programs generating durable intergenerational integration and those producing short-term engagement without structural community change (Beck, 2025). This empirically validates Sanders and Stappers' (2008) theoretical proposition that the transition from "designing with" to "designing by" represents not merely a methodological preference or an ethical aspiration but a qualitative difference in the kind and durability of social change that co-creation can produce (Krzeczkowska, 2021). The finding that co-creation activities in the pre-service and post-service stages—consensus-building forums and governance co-design workshops—generate more durable intergenerational relational outcomes than in-service activity design, despite containing less visible or aesthetically compelling programmatic content, has important practical implications: it suggests that program developers should redirect substantial design effort from activity content optimization toward the governance and empowerment processes that bookend activities in time (Landa-Oregi, 2026).

6.3 Limitations, Tensions, and Directions for Future Research

The DDII framework carries inherent tensions that require honest engagement. The most fundamental is the tension between the framework's ambition to cultivate genuine community autonomy and the unavoidably directive dimension of any designed framework: the DDII architecture necessarily embeds the theoretical commitments, methodological assumptions, and social values of its designers, and may therefore foreclose forms of community self-determination that do not conform to those orientations (Wang, 2025). Future applications should include systematic reflexive mechanisms—structured opportunities for communities to critique, modify, and reject framework components—to ensure that the empowerment orientation of the framework is genuinely rather than merely rhetorically enacted. A second tension concerns the equity of co-creation participation: workshops and governance processes are cognitively and socially demanding, and the Xinguang and Hongqiao cases both confirm the risk of disproportionate engagement from already-active community members while the most socially isolated elderly residents—those for whom intergenerational integration is most urgently needed—remain unreached. The service design of inclusive participation pathways appropriate for residents with limited mobility, sensory impairment, low institutional literacy, or strong social anxiety requires systematic design attention comparable to that devoted to activity content. A third limitation concerns contextual specificity and generalizability: both primary field sites are mid-to-large Chinese cities with substantial institutional infrastructure, established neighborhood council systems, and university partnership capacity that may not be available in smaller cities, rural communities, or different national policy and governance contexts. The Community 4.0 governance architecture in particular presupposes a degree of multi-institutional coordination that may require significant adaptation for application in resource-constrained or institutionally fragmented settings. Future research should pursue longitudinal investigation tracking program

sustainability across three-to-five year periods; cross-national comparative application testing the framework's portability across diverse institutional environments; and mixed-methods investigation of the specific mechanisms linking co-creation depth to intergenerational integration outcomes across diverse community demographic compositions.

7. Conclusions

This paper has presented the Design-Driven Intergenerational Integration (DDII) framework as an integrated response to the structural challenge of intergenerational fragmentation in aging urban communities. By synthesizing intergenerational integration theory, co-creation practice, and service design methodology—and grounding this synthesis in empirical multi-case research across Chinese and international community contexts involving over 200 community participants—the framework advances three principal contributions to scholarship and practice.

Theoretically, the paper establishes that intergenerational integration, co-creation, and service design form a nested, mutually constitutive system rather than parallel theoretical inputs: service design structures the temporal and institutional arc of community program delivery across its full lifecycle, co-creation animates the relational practice of intergenerational encounter and generates community design capacity through collaborative process, and intergenerational integration names the social transformation toward which both are collectively and progressively oriented. This synthesis fills a precisely identified gap across three scholarly fields—the intergenerational literature's lack of design methodology for sustainability, the co-creation literature's lack of lifecycle structure, and the service design literature's lack of governance theory—and provides a productive foundation for interdisciplinary dialogue between design studies, social innovation research, and community development scholarship.

Methodologically, the study demonstrates the value of participatory design research as an epistemological approach that simultaneously generates valid social science knowledge and produces beneficial community change, and it introduces the boundary object function of service design tools in intergenerational co-creation workshops as a concrete methodological contribution to the co-creation literature. Practically, the three-stage service design model and the Community 4.0 governance architecture—including the empirically-grounded Community Expert 1.0–3.0 volunteer cultivation system—provide a theoretically coherent and empirically validated roadmap for community designers, social workers, policymakers, and community managers working at the intersection of aging, intergenerational education, and democratic community governance. Aging societies require not merely better-designed individual services but more fundamentally better-designed community social infrastructure: the institutional arrangements, relational bonds, shared governance practices, and collective design capacities through which intergenerational integration becomes not a managed program dependent on institutional support but a living community culture capable of sustaining and renewing itself. The DDII framework provides a theoretically grounded and practically actionable foundation for that longer project of design-driven community transformation.

Data Availability Statement: The data supporting the findings of this study are available within the article and its supplementary materials. Further inquiries can be directed to the corresponding author(s).

Ethics Review: The Medical Ethics Committee of our university has reviewed the relevant medical ethics issues associated with this project ‘ Intergenerational Integration Co-Creation Design Method ’ .

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