An Intentional Sociotechnical Framework for Civic Cohesion

Gill Hagan-Green[1,*] **Iain Caldwell**[2,] **Simon Burdus**[3]

[1]Digital Safety CIC, United Kingdom, [2]Lets Connect, united Kingdom, [3]BornGood, United Kingdom

Abstract

Civic cohesion is increasingly shaped by hybrid digital–physical systems in which communities, technologies, organisations, and public institutions interact to produce trust, participation, and collective capability. Existing theories of social capital, collective efficacy, Problem-Oriented Policing, Asset-Based Community Development, and Civic Intelligence explain important dimensions of community life, but provide limited account of how cohesive civic systems can be intentionally designed, governed, and sustained. This position paper develops the Civic Cohesion Framework as an intentional sociotechnical architecture for analysing, designing, and evaluating civic systems. Drawing on socio-technical systems theory, design science, knowledge management, polycentric governance, digital participation, and community development literature, the framework distinguishes civic cohesion as an outcome from the civic sociotechnical system that produces it and reconceptualises cohesion as an adaptive property of relationships between people, structures, technologies, and processes. It advances four theoretical contributions: communities are conceptualised as adaptive sociotechnical systems; cohesion is reframed as a continuing process of capability development rather than a static outcome; translation between informal community knowledge and formal governance is positioned as the mechanism through which civic intelligence becomes public value; and intentionality, understood as enabling rather than controlling, is introduced as the design philosophy guiding civic system development. Five design principles, aligned with Cherns' principles of sociotechnical design, are proposed with illustrative examples. The paper contributes a mid-range design theory for intentional civic systems, discusses its limitations, and sets out an agenda for research into digital governance, civic intelligence translation, adaptive evaluation, and community resilience.

Keywords

civic cohesion, sociotechnical systems, civic intelligence, intentionality, design science, Asset-Based Community Development, Problem-Oriented Policing, knowledge translation, digital governance, community resilience

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1. Introduction

Communities are increasingly shaped by the dynamic interaction of physical places, digital technologies, organisational networks, and public institutions. Access to public services, civic participation, education, employment, volunteering, and mutual aid is no longer confined to geographical neighbourhoods but increasingly occurs across interconnected digital and physical environments. While these developments have expanded opportunities for participation and collaboration, they have also introduced new challenges associated with digital exclusion, declining institutional trust, fragmented communities, misinformation, algorithmic mediation, and unequal access to civic resources. Understanding how community cohesion can be sustained within these hybrid environments has therefore become an important concern for policymakers, practitioners, and researchers alike.

Traditional explanations of community cohesion have largely emerged from sociology, criminology, and community development. Concepts such as social capital [1, 2], collective efficacy [3], community integration [4, 5], and environmental criminology [6] have all contributed significantly to understanding why communities become more or less cohesive. These perspectives emphasise the importance of trust, shared norms, social networks, and informal social control in maintaining resilient communities. More recent developments, including Asset-Based Community Development (ABCD) [7, 8] and Schuler's [9, 10] concept of Civic Intelligence, have further shifted attention towards community capability, collaborative problem-solving, and citizen-led innovation.

Although these traditions provide valuable insights, they were largely developed before contemporary digital infrastructures became central to civic life. Increasingly, communities organise through online platforms,

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*Corresponding author.

Gill Hagan-Green | gill.h@ds-cic.com | ORCID iD: 0000-0001-9665-0734| Iain Caldwell | iaincaldwell@letsconnect-eng.co.uk | Simon Burdus | simon.burdus@borngood.co.uk

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digital public services, community messaging applications, and hybrid forms of participation that transcend traditional spatial boundaries. Consequently, community cohesion can no longer be understood solely through social relationships or institutional arrangements considered independently. Instead, it emerges through complex interactions between people, technologies, organisations, governance systems, and communication infrastructures. This reflects broader developments within information systems research, where socio-technical perspectives recognise that organisational and societal outcomes arise through the joint optimisation of social and technical systems rather than through technological or social determinism alone [11, 12, 13, 14, 15].

Despite this growing recognition, relatively little research has integrated socio-technical systems theory with contemporary theories of community development and civic participation. Existing civic cohesion frameworks frequently identify desirable outcomes, such as trust, participation, or resilience, but provide comparatively limited explanation of how these outcomes can be intentionally designed within hybrid civic systems. Similarly, digital participation research has demonstrated that technological innovation alone rarely produces meaningful civic engagement unless accompanied by appropriate governance arrangements, institutional responsiveness, and opportunities for community influence [16, 17]. A neighbourhood messaging group, for example, can become a channel for mutual aid or a vector for rumour and exclusion; the technology is the same, and what differs is the social arrangement in which it is embedded.

This paper responds to this gap by proposing the Civic Cohesion Framework v3, an intentional sociotechnical architecture for analysing, designing, and evaluating civic systems. Throughout, the paper distinguishes between the *outcome* of interest, civic cohesion, and the *system* that generates it: the interaction of a social subsystem (people and structures) with a technical subsystem (technologies and tasks) in a hybrid digital–physical environment [12, 18]. The framework argues that communities create public value, understood as the value produced for citizens collectively rather than for individual service users [19], not simply through participation but through their capacity to generate, translate, and apply civic intelligence across formal and informal domains.

The framework makes four principal theoretical contributions.

First, it conceptualises communities as adaptive sociotechnical systems, organised across four interconnected civic development domains that span Personal-Community and Digital-Physical dimensions (Figure 1, Section 5.1). Rather than representing separate intervention areas, these domains constitute an integrated civic ecosystem in which individual capability, community participation, leadership development, and institutional governance continually reinforce one another.

Second, it reframes cohesion as a continuing process of capability development rather than a static outcome. Cohesion is not a fixed characteristic of successful neighbourhoods but something that is continually produced, and can be eroded, through the everyday functioning of the civic sociotechnical system.

Third, it positions translation between informal community knowledge and formal governance as the mechanism through which civic intelligence becomes public value (Figure 2, Section 5.2). Drawing upon knowledge management literature [20, 21], it argues that civic cohesion depends upon the continual movement of knowledge, trust, and legitimacy between informal community relationships and formal governance structures.

Fourth, it introduces intentionality as the design philosophy guiding civic system development (Figure 3, Section 5.3). Extending the socio-technical tradition beyond organisational work systems, it argues that cohesive civic systems can be purposefully designed through the deliberate alignment of technological infrastructures, governance arrangements, community assets, leadership pathways, and communication practices. Importantly, intentional design is understood here as enabling rather than controlling: its purpose is to open up spaces in which communities can grow organically and act on their own priorities, not to engineer or tightly regulate citizen behaviour.

Across these contributions, communication is treated not as a separate dimension but as the relational infrastructure that enables knowledge, trust, participation, and legitimacy to circulate throughout civic systems, consistent with infrastructure studies that locate the significance of infrastructures in the relationships they enable [22, 23].

Methodologically, the paper is a conceptual synthesis, offered as a position paper. It critically reviews literature from community development, criminology, socio-technical systems, information systems, knowledge management, and participatory governance before integrating these perspectives into a design-oriented theory intended to inform future empirical research and practical intervention. Section 2 reviews theories of community cohesion and sets out the sociotechnical terminology used in the paper. Section 3 examines Problem-Oriented Policing as a methodological antecedent. Section 4 reviews Asset-Based Community Development, Civic Intelligence, and knowledge translation. Section 5 develops the Civic Cohesion Framework, and Section 6 concludes with the paper's contributions, limitations, and a future research agenda.

2. Reconceptualising Community Cohesion in Hybrid Civic Systems

Community cohesion has traditionally been understood as the extent to which individuals and groups share a sense of belonging, trust one another, participate in civic life, and contribute to collective wellbeing [4, 5]. Although definitions vary, most recognise cohesion as a multidimensional construct incorporating interpersonal trust, shared norms, collective identity, civic participation, and social resilience.

Much of this literature has been informed by theories of social capital. Coleman [1] conceptualised social capital as a resource embedded within social relationships that facilitates coordinated action, while Putnam [2] distinguished between bonding social capital, which strengthens relationships within communities, and bridging social capital, which connects diverse groups. Complementing these relational perspectives, Sampson, Raudenbush and Earls [3] introduced collective efficacy, arguing that neighbourhood resilience depends upon both mutual trust and the shared willingness of residents to intervene for the common good. Collective efficacy shifts attention from the existence of social networks towards their capacity to produce coordinated action.

However, while these theories explain many characteristics of cohesive communities, they remain primarily descriptive. They identify the conditions associated with cohesion but provide comparatively limited explanation of how cohesion can be intentionally cultivated within increasingly complex digital societies. This distinction becomes particularly significant as community participation is progressively mediated through digital technologies that reshape how relationships are formed, maintained, and governed.

The rapid expansion of digital infrastructures has altered the ecology of civic participation. Communities are no longer exclusively place-based but increasingly exist as hybrid civic systems operating simultaneously across online and offline contexts [24, 23]. Digital platforms function not merely as communication channels but as civic infrastructures that mediate access to information, participation, services, and public decision-making. At the same time, algorithmic curation, platform governance, digital exclusion, misinformation, and fragmented online publics have complicated traditional assumptions regarding participation and democratic engagement [25, 56]. Systematic reviews consistently demonstrate that technology alone does not strengthen civic engagement; successful participation depends upon institutional responsiveness, transparency, trust, digital literacy, and meaningful opportunities for influence [16, 17].

This observation aligns closely with socio-technical systems theory. Since the pioneering work of the Tavistock Institute, socio-technical researchers have argued that successful systems emerge through the joint optimisation of social and technical elements rather than through technological innovation alone [11, 13]. Later work demonstrated that technologies are embedded within organisational practices and continually shaped through human interaction [15, 14]. While these contributions have largely focused upon organisational contexts, their underlying principles provide an important lens for understanding contemporary civic systems.

To keep the argument precise, this paper adopts terminology drawn directly from that tradition. Bostrom and Heinen [12] describe a work system as the interaction of a *social subsystem*, comprising people and structure, and a *technical subsystem*, comprising technology and tasks. Davis et al. [18] extend this view into a hexagonal model in which goals, people, infrastructure, technology, culture, and processes are interdependent parts of a single system embedded in an environment. Applied to civic life, the civic sociotechnical system consists of people (residents, volunteers, community leaders, public officers), structures (governance arrangements, partnerships, roles, community assets), technologies (platforms, devices, connectivity, data), and tasks and processes (participation, referral, deliberation, translation). Civic cohesion is the outcome of how well these elements are jointly optimised: the trust, capability, legitimacy, and public value that the system produces. The distinction matters because interventions act on the system, not directly on the outcome. Distributing devices to digitally excluded residents, for example, changes only the technical subsystem; unless people, structures, and processes are adjusted alongside it, through peer support, trusted venues, and responsive services, cohesion is unlikely to improve.

Asset-Based Community Development and Civic Intelligence strengthen this perspective by locating capability within communities themselves [7, 9], while knowledge management helps explain how that capability moves between informal and formal settings [20, 21]; both are examined in Section 4. Taken together, these traditions point towards a significant gap within existing civic cohesion literature. Although each explains important dimensions of civic life, none provides a comprehensive account of how cohesive civic systems can be intentionally designed across hybrid digital–physical environments, nor of how community knowledge moves between informal civic activity and formal governance structures.

This paper responds to that gap by reconceptualising civic cohesion as the outcome of an intentional sociotechnical architecture rather than simply a desirable social condition. The following sections examine the contribution and limitations of Problem-Oriented Policing, Asset-Based Community Development, and Civic Intelligence before integrating these perspectives into the Civic Cohesion Framework v3, which positions

intentionality, translation, and joint sociotechnical design as the central mechanisms through which communities generate trust, capability, and enduring public value.

3. Problem-Oriented Policing: Systemic Analysis as a Design Antecedent

Although the paper's orientation is strengths-based, it begins its review with a tradition that originates in deficit reduction. The reason is methodological: while Problem-Oriented Policing (POP) was designed to reduce recurring problems, its infrastructure of systemic analysis and iterative learning loops provides the structural engine needed to operationalise strengths-based community assets. The later sections retain this engine while changing what it is pointed at.

POP, first articulated by Goldstein [26, 27], represented a significant departure from reactive policing by reconceptualising policing as a process of understanding and addressing the underlying conditions that generate recurring community problems. Rather than responding repeatedly to incidents, POP advocates identifying root causes, analysing systemic interactions, engaging multiple stakeholders, and developing tailored interventions capable of producing sustainable improvements. Goldstein [27] argued that recurring issues emerge through interactions between individuals, organisations, physical environments, institutional arrangements, and wider socioeconomic conditions, and that policing organisations should therefore become learning organisations capable of analysing problems, designing collaborative responses, evaluating outcomes, and adapting future practice.

The practical embodiment of this philosophy was the SARA model (Scanning, Analysis, Response and Assessment) developed by Eck and Spelman [28]. SARA introduced an iterative process of diagnosis, intervention, evaluation, and organisational learning that closely resembles contemporary approaches to systems thinking and adaptive governance. The logic transfers readily to civic settings. A local partnership might *scan* referral data and notice that older residents repeatedly miss online appointments; *analyse* the causes and find that cost is less important than low confidence and distrust of online services; *respond* with device loans delivered alongside peer mentors in a trusted community venue; and *assess* not only appointment attendance but whether residents go on to use digital channels independently.

This structural alignment between socio-technical thinking and public safety was foreshadowed by Mumford [29], who applied socio-technical problem solving to complex policing and public safety dilemmas and showed that linear administrative interventions tend to fail when problems are deeply interconnected. From this perspective, community risks cannot be separated from the communication infrastructures and institutional realities through which they are sustained.

Viewed from a contemporary perspective, POP can therefore be interpreted as an early design methodology rather than simply a policing strategy. Simon [32] argued that design is concerned with creating preferred future states through purposeful intervention, and Romme [33] distinguishes explanatory theories from design theories that provide principles for purposeful organisational action. Although Goldstein did not position POP within design science, its emphasis on structured diagnosis, iterative learning, collaborative intervention, and continuous refinement demonstrates many characteristics of design-oriented inquiry. POP also exhibits affinities with Soft Systems Methodology [30], which rejects linear intervention in favour of iterative inquiry among stakeholders with differing perspectives, and with Engeström's [31] concept of expansive learning, in which diverse actors collectively reconceptualise shared activity across institutional boundaries.

POP also challenged assumptions concerning organisational responsibility. Community safety was no longer regarded solely as the responsibility of the police but as a shared outcome requiring collaboration between residents, local authorities, education providers, housing organisations, voluntary groups, businesses, and other public services. This anticipated later developments in co-production [34] and polycentric governance [35], in which complex public problems are addressed through distributed systems where communities, institutions, and civic organisations contribute complementary knowledge and capability.

Despite its influence, POP has attracted sustained criticism. Researchers note that operational pressures frequently encourage rapid responses rather than comprehensive diagnosis [36], and that limited analytical capability, fragmented governance, and resource constraints often reduce POP to isolated projects rather than continuous organisational learning [37, 38]. These critiques reveal that effective systems methodologies require supportive organisational infrastructures, but they concern implementation rather than the conceptual foundations of the approach.

POP nevertheless retains an important conceptual limitation. Its primary orientation remains problem resolution: the desired outcome is the reduction of identified problems rather than the intentional cultivation of community capability. Communities are positioned largely as participants within institutional interventions

rather than as autonomous producers of civic capability and public value. The Civic Cohesion Framework builds upon POP's systems orientation while extending it in four respects: it shifts the focus from resolving problems towards cultivating capability; it integrates physical and digital environments within one sociotechnical architecture; it positions translation between informal and formal knowledge as the mechanism of public value creation; and it introduces intentionality as the principle guiding the design of adaptive civic systems.

4. From Community Capability to Civic Intelligence: Towards Intentional Civic Systems

The development of community theory over the past three decades reflects a shift from problem-solving towards capability-building. Earlier models largely viewed communities as recipients of institutional intervention; contemporary perspectives increasingly recognise communities as adaptive sociotechnical systems capable of creating public value through distributed knowledge, collaborative learning, and collective action. Two complementary traditions have been particularly influential in this transition: Asset-Based Community Development (ABCD) and Civic Intelligence.

4.1 Asset-Based Community Development: Communities as Producers of Capability

ABCD, developed by Kretzmann and McKnight [7], challenged deficit-oriented models of intervention by arguing that sustainable development begins with identifying and connecting the assets already present within communities: relationships, practical skills, voluntary organisations, cultural resources, and informal leadership that often remain invisible to service-led approaches. Rather than positioning citizens as clients, ABCD reconceptualises residents as active producers of community capability. Russell [8] extends this through the concept of *citizen space*, arguing that democratic renewal depends upon preserving communities' capacity to organise, deliberate, and solve problems independently of professional institutions.

ABCD therefore redefines where capability resides. Community capability is not an outcome of institutional intervention but the principal resource from which intervention emerges. This aligns closely with socio-technical systems thinking, in which technological value is created not by technology itself but through its integration within existing social relationships and practices [14, 39]. A community café that already hosts a weekly knitting group, for instance, may be a more effective site for digital skills support than a purpose-built facility, because the trust and routine are already in place.

Nevertheless, ABCD has attracted significant critique. MacLeod and Emejulu [40] argue that strengths-based approaches risk being appropriated within neoliberal governance to justify the withdrawal of statutory support while transferring responsibility to communities lacking adequate resources, and critics note that an exclusive emphasis on assets may underplay structural inequalities associated with poverty, digital exclusion, discrimination, and unequal access to power. These critiques demonstrate that community capability and institutional capacity should be regarded as complementary components within broader civic systems. Ostrom's [35] theory of polycentric governance reinforces this position, and the Civic Cohesion Framework therefore adopts an integrative stance in which community assets, institutional governance, and technological infrastructures collectively contribute to civic capability.

4.2 Civic Intelligence: Communities as Collective Learning Systems

Whereas ABCD primarily explains where civic capability originates, Schuler's [9, 10] concept of Civic Intelligence explains how capability becomes coordinated collective action. Civic Intelligence describes the collective capacity of communities, organisations, and societies to understand shared problems and organise effective responses through participation, dialogue, creativity, and collaborative learning. Intelligence is therefore not located within individuals or institutions but emerges through relationships between diverse actors.

This perspective aligns with Wenger's [41] theory of Communities of Practice, which holds that learning, identity, and capability develop through participation in shared practice, and with Engeström's [31] account of expansive learning across institutional boundaries. Digital platforms increasingly function as civic infrastructures through which such learning is coordinated [23], yet algorithmic governance, platform moderation, digital exclusion, and fragmented online publics raise questions of legitimacy, transparency, and accountability [25]. Civic Intelligence should therefore be understood not simply as a property of communities but as an emergent characteristic of relationships between people, organisations, digital infrastructures, and

governance systems; in the terminology of Section 2, it is a property of the civic sociotechnical system as a whole.

4.3 Knowledge Translation within Sociotechnical Civic Systems

Although ABCD and Civic Intelligence significantly advance understanding of community capability, both leave an important question unresolved: how does community knowledge become institutional action? ABCD explains how assets are identified and mobilised, and Civic Intelligence explains how communities develop collective problem-solving capacity, but neither explains how locally generated knowledge moves between informal civic activity and formal governance.

Knowledge management provides the bridge. Nonaka and Takeuchi's [20] SECI model shows that learning depends upon continual interaction between tacit and explicit knowledge through socialisation, externalisation, combination, and internalisation. Carlile [21] argues that innovation depends less upon knowledge creation than upon effective translation across boundaries where actors hold different interests, languages, and forms of expertise. Checkland and Holwell [42] add that data only becomes information when people attribute meaning to it in the context of purposeful action, which implies that translation is an act of shared sense-making rather than a transfer of facts.

Applied to civic environments, these insights suggest that communities continually generate valuable civic intelligence through lived experience, volunteering, peer support, neighbourhood relationships, and digital participation. Civic effectiveness therefore depends not simply upon participation but upon the capacity to translate tacit community knowledge into explicit forms capable of informing governance while preserving legitimacy and local ownership. Digital platforms consequently function as knowledge infrastructures through which communities create, exchange, interpret, and apply civic intelligence across institutional boundaries [23], and governance shifts from directing participation towards enabling learning across diverse civic actors.

4.4 Towards Intentional Civic Systems

Collectively, the traditions reviewed in this section represent successive stages in the evolution of civic systems thinking. Problem-Oriented Policing explains systemic analysis; ABCD explains community capability; Civic Intelligence explains collective learning; and knowledge management explains knowledge translation. Yet none alone explains how hybrid civic systems can be intentionally designed.

The present paper argues that these traditions converge towards a synthesis grounded in intentional sociotechnical design. Civic cohesion should be understood not simply as participation, trust, or social capital, but as an adaptive capability emerging from intentionally designed relationships between community assets, organisational learning, technological infrastructures, governance arrangements, and knowledge translation. Drawing upon Simon's [32] design science and Romme's [33] conception of design theory, the Civic Cohesion Framework is intended not only to explain existing civic systems but to provide principles for the purposeful design of future ones. It is therefore offered as a mid-range design theory for analysing, designing, and evaluating intentional civic systems.

5. Operationalising the Civic Cohesion Framework: An Intentional Sociotechnical Architecture

Building upon socio-technical systems theory [11, 13, 14], design science [32, 33], Asset-Based Community Development [7, 8], Civic Intelligence [9, 10], knowledge management [20, 21], and polycentric governance [35, 34], the Civic Cohesion Framework v3 treats civic cohesion as the outcome of an intentionally designed sociotechnical system. This represents a shift from explanation to design: earlier cohesion theories explain why trust, participation, and collective efficacy matter, but offer less guidance on how cohesive civic systems can be deliberately constructed, governed, and sustained.

Communication is not treated as a separate analytical dimension. Instead, it functions as the relational infrastructure through which civic knowledge, trust, legitimacy, and participation circulate. This reflects infrastructure studies, where infrastructures are understood as embedded, relational, and visible through use and breakdown rather than as neutral technical backdrops [22, 23].

The framework is best understood through four interrelated architectural layers:

1. civic development domains (Section 5.1, Figure 1);
2. formal–informal translation pathways (Section 5.2, Figure 2);
3. intentional sociotechnical design and its principles (Sections 5.3 and 5.4, Figure 3, Table 1); and
4. learning-oriented evaluation (Section 5.5).

5.1 Civic Development Domains

The first architectural layer consists of four interdependent domains organised across two intersecting axes: Personal-Community and Digital-Physical. As illustrated in the 2×2 matrix in Figure 1, these domains are not discrete stages or separate programmes. Rather, they identify the principal civic spaces in which capability is developed, exchanged, and translated into collective action, with communication at the centre as the infrastructure connecting them.



Figure 1: Civic development domains of the Civic Cohesion Framework, organised across Personal-Community and Digital-Physical axes. The central cycle indicates that the domains reinforce one another through communication as relational infrastructure.

Digital Safety Development (Personal-Digital) focuses on the individual capabilities required for safe, confident, and meaningful participation in digitally mediated civic life. Digital inclusion research increasingly recognises that access to devices or connectivity is insufficient; meaningful participation requires digital literacy, critical media awareness, cyber resilience, privacy management, and the confidence to engage with public and community services [43, 56]. These capabilities are also elements of digital citizenship, which frames safe and responsible technology use as a civic competence rather than a purely technical skill [44]. Informal mechanisms such as peer mentoring, intergenerational support, gaming communities, and trusted conversations are strengthened by formal safeguarding frameworks, cybersecurity protocols, and reporting procedures.

Online Community Support (Community-Digital) extends individual capability into digitally mediated collective action. Digital platforms increasingly operate as civic infrastructures through which communities coordinate mutual aid, organise volunteering, share resources, deliberate on local priorities, and maintain social connection. Systematic evidence shows that digital participation tools can support information flow between citizens and governments, but that their effectiveness depends on governance, accessibility, trust, and institutional responsiveness rather than functionality alone [16, 17]. Informal practices such as community storytelling, peer support, rapid mutual aid, and neighbourhood forums therefore interact with formal moderation, onboarding, safeguarding, and documentation.

Civic Leadership Development (Personal-Physical) focuses on distributed leadership through volunteering, mentoring, community organising, facilitation, and experiential learning. Consistent with ABCD, leadership emerges from community assets and trusted relationships rather than from institutional appointment alone [7, 8], and Communities of Practice theory shows that identity develops through participation in shared practice [41]. Informal leadership emerges through trust networks, peer recognition, and everyday organising; formal pathways include civic education, youth leadership programmes, accredited training, and trustee development.

Local Policy Development (Community-Physical) concerns the translation of community intelligence into place-based governance, including participatory budgeting, community wealth building, neighbourhood renewal, local assemblies, and collaborative planning. Ostrom's work demonstrates that complex public problems are more effectively governed through multiple interacting centres of decision-making than through centralised control [35, 34]. Informal neighbourhood conversations and lived experience generate local knowledge, while formal mechanisms provide accountability, policy authority, and resource allocation. Public value is realised when citizen knowledge is not merely collected but translated into institutional learning and visible change.

The value of the domains lies in their interdependence. An illustrative (hypothetical) example traces one path through them. An older resident attends a digital skills session run by peer mentors at her local library and gains the confidence to use a video-calling app safely (Digital Safety Development). She joins a neighbourhood online group, where she begins answering other residents' questions about bus timetables (Online Community Support). The group's organiser invites her to become a volunteer digital champion, and she co-facilitates sessions at a community centre (Civic Leadership Development). Her accumulated knowledge of why residents struggle with the council's transport app is then fed into a local transport consultation, and the app's accessibility is improved (Local Policy Development). No single intervention produced this outcome; it arose from the connections between the domains.

5.2 Formal and Informal Translation Pathways

The second architectural layer concerns the movement of knowledge, legitimacy, and agency between informal community life and formal governance. Participation literature often distinguishes grassroots engagement from institutional decision-making without explaining how knowledge travels between them. The Civic Cohesion Framework instead positions translation as the central mechanism through which cohesion develops. The iterative translation loop is modelled in Figure 2.

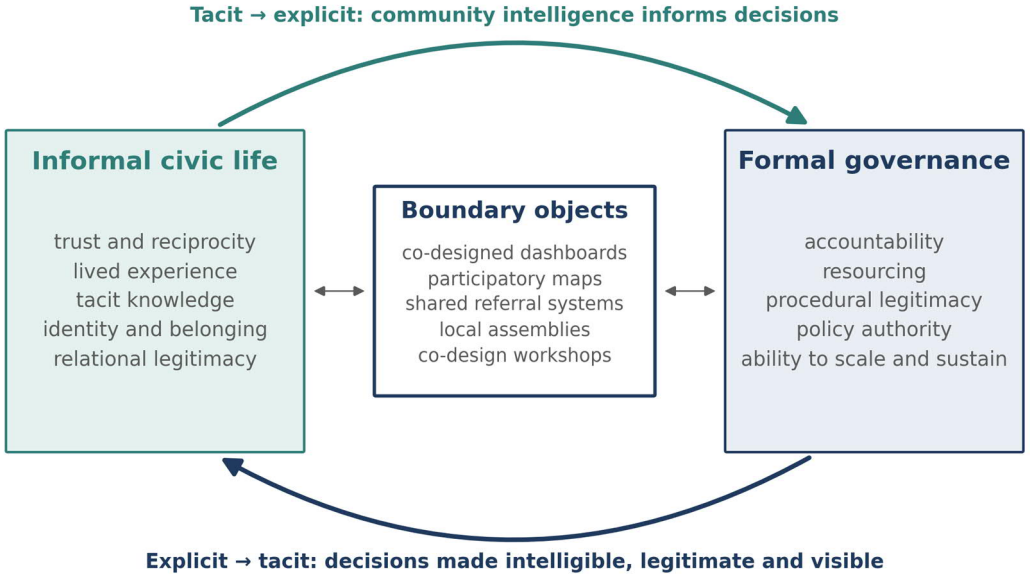


Figure 2: Formal-informal translation loop. Boundary objects allow community intelligence to inform formal decisions (tacit to explicit) and allow those decisions to be made intelligible and legitimate within communities (explicit to tacit).

Informal civic activity generates trust, lived experience, tacit knowledge, identity, and relational legitimacy. Formal institutions provide accountability, resourcing, procedural legitimacy, and the ability to scale or sustain decisions. Neither is sufficient alone. Informal activity without formal translation may remain invisible to policy systems; formal governance without informal legitimacy risks tokenism, mistrust, or implementation failure.

Translation occurs through boundary objects: artefacts, processes, or shared spaces that enable different groups to coordinate without requiring identical understandings [45]. Examples include community dashboards, participatory maps, civic charters, shared referral systems, local assemblies, co-design workshops, and collaborative evaluation tools. A participatory map of routes that young people avoid after dark, for example, turns individual experiences into a shared artefact that a council can act upon, while the council's response can be recorded on the same map so that young people see that their contribution mattered.

Boundary objects also provide a means of negotiating what Soft Systems Methodology calls *problem situations*: real-world situations that different stakeholders perceive and value differently [30, 46]. By giving residents, voluntary organisations, and public bodies a shared object to debate, they help surface conflicting perceptions and support the search for changes that are, in Checkland's [47] terms, both systemically desirable and culturally feasible. This is consistent with Engeström's [31] expansive learning: translation is not a one-way transfer of information from communities to institutions but an adaptive process through which community actors, voluntary organisations, public bodies, and digital platforms learn together.

5.3 Intentional Sociotechnical Design

The third architectural layer introduces the central theoretical contribution of the framework: intentionality. Existing theories often describe participation, trust, or collective efficacy as properties that emerge from social interaction or favourable institutional conditions, but provide limited guidance on how civic systems might be deliberately designed. Figure 3 brings the layers together, showing the civic sociotechnical system, the outcome it produces, the design principles that shape it, and the evaluation loop through which it learns.

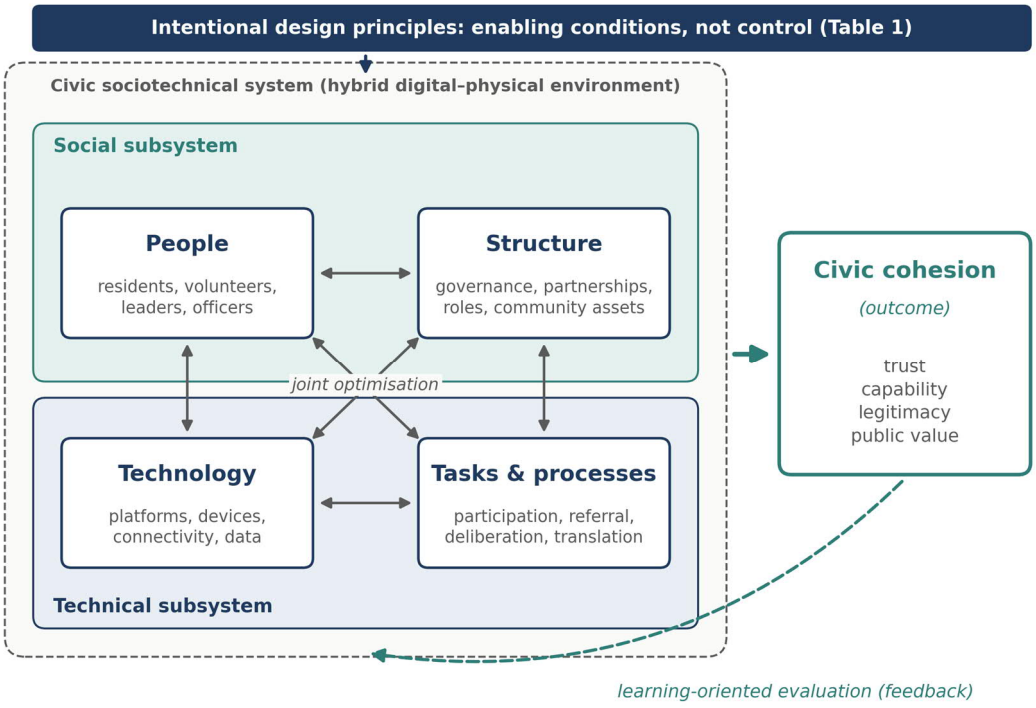


Figure 3: The intentional sociotechnical architecture. Civic cohesion is the outcome of joint optimisation between the social subsystem (people, structure) and the technical subsystem (technology, tasks and processes) within a hybrid environment, shaped by intentional design principles and renewed through learning-oriented evaluation. Adapted from the socio-technical system views of Bostrom and Heinen [12] and Davis et al. [18].

This shift draws on design science. Simon [32] argued that design is concerned with transforming existing situations into preferred ones, and Romme [33] argues that design theory should provide principles for purposeful action rather than description alone. In a hybrid civic system, a preferred state might involve transforming an algorithmically fragmented online neighbourhood forum into a verified, polycentric digital local assembly in which residents, community groups, and council officers deliberate together and decisions are publicly recorded.

The framework also extends classical socio-technical systems theory. Cherns [11] and Trist [13] argued that effective systems arise through the joint optimisation of social and technical arrangements. This remains a central tenet of contemporary socio-technical scholarship: recent empirical work continues to show how human-centred design principles reduce misalignment, dissatisfaction, and turnover within organisational work systems [48]. The Civic Cohesion Framework expands this mandate from organisational boundaries to open-ended civic ecosystems, arguing that intentional design must safeguard human wellbeing and trust across both institutional and community-wide technical infrastructures.

Crucially, intentional design in this sense is not a top-down process run by technology specialists or public authorities. Mumford's ETHICS methodology [49, 50] established that the people who will live with a system

should be its principal designers, and that human needs such as job satisfaction and autonomy should be treated as design objectives alongside technical efficiency. The Civic Cohesion Framework carries this democratic, participatory ideal into civic life, positioning ordinary citizens as the primary designers of their hybrid communities. Bednar and Welch [51] similarly observe that information systems development is an emergent consequence of continuous individual and collective learning shaped by contextual dependencies. Intentional design is therefore not an act of deterministic control but the creation of deliberate sociotechnical spaces that empower citizens to express their values, navigate local circumstances, and grow organically.

Intentionality therefore means more than planning. It refers to the normative alignment of technologies, institutions, relationships, and community assets towards desired civic outcomes: trust, inclusion, reciprocity, democratic legitimacy, resilience, and shared public value. This is particularly important in digitally mediated contexts. Digital tools may improve participation, but they may also reproduce inequalities, intensify exclusion, or fail to influence decision-making unless accompanied by inclusive governance and institutional commitment [16, 17]. Emerging technologies also bring risks around bias, exclusion, transparency, and democratic accountability, and OECD guidance stresses that the public should be involved in their design, development, regulation, and governance [52].

5.4 Principles of Civic Cohesion Design

If civic cohesion can be intentionally designed, civic systems require principles to guide their development and evaluation. Cherns' [11] principles of sociotechnical design provide the starting point: compatibility, minimal critical specification, the sociotechnical criterion (controlling variances close to their source), multifunctionality, boundary location, information flow, support congruence, design and human values, and incompletion. Digitally mediated civic systems, however, require these principles to be reinterpreted to incorporate community capability, knowledge translation, adaptive governance, and democratic legitimacy. The Civic Cohesion Framework therefore proposes five design principles, each aligned with one or more of Cherns' principles, as summarised with illustrative examples in Table 1.

First, communities before technologies. Technologies should be introduced only in relation to existing community assets, relationships, capabilities, and needs. This reflects ABCD's claim that communities are producers of capability rather than passive recipients of intervention [7, 8], and Cherns' principle of compatibility: a design process intended to produce a participatory system must itself be participatory.

Second, relationships before transactions. Civic systems should prioritise trust, reciprocity, and mutual accountability over simple service transactions or participation metrics. In Cherns' terms, this is a matter of support congruence: the reward and recognition systems surrounding a civic platform should reinforce relational behaviour, such as peer help, rather than counting log-ins.

Third, translation before implementation. Interventions should include deliberate mechanisms for moving knowledge between informal community settings and formal governance systems. This extends Cherns' principles of information flow, which directs information to where action is taken, and boundary location, which holds that boundaries should not impede the sharing of knowledge. Without translation, participation risks becoming symbolic rather than transformative.

Fourth, adaptation before optimisation. Civic systems operate within uncertainty, contested values, and changing social conditions. This principle draws directly on Cherns' principle of minimal critical specification: designers should specify only the bare minimum conditions that are essential, such as safeguarding and accessibility requirements, leaving local communities the freedom to adapt the system organically to their own circumstances. It also reflects Cherns' principle of incompletion, which treats design as a continuing process, and draws on Soft Systems Methodology [30] and developmental evaluation [53] in favouring reflective, learning-oriented governance over fixed, predetermined outputs.

Fifth, participation before automation. Emerging technologies should support rather than replace democratic judgement, and the public should be involved in the design and governance of technologies that shape civic participation, service access, or public decision-making [52]. This principle directly operationalises Cherns' principle of design and human values and Mumford's ETHICS methodology [49, 50], adapting classical, humanistic socio-technical design for digital civic infrastructures. It also aligns with Critical Systemic Thinking, which holds that information systems research and practice must respect the unique, socially constructed worldviews of individuals [54]. By favouring divergent thinking over reductive, automated problem-solving, intentional design becomes an ethical intervention: technical infrastructures should enrich pluralistic dialogue rather than impose a single top-down consensus.

Table 1

Civic cohesion design principles aligned with Cherns' [11] principles of sociotechnical design, with illustrative examples

Design principle	Aligned Cherns [11] principle(s)	Illustrative civic example
Communities before technologies	Compatibility; design and human values	Map existing groups and trusted venues (libraries, community centres, youth clubs) before choosing a platform, and select tools together with residents.
Relationships before transactions	Support congruence; multifunctionality	Fund peer mentors alongside device distribution, and recognise reciprocal help between residents rather than counting log-ins.
Translation before implementation	Information flow; boundary location	A co-designed "you said, we did" dashboard that records how community input changed council decisions.
Adaptation before optimisation	Minimal critical specification; sociotechnical criterion; incompletion	Specify only safeguarding and accessibility essentials for a neighbourhood forum, and let each group set its own norms and moderation practices.
Participation before automation	Design and human values; compatibility	Residents deliberate on, and approve, any automated triage or AI chatbot used in a local service, with human review of automated decisions.

Together, these principles extend socio-technical design into civic environments. They shift attention from implementing discrete technological solutions towards cultivating the relationships, institutions, and learning processes through which civic cohesion is produced.

5.5 Evaluating Civic Cohesion as a Learning System

Reconceptualising civic cohesion as the outcome of an intentionally designed sociotechnical system also requires rethinking evaluation. Conventional approaches often rely on participation statistics, service uptake, digital access, or policy outputs. These indicators remain useful, but they provide only partial insight into whether civic systems are strengthening capability, trust, legitimacy, and public value. Mumford [50, 14] consistently argued that socio-technical systems should be judged by human-centred outcomes as well as technical efficiency. In civic contexts, this means evaluating outcomes such as mutual trust, community morale, and reductions in digital alienation.

Socio-technical systems theory suggests that evaluation should examine the quality of interactions between people, technologies, processes, and environments [13, 39], while knowledge management shifts attention from information collection towards knowledge movement, interpretation, and application [20, 21]. Evaluation therefore becomes concerned not only with what a civic system produces, but with how it learns. This requires moving from auditing metrics towards what Bednar and Welch [55] describe as *usefulness* rather than *usability*: whether a system is meaningful and valuable to the people who use it in their own context, not only whether it functions. In their double helix metaphor, use and usefulness co-evolve through a continuing dialectic; in civic terms, lived community experience and institutional reflection form an evolving learning spiral, and evaluation is the mechanism that sustains it.

In practice, evaluation should examine whether informal community knowledge is translated into institutional learning, whether institutional decisions remain meaningful to communities, whether digital platforms support reciprocal dialogue, and whether governance processes are trusted and responsive. Illustrative indicators include the proportion of community proposals that receive a documented public response, the density of connections between previously separate community groups, and the extent to which residents report that their contributions made a difference. Systematic reviews reinforce this emphasis: civic technologies create value when citizens perceive that their contributions matter and institutions demonstrate transparency and responsiveness [16, 17].

Because civic cohesion develops gradually through repeated interaction and evolving relationships, longitudinal and participatory methodologies are required. Developmental evaluation [53], participatory action research, social network analysis, digital trace analysis, and mixed-method longitudinal designs are better suited to understanding civic systems than static outcome measurement alone. Evaluation thus becomes part of the sociotechnical system itself: it strengthens adaptive capacity by generating feedback, supporting reflection, and enabling communities and institutions to refine their relationships over time.

5.6 Synthesis

Taken together, these layers position the Civic Cohesion Framework v3 as a mid-range design theory for civic systems rather than a descriptive model of community participation. It explains how civic cohesion, as an outcome, is produced by a civic sociotechnical system through the interaction of four civic development domains, formal-informal translation pathways, intentional design principles aligned with established socio-technical principles, and learning-oriented evaluation. Communication runs through every layer as the relational infrastructure through which knowledge, trust, and legitimacy circulate, enabling communities to generate civic intelligence, institutions to learn from it, and technologies to become meaningful within social practice.

6. Conclusion: Towards Intentional Civic Systems

This paper has argued that civic cohesion should no longer be understood only as a social condition arising from participation, trust, institutional effectiveness, or shared identity. In hybrid digital–physical societies, civic life is increasingly shaped by relationships between communities, technologies, organisations, governance arrangements, communication infrastructures, and knowledge systems. The central contribution of the paper is therefore to reposition civic cohesion as the outcome of **intentionally designed sociotechnical systems**.

The framework contributes to theory in four main ways. First, it conceptualises communities as adaptive sociotechnical systems in which civic capability arises from the interaction of people, structures, technologies, and processes rather than from any one in isolation. Second, it reframes civic cohesion as a continuing process of capability development rather than a static outcome. Third, it positions translation as the mechanism through which civic intelligence becomes public value: informal community knowledge must be translated into formal governance, while institutional decisions must remain intelligible and legitimate within communities. Fourth, it introduces intentionality, understood as enabling rather than controlling, as the design philosophy through which civic systems are conceived, governed, and evaluated.

The framework also extends socio-technical systems theory beyond its traditional concern with organisational work systems. In doing so, it carries forward Enid Mumford's lifelong commitment to participatory, humanistic design [49, 50, 14] into the modern, hybrid public square. Communities are not merely contexts in which technologies are deployed; they are active sociotechnical systems through which public value is created, and their members are the rightful designers of those systems.

For practice, the framework suggests that digital inclusion programmes, leadership development, community engagement, participatory governance, and digital platforms should not be designed separately but as interconnected layers within a civic system. Digital safety supports online participation; online participation surfaces community intelligence; civic leadership translates individual agency into collective action; and local policy development institutionalises learning from communities. For evaluation, it argues that civic cohesion should be assessed as a learning system, examining whether informal knowledge reaches formal decision-making, whether governance remains responsive, and whether communities experience participation as meaningful.

6.1 Limitations

As a conceptual position paper, the framework has several limitations. First, it has not yet been empirically validated; the domains, translation pathways, and design principles are derived from literature synthesis and practice experience rather than systematic data, and the illustrative examples are hypothetical. Second, the literature drawn upon is predominantly from the United Kingdom, Europe, and North America, and the framework may require adaptation in contexts with different governance traditions, levels of connectivity, or relationships between state and civil society. Third, the framework assumes a degree of institutional willingness to receive and act upon community intelligence; where institutions are unresponsive or distrusted, translation pathways may fail regardless of design quality. Fourth, power and conflict are under-theorised: communities are not homogeneous, and translation mechanisms can privilege more confident or better-connected voices. Fifth, as the critique of ABCD suggests [40], the language of intentional design and community capability could be appropriated to shift responsibility onto under-resourced communities. Finally, the four domains are analytical categories with porous boundaries and are not claimed to exhaust civic life.

6.2 Future Research

Empirical studies are needed to examine how the four civic development domains interact in different places and communities, and to develop and test measures for the human-centred outcomes proposed in Section 5.5.

Comparative case studies could investigate which boundary objects and translation mechanisms most effectively connect informal civic knowledge with formal governance, and under what conditions. Longitudinal studies could explore how trust, capability, and institutional responsiveness develop over time, while action research could test whether the five design principles improve outcomes when applied to real civic programmes. Further work should examine how artificial intelligence, automated decision-making, platform governance, and digital public infrastructures reshape civic participation and democratic accountability, and how the framework applies beyond the contexts in which it was developed.

Finally, the framework provides the foundation for further theoretical development through the **Civic Intelligence Translation Model (CITM)**. Whereas the Civic Cohesion Framework identifies the architecture through which civic capability develops, CITM would focus specifically on the processes through which civic intelligence moves across formal and informal domains: how communities generate knowledge, how institutions learn from it, and how sociotechnical systems can be designed to convert civic capability into enduring public value.

Ultimately, the future of civic cohesion lies not simply in increasing participation, expanding access, or building digital platforms, but in designing intentional civic systems that enable communities, organisations, institutions, and technologies to learn together. Civic cohesion is therefore not a fixed state to be achieved, but a continuing process of sociotechnical design, translation, adaptation, and collective learning.

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Declaration on Generative AI

During the preparation of this work, the author used Claude (Anthropic) in order to revise the text in response to reviewer comments, check grammar and spelling, and draft Figures 1–3. After using this tool, the author reviewed and edited the content as needed and takes full responsibility for the publication's content.

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