

Article

Institutional Learnability in Sustainable Smart Region Governance: The Act/Remember Gap in Community Knowledge-Building

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Abstract

Smart city and smart region governance increasingly relies on data-informed decision-making, stakeholder participation, digital tools, and public feedback. However, these mechanisms do not automatically create institutional learning. This article examines sustainable smart region governance as an institutional learnability problem and asks whether participation, local knowledge, and feedback are converted into adaptive action and retained as institutional memory. The study applies a Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR)-informed structured evidence mapping combined with an embedded regional case diagnosis from the Tokaj Wine Region, Hungary. The analysis integrates the literature on smart governance, learning regions, higher education quality assurance, territorial resilience, and adaptive governance with regional governance observation materials, stakeholder survey data, coding tables, calculation workbooks, and analytical figures deposited in a public Figshare dataset. The results identify the Act/Remember gap as the central learning-cycle disruption. Planning, implementation, monitoring, and consultation may be present, but feedback often fails to become adaptive action, and action is weakly retained as institutional memory. The comparison with higher education quality assurance shows that structured feedback and continuous improvement principles are transferable only as learning logic, not as procedural models. The findings also show that single-profile territories are especially vulnerable to delayed learning, strategic lock-in, and weak community knowledge-building. The article contributes to smart governance research by proposing institutional learnability as a diagnostic capacity of sustainable smart regions. It argues that digital tools should function as learning infrastructure supporting traceability, feedback-to-action mechanisms, and institutional memory, rather than as substitutes for human deliberation, trust, and collective responsibility.



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1. Introduction

Smart city research has increasingly moved from technological infrastructure toward governance, participation, sustainability, and resilience. Early smart city imaginaries often emphasized digital systems, data-driven optimization, sensor infrastructures, and technology-enabled efficiency. However, the contemporary challenge of smart cities and

smart regions is no longer only whether urban or territorial systems can collect more data or coordinate services more efficiently. The more difficult governance question is whether they can learn from the information, participation, feedback, and local knowledge they generate. In this sense, the central issue is not simply informational or technological; it is institutional.

This issue is especially relevant because smart city development now operates under multiple and sometimes conflicting expectations. Smart city strategies are expected to support digital transformation, improve policy implementation, enhance citizen engagement, strengthen social sustainability, and contribute to resilience-oriented territorial development. Yet these expectations do not necessarily reinforce one another automatically. Tomor et al. [1] show that empirical evidence on the sustainability outcomes of smart governance remains mixed. Their finding is important because it suggests that smart governance instruments do not automatically produce sustainable or socially inclusive results.

A first strand of the literature has therefore criticized technology-driven smart city models. Hollands [2] argues that corporate smart city approaches tend to privilege technology-led urban development while leaving limited room for meaningful citizen participation. This critique challenges the assumption that technological sophistication is equivalent to urban intelligence. Melgaço and Willis [3] describe the smart city debate as a tension between technocratic and social paradigms. Their framing is useful because it shows that the smart city is not a neutral technical project, but a contested model of urban and social organization.

A related critical branch of the literature has also questioned whether smart city development can depoliticize urban governance. Kitchin [4] argues that smart urbanism raises ethical questions concerning data, power, governance, and urban science. This matters for the present article because institutional learning cannot be reduced to data availability. Data may increase visibility, but visibility does not guarantee interpretation, accountability, or adaptive action. Critical smart city scholarship therefore provides the first foundation for this article: technology may support smart governance, but it cannot define smartness by itself.

A second strand of the literature responds to this limitation by emphasizing smart governance, participation, and co-production. Meijer and Bolívar [5] argue that smart urban governance depends on human collaboration, institutional arrangements, and open decision-making processes. Their contribution shifts the focus from technological infrastructure to governance capacity. Pereira et al. [6] similarly frame smart governance as a field in which ICT is relevant, but collaboration, citizen engagement, and governance arrangements remain central.

The co-production literature further strengthens this participatory interpretation of smart governance. Webster and Leleux [7] conceptualize smart governance as technologically mediated citizen co-production, where digital tools may support reciprocal relationships between citizens and municipalities. Castelnovo et al. [8] argue that smart city governance should be assessed through participation, co-design, co-production, and social innovation rather than through technological performance alone. Cortés-Cediel et al. [9] show that citizen participation and engagement have become important components of European smart city initiatives. Together, these sources show that the participatory turn has become central to contemporary smart governance research.

However, the participatory turn does not fully solve the learning problem. Public participation can generate input without changing policy routines. Stakeholder engagement can increase consultation without producing adaptive governance. Citizen feedback can be collected through digital platforms without becoming institutional memory. A dashboard can make problems visible without ensuring that institutions act on them.

This creates a second-order problem for smart governance: a city or region may become more participatory, more data-rich, and more technologically equipped while remaining weakly learnable.

This problem connects smart governance to the literature on learning cities and learning regions. Longworth [10] conceptualizes learning cities as places where learning becomes a strategic resource for personal, social, civic, and economic development. This perspective is important because it treats the city not only as an infrastructure system, but also as a learning environment. Valdés-Cotera et al. [11] document how learning city strategies can be developed across diverse urban contexts through lifelong learning, partnerships, and community development. Their work shows that learning cities require institutional coordination and social mobilization, not only educational provision.

The learning region literature extends this argument to territorial development. Boekema et al. [12] similarly connect regional learning to knowledge, innovation, and economic growth. This literature provides a bridge between smart regions and institutional learning because it treats regions as knowledge-based and relational systems. At the same time, Mackinnon et al. [13] warn that learning region approaches can become overly normative when they understate wider structural conditions and extra-local constraints. This critique is important for the present article because it prevents an idealized view of learning regions.

The governance and community-development strand of the learning literature adds another important dimension. Morgan [14] connects learning regions with institutions, innovation, and regional renewal. This perspective shows that regional learning is not only an economic innovation process, but also a civic and governance process. Callaghan and Wistow [15] emphasize the importance of community knowledge and participation in local governance. Their argument supports the idea that governance learning depends on how institutions recognize and process situated knowledge.

A further theoretical foundation comes from organizational learning, policy learning, and adaptive governance. Argyris and Schön [16] establish that organizational learning involves more than error detection; it requires the modification of routines, assumptions, and action strategies. This is directly relevant to smart governance because feedback becomes meaningful only when it changes how institutions act. Pahl-Wostl et al. [17] connect social learning to multi-actor governance and adaptive capacity. Their work is especially useful for smart regions because it shows that learning occurs through interaction among actors, institutions, and knowledge systems.

The adaptive governance literature clarifies why learning is central to resilience. Folke et al. [18] position adaptive governance as a key condition for managing complex social-ecological systems. This argument matters for smart cities and smart regions because resilience depends not only on infrastructure or data, but also on the capacity to adapt under uncertainty. Birkland [19] shows that disasters can become focusing events for policy learning, but also that learning after failure is politically and institutionally difficult. This is important for single-profile territories because delayed learning can turn weak signals into crises.

Taken together, these studies suggest that the core issue for Smart Cities research is not whether smart governance can generate information, participation, or feedback, but whether it can institutionalize learning from them. The smart governance literature has examined digital infrastructure, citizen participation, stakeholder engagement, and co-production; the learning city and learning region literature has treated cities and territories as learning environments; and organizational learning and adaptive governance studies clarify that learning requires changed routines, adaptive action, and institutional memory.

The remaining gap is the absence of a diagnostic framework that connects these strands for sustainable smart region governance.

This article addresses that gap by introducing institutional learnability as a capacity of sustainable smart region governance. Institutional learnability refers to the capacity of a governance system to convert participation, stakeholder feedback, local knowledge, data-informed signals, and observed consequences into shared interpretation, adaptive action, and institutional memory. The concept therefore aligns with the Smart Cities scope by connecting public participation, digital support, territorial resilience, and sustainable governance implementation.

This shift is especially important for single-profile territories. These are regions whose development identity, economic profile, cultural heritage, tourism image, or strategic discourse is strongly organized around one dominant territorial profile. Wine regions, mining regions, heritage territories, tourism-dependent destinations, and resource-dependent communities can derive strength from a dominant profile, but they can also become vulnerable to strategic narrowing. In such settings, smart governance must do more than coordinate projects or promote regional branding. It must create learning infrastructures through which weak signals, local knowledge, stakeholder concerns, and risk information can be interpreted, acted upon, and retained.

The research problem emerged from a dual practice observation. In higher education development, feedback, self-evaluation, stakeholder input, and improvement planning are formally expected as part of quality assurance. In regional governance practice, similar inputs also exist in the form of council documents, stakeholder claims, public concerns, local knowledge, strategic debates, and development priorities. However, these inputs do not necessarily become a continuous learning cycle. This contrast led to the central problem of the article: smart governance may contain data, participation, and feedback, yet still fail to transform them into adaptive action and institutional memory.

The higher education comparison is introduced here because quality assurance is one of the few institutional fields in which feedback, evaluation, stakeholder input, documentation, and improvement planning are explicitly organized as a recurring learning cycle. It therefore serves as a heuristic reference for identifying what is often missing in regional governance: not the existence of feedback, but the disciplined conversion of feedback into action and memory.

The article therefore compares smart region governance with higher education quality assurance. This comparison is not procedural. It does not suggest that regions should copy university quality-assurance systems. Instead, higher education quality assurance is used as a reference field where feedback, evaluation, stakeholder input, and continuous improvement are already formally recognized. The comparison helps identify what is often fragmented in smart region governance: the conversion of feedback into Act and the conversion of action into Remember.

The central claim is that smart region governance becomes genuinely smart only when feedback becomes adaptive action and adaptive action becomes institutional memory. Technology can support this process by improving traceability, feedback aggregation, participatory monitoring, and data-informed deliberation. Technology cannot replace the human learning networks through which trust, interpretation, deliberation, and collective responsibility are created.

The article asks three research questions. First, how can smart region governance be conceptualized as an institutional learning cycle rather than only as digital coordination or public participation? Second, what learning barriers prevent participation, feedback, and community knowledge from becoming adaptive action and institutional memory? Third,

how can higher education quality-assurance logic help diagnose the Act/Remember gap in sustainable smart region governance?

The study formulates five analytical propositions. P1 proposes that smart region governance requires institutional learnability beyond formal participation and digital support. P2 proposes that higher education quality assurance provides transferable learning principles for smart region governance, but not a procedural model to be copied mechanically. P3 proposes that the main weakness in both higher education quality assurance and smart region governance appears in the Act/Remember phase of the learning cycle. P4 proposes that single-profile territories are especially exposed to learning failure when community knowledge is not converted into institutional memory and adaptive governance. P5 proposes that technology can strengthen but not replace human learning networks in smart governance.

To examine these propositions, the article applies a PRISMA-ScR-informed structured evidence mapping with embedded regional case diagnosis. This design connects heterogeneous studies on smart governance, learning regions, higher education quality assurance, territorial resilience, disaster learning, and community knowledge-building with empirical regional governance materials from a single-profile territory. The following section describes the methodological design, evidence streams, coding framework, and comparative analytical logic.

The contribution of the article is threefold. First, it contributes to smart governance research by reframing smartness as institutional learning capacity rather than technological sophistication alone. Second, it contributes to smart region and sustainable territorial development debates by showing why single-profile territories require community knowledge-building and institutional memory. Third, it contributes a diagnostic framework for identifying the Act/Remember gap, where participation and feedback fail to become adaptive policy implementation and durable governance capacity.

2. Materials and Methods

2.1. Methodological Approach

This study applied a PRISMA-ScR-informed structured evidence mapping with embedded regional case diagnosis. The method was designed to identify recurring learning barriers across several interdisciplinary fields and to develop a diagnostic framework for institutional learnability in sustainable smart region governance.

The study was not designed as a meta-analysis or as a full systematic review. It applies a PRISMA-ScR-informed reporting logic to make the evidence-mapping process transparent, auditable, and reproducible without claiming exhaustive coverage of all relevant studies. Page et al. [20] provide the general PRISMA 2020 reporting logic for transparent review documentation, while the scoping-specific reporting logic is grounded in the PRISMA-ScR guidance discussed below.

The PRISMA-ScR elements were used as a transparency and reporting aid for structured evidence mapping, not as a claim that the manuscript is a systematic review or a scoping review article. The primary article type remains a conceptual and diagnostic Article; the evidence-mapping procedure supports framework construction rather than exhaustive review synthesis.

Tricco et al. [21] developed the PRISMA extension for scoping reviews, which informed the reporting logic of the evidence-mapping process used in this study.

The evidence base was conceptually heterogeneous. It included studies on smart governance, public participation, learning cities and regions, higher education quality assurance, disaster learning, territorial resilience, and community knowledge-building. Arksey and O'Malley [22] define scoping studies as useful when the aim is to map a broad

research field rather than answer a narrowly bounded effectiveness question. This logic fits the present study because institutional learnability is distributed across several studies rather than located in one disciplinary field.

Levac et al. [23] refine the scoping review approach by emphasizing the need to clarify the purpose of the review, link the research question to the intended outcome, and treat analysis as an iterative interpretive process. This was relevant for the present study because the purpose was not only to collect evidence from the literature, but to construct an analytical framework for comparing governance learning across domains.

Peters et al. [24] provide updated guidance for conducting scoping reviews, especially regarding transparent eligibility criteria, source selection, and reporting. Their guidance informed the separation between search blocks, screening logic, coding categories, and reporting outputs in the present study.

To make the PRISMA-ScR logic auditable in the shared data package, the supporting dataset [25] includes a dedicated evidence-mapping folder, 03_prisma_scr_evidence_mapping, containing screening_matrix.xlsx and literature_evidence_collection.xlsx, together with a documentation note, prisma_scr_evidence_mapping_note.md. These files document the thematic search blocks, screening decisions, retained records, thematic categorisation, and evidence-mapping outputs used in the study [25].

Hetrick et al. [26] describe evidence mapping as a method for organizing heterogeneous evidence and identifying gaps across a field. This was relevant because the present study compares evidence across smart governance, learning regions, higher education quality assurance, and territorial resilience.

Mays et al. [27] argue that heterogeneous qualitative and quantitative evidence can be systematically synthesized to inform policy and management questions. This supported the integration of empirical regional materials with the conceptual and review-based literature.

The analytical sequence followed five steps. First, a PRISMA-ScR-informed evidence map organized heterogeneous studies into thematic search blocks. Second, sensitizing concepts derived from the literature were translated into obstacle fields, diagnostic layers, learning-cycle phases, and territorial contexts. Third, the retained records and regional governance materials were coded through an iterative abductive process: deductive concepts from the literature were refined through repeated engagement with the Tokaj empirical materials. Fourth, the coded evidence was transformed into ordinal diagnostic ratings, learning-cycle gap values, and obstacle-coupling inputs. Fifth, these outputs were integrated into the institutional learnability framework and the Act/Remember diagnostic model.

This sequence is important because the framework was not imposed as a fully pre-determined model. It emerged from the structured interaction between existing theory, the coded literature, regional governance materials, and comparative quality-cycle reasoning.

2.2. Evidence Streams

The analysis integrated three evidence streams.

The first evidence stream was a structured literature corpus covering smart governance, learning cities and regions, higher education quality assurance, single-profile territories, disaster governance, mining and heritage-risk contexts, and territorial resilience. This corpus provided the conceptual basis for identifying recurring barriers to institutional learnability.

The second evidence stream consisted of empirical regional governance materials from the Tokaj Wine Region. These materials included formal regional governance documents, qualitative observation-based materials, survey documentation, and a qualitative coding

matrix. They were used to examine whether the learning barriers identified in the literature appear in a concrete single-profile regional governance setting.

The empirical regional governance materials used in the embedded case diagnosis are deposited in the supporting dataset accompanying this study [25]. The relevant uploaded file groups are 01_regional_governance_observation and 02_regional_stakeholder_survey; the key files include council_meeting_documents_2023.zip, council_meeting_documents_2024.zip, qualitative_coding_matrix_2023_2024.xlsx, and regional_survey_database_2025.xlsx.

The third evidence stream was the higher education quality-assurance reference logic. Higher education was not treated as the empirical object of the article. It was used as a comparative institutional field in which feedback, evaluation, stakeholder involvement, and improvement cycles are already formally recognized. Stensaker [28] argues that quality assurance in higher education should be examined not only as a control mechanism, but also in relation to organizational change and knowledge production. This makes higher education quality assurance relevant as a reference point for thinking about institutionalized learning.

2.3. Search and Screening Strategy

The literature search was organized into thematic blocks rather than one narrow keyword string. This was necessary because the research question connects smart governance, community learning, quality assurance, territorial vulnerability, and resilience.

The thematic blocks covered smart governance and community learning; learning cities and learning regions; higher education quality assurance and PDCA/ESG-related learning cycles; single-profile and resource-dependent territories; disaster governance and institutional learning; mining and heritage-risk contexts; and Latin American territorial governance cases.

Records were included when they addressed at least one of the following themes: smart governance, public participation, stakeholder engagement, knowledge co-production, institutional learning, learning cities or regions, higher education quality assurance, PDCA/ESG, disaster learning, community resilience, single-profile territorial vulnerability, or adaptive governance.

Records were excluded when they were purely technical and did not contain explicit relevance to governance, participation, learning, resilience, or institutional adaptation. Technical studies were retained only when they contributed to understanding governance capacity, public participation, risk interpretation, community resilience, or institutional learning.

2.4. Coding Framework

The retained records were coded through four analytical dimensions. The coding logic was iterative and abductive. The initial codes functioned as sensitizing concepts derived from the literature, while the regional governance materials were used to refine their empirical and diagnostic relevance. Each source or governance episode could receive multiple codes when it addressed more than one barrier to institutional learnability.

The first coding dimension was the obstacle field. This dimension captured barriers that limit institutional learnability. The obstacle fields included formal participation without learning, weak feedback integration, weak institutional memory, technocratic dominance over local knowledge, weak adult-learning or organizational-learning infrastructure, strategic monoculture, crisis-only learning, low trust and legitimacy, and limited transfer of quality-cycle logic beyond formal educational institutions.

The second coding dimension was the diagnostic layer. The first layer captured formal-technical governance rationality, including strategies, procedures, decision rules, formal

documents, and data systems. The second layer captured community governance practice, including public participation, stakeholder engagement, local knowledge, deliberation, and collective articulation. The third layer captured institutional learnability capacity, meaning the ability of a governance system to convert feedback into adaptive action and retain lessons as institutional memory.

The third coding dimension was the learning-cycle phase. The study used a five-phase cycle: Plan, Do, Check, Act, and Remember. The first four phases follow the logic of continuous improvement commonly associated with PDCA-based quality cycles. The fifth phase, Remember, was added because regional governance problems often persist not only when adaptive action is weak, but also when lessons are not retained across institutions, actors, and strategic cycles.

The fourth coding dimension was the territorial or institutional context. Records were coded according to whether they concerned higher education, smart governance, learning cities or regions, disaster governance, wine regions, mining regions, heritage territories, tourism-dependent destinations, or resource-dependent communities.

2.5. Embedded Regional Case Diagnosis

The Tokaj Wine Region was treated as an embedded regional case of single-profile territorial governance. A single-profile territory is understood as a region whose development identity, economic profile, cultural heritage, and strategic discourse are strongly organized around one dominant territorial profile.

The case was used diagnostically rather than statistically. Its role was to examine whether the literature-derived learning barriers could be observed in a concrete regional governance setting. The case also made it possible to analyze how formal decision-making, stakeholder articulation, local knowledge, strategic discourse, and institutional learning capacity interact in a single-profile region.

Yin [29] argues that case study research is appropriate when the aim is to investigate a contemporary phenomenon in depth and within its real-world context. This logic applies to the Tokaj case because institutional learnability cannot be separated from the concrete governance setting in which participation, representation, local knowledge, and strategic decisions occur.

The study was also informed by reflexive researcher positionality. Corlett and Mavin [30] emphasize that reflexivity requires researchers to make visible how their position shapes access, interpretation, and knowledge production. In the present study, the researcher's dual position between higher education strategic development and regional governance participation was treated as an analytical vantage point rather than as neutral external observation.

Folkes [31] argues that positionality should not be reduced to a static declaration, but should be understood as a reflexive process throughout the research. This informed the way the embedded regional case was handled: the researcher's access helped generate the research problem, but the analytical claims were developed through documented materials, explicit coding categories, and repository-based evidence tracking.

2.6. Comparative Analytical Logic

The comparison between higher education quality assurance and smart region governance was analogical, not procedural. The study does not argue that university quality-assurance systems should be copied by regions. Instead, it examines whether the underlying learning logic of quality assurance—feedback, evaluation, stakeholder involvement, action, and memory—can help identify what is missing in smart region governance.

Smart governance also contains PDCA-like elements, although they usually appear under different names. Planning appears as strategy and policy design. Doing appears as projects, platforms, services, and participatory interventions. Checking appears through monitoring, dashboards, public feedback, evaluation, complaints, and stakeholder review. Acting appears as policy adjustment, service redesign, institutional reform, or revised implementation routines. Remembering appears when lessons are documented, retained, and reintroduced into future decision cycles.

The central analytical question was therefore not whether smart governance contains feedback mechanisms. The key question was whether those mechanisms form a continuous and accountable learning cycle. The study focused especially on the Act/Remember gap, defined as the point at which feedback should become adaptive action and adaptive action should become institutional memory.

2.7. Analytical Status of Propositions

The study formulated analytical propositions rather than experimentally testable hypotheses. This was appropriate because the research design combined structured evidence mapping, qualitative coding, cross-domain comparison, and embedded regional case diagnosis.

The propositions were assessed through evidence-based interpretation. The statistical outputs of the study are descriptive and diagnostic rather than experimental. They include evidence distribution, coding frequencies, learning-cycle phase mapping, and relational obstacle analysis.

The propositions concerned five issues: whether smart region governance requires institutional learnability beyond formal participation and digital support; whether higher education quality assurance provides transferable learning principles for smart region governance; whether the main weakness in both systems appears in the Act/Remember phase; whether single-profile territories are especially exposed to learning failure; and whether technology can strengthen but not replace human learning networks in smart governance.

The overall evidence integration logic is shown in Figure 1. The figure presents the study as a sequential mixed-evidence design. The left side of Figure 1 shows the research problem emerging from the dual-position observation between higher education quality-assurance practice and regional governance participation. The central part shows how the three evidence streams are processed through screening, coding, barrier-field identification, and learning-cycle mapping. The right side shows the analytical outputs: obstacle taxonomy, comparative intensity profile, coupling network, phase-gap analysis, and the smart region learnability model.

2.8. Derivation of Analytical Scores and Visualizations

The analytical figures and proposition assessments should be interpreted as diagnostic outputs of a structured qualitative and mixed-evidence synthesis, not as causal or inferential statistical results. The supporting dataset [25] functions as the transparency layer of the study: it documents the transition from PRISMA-ScR-informed evidence mapping to coding, calculation, obstacle intensity assessment, learning-cycle gap values, obstacle-coupling analysis, and final analytical figures.

Obstacle intensity scores are ordinal diagnostic ratings. They indicate the relative strength and recurrence of governance barriers across the coded evidence base and comparative domains. The coding framework uses a 0–3 relevance convention at the level of coded sources or episodes, while the comparative visual profiles use a 0–5 diagnostic display scale to make cross-domain differences visible in the figures. Higher displayed values indicate

stronger and more recurrent barriers to institutional learnability, not statistically measured effect sizes.

Learning-cycle gap values were derived by comparing the coded presence or weakness of five learning-cycle functions: Plan, Do, Check, Act, and Remember. Higher gap values indicate stronger discontinuity between a governance function and its institutionalized learning outcome. The `learning_cycle_gap_workbook.xlsx` file documents the phase-gap logic, barrier-phase mapping, and transfer interpretation used for the heatmap.

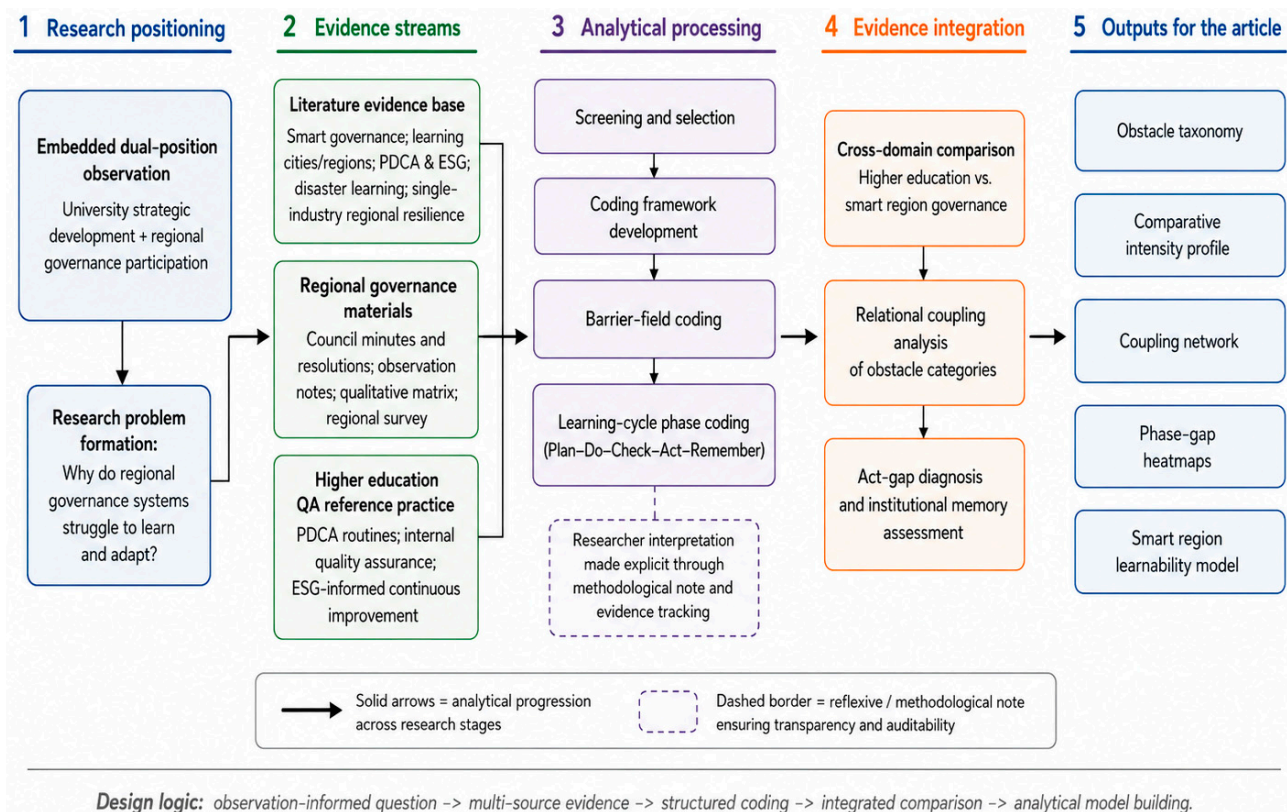


Figure 1. Research design and evidence integration framework.

The obstacle-coupling network is a conceptual-analytical coupling map, not a formal statistical network model. Couplings were identified where obstacle categories repeatedly co-occurred in the coded evidence base or where the analysis indicated a direct interpretive relationship within the governance learning cycle. Node size therefore represents relative analytical centrality, while edge thickness represents coupling strength based on coded co-occurrence and interpretive linkage.

The detailed score-derivation and visualization trace is documented in the coding and calculation workbooks deposited in the supporting dataset [25]. These files also document the criteria used to interpret the analytical propositions as supported, partially supported, or strongly supported.

3. Results

3.1. Evidence Base and Analytical Scope

The analysis was based on a mixed-evidence design combining structured literature mapping with empirical regional governance materials. The research design and evidence integration logic were introduced in Figure 1 in the methodological section. As shown there, the study connected three evidence streams: a structured literature corpus, empirical regional materials from the Tokaj Wine Region, and higher education quality-assurance

logic used as a comparative reference. This structure is important because the results are not derived from a single disciplinary study or one empirical source, but from the integration of literature-based patterns, regional governance materials, and quality-cycle reasoning.

The literature corpus initially contained 155 records across seven thematic domains: smart governance and community learning; learning cities and learning regions; higher education quality assurance and PDCA/ESG-related quality cycles; single-profile and resource-dependent territories; disaster governance and institutional learning; salt-mine and heritage-risk materials related to Praid/Parajd; and Latin American mining and territorial governance cases. After preliminary deduplication, 141 unique records remained, of which 115 contained valid DOI information. A total of 105 records were retained for structured screening and coding.

The empirical layer was based on the supporting research-materials dataset [25], especially the files organized under 01_regional_governance_observation, 02_regional_stakeholder_survey, 03_prisma_scr_evidence_mapping, and 04_coding_and_calculations. This empirical layer made it possible to compare the literature-derived learning barriers with a concrete single-profile territorial governance case.

The results below follow the proposition logic introduced in the Introduction without using the propositions as section headings. First, the analysis identifies why participation and digital support are insufficient without institutional learnability. Second, it examines what can and cannot be transferred from higher education quality-assurance logic. Third, it identifies the Act/Remember gap as the central disruption in the learning cycle. Fourth, it shows why single-profile territories are especially vulnerable when learning is delayed or weakly institutionalized. Fifth, it clarifies the role of technology as an enabling but non-substitutive condition. The section concludes by assessing the five analytical propositions.

3.2. From Participation to Institutional Learnability

The smart governance and smart region evidence shows that public participation, stakeholder engagement, strategic planning, data-informed governance, citizen feedback, digital platforms, and policy implementation are recurring elements of the smart city and smart region agenda. These mechanisms are directly connected to social sustainability, community well-being, regional resilience, and human-centered governance.

The main result is that these mechanisms do not automatically form an institutional learning cycle. Participation may collect voices without producing shared interpretation. Stakeholder engagement may create consultation without changing decision routines. Data-informed governance may increase informational density without improving adaptive capacity. Digital tools may support feedback collection, visualization, traceability, or monitoring, but they do not by themselves generate trust, deliberation, institutional memory, or responsibility for policy adaptation.

This result is visualized in Figure 2. The radar chart compares higher education quality assurance and smart region governance across the main learning-related obstacle fields. The green smart region governance profile extends farther toward the outer edge of the chart on most axes, indicating stronger barrier intensity. This is especially visible on the axes for formal participation without learning, weak institutional memory, low trust and legitimacy, strategic monoculture, weak community knowledge-building, and the Act/adaptation gap. By contrast, the blue higher education quality-assurance profile is more moderate, although it also shows weaknesses in institutional silos and feedback translation.

Figure 2 visualizes ordinal diagnostic ratings derived from the coded obstacle fields and comparative interpretation. The values indicate relative barrier intensity on the display scale used for the radar chart. They should not be read as measured effect sizes or

survey means; their function is to make the comparative learning-obstacle profile auditable and interpretable through the coding and calculation files deposited in the supporting dataset [25].

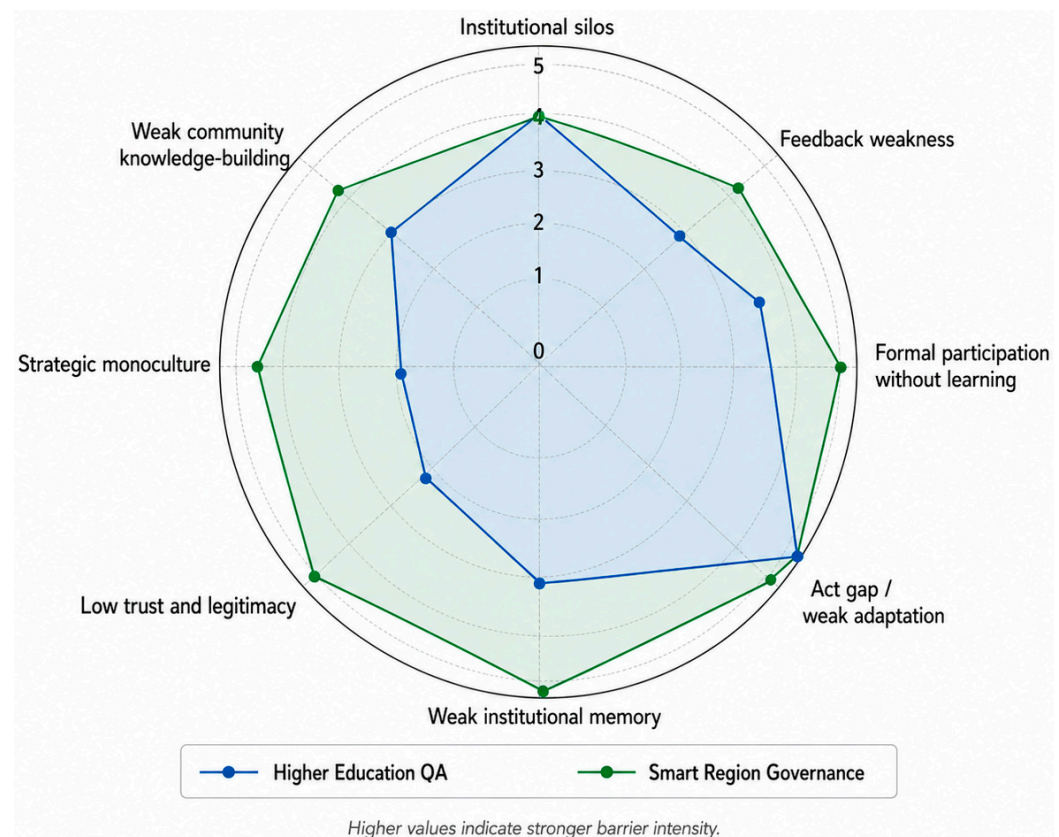


Figure 2. Obstacle intensity profile across domains.

The visual contrast in Figure 2 supports the interpretation that the two systems do not differ simply by the presence or absence of feedback. Both systems contain feedback mechanisms. The difference lies in the degree to which feedback is institutionalized, acted upon, remembered, and reintroduced into future decision cycles. The wider smart region profile therefore supports the finding that smart region governance requires institutional learnability beyond formal participation and digital support.

3.3. Transferable Learning Logic from Higher Education Quality Assurance

The higher education evidence shows that quality assurance contains a formalized learning grammar. Planning, implementation, monitoring, stakeholder feedback, internal evaluation, documentation, and continuous improvement are embedded in institutional quality-assurance routines. In this respect, higher education provides a useful comparative reference for smart region governance because it demonstrates how complex organizations can organize repeated feedback and self-evaluation as part of institutional development.

However, the evidence also shows that higher education quality assurance should not be treated as a complete or ideal model. Its strongest weakness appears in the translation from evaluation to sustained organizational change. In PDCA terms, the Plan, Do, and Check phases are relatively visible, because institutions are required to plan, implement, monitor, and document educational processes. The Act phase is more fragile. Evaluation may generate reports, recommendations, improvement plans, and procedural modifications, but these outputs do not automatically become deep organizational learning, durable institutional memory, or changed professional practice.

The comparative result is therefore qualified. Higher education quality assurance provides transferable learning principles: structured feedback, self-evaluation, stakeholder involvement, documentation, and continuous improvement. It does not provide a procedural model that can be copied mechanically by smart regions. The transfer is analogical rather than procedural. The learning logic is transferable, but the institutional form is not.

3.4. *The Act/Remember Gap as the Central Learning-Cycle Disruption*

The comparison between higher education quality assurance and smart region governance reveals a shared learning-cycle weakness. In both systems, the most critical disruption appears after feedback has been generated. The problem is less visible in the Plan and Do phases, because both universities and regional governance bodies can formulate strategies, initiate activities, and document implementation. The Check phase is also present in both systems, although in different forms. Higher education uses evaluation, monitoring, stakeholder feedback, and quality-assurance procedures. Smart governance uses citizen input, public participation, data-informed monitoring, consultation, and policy review.

The decisive weakness appears in the transition from Check to Act and from Act to Remember. In higher education, this weakness concerns the depth of organizational change: evaluation exists, but its transformation into durable organizational learning is uneven. In smart region governance, the problem is more foundational. The learning cycle itself is often less explicitly institutionalized. Participation, feedback, data, local knowledge, and public consultation may be present, but they are not necessarily organized into recurring institutional routines that produce action and memory.

Figure 3 presents the learning-cycle gap heatmap. The columns represent the five phases of the extended learning cycle: Plan, Do, Check, Act, and Remember. The rows represent the main analytical domains. Darker blue cells indicate stronger gap intensity. As shown in Figure 3, the strongest concentrations appear in the Act and Remember columns. This means that the main disruption is not located primarily in planning, implementation, or even feedback collection. The disruption appears where feedback should be translated into adaptive action and where action should be retained as institutional memory.

Figure 3 is based on the phase-gap logic documented in `learning_cycle_gap_workbook.xlsx` in the supporting dataset [25]. The darker cells indicate higher ordinal gap intensity, constructed from the coded weakness of Plan, Do, Check, Act, and Remember functions across domains. The heatmap therefore visualizes where the learning cycle is most disrupted, rather than reporting causal effects.

The heatmap also shows that the Act/Remember gap is not restricted to one domain. It appears in higher education quality assurance, but with lower intensity and mainly as an implementation-depth problem. It appears more strongly in smart governance, single-profile territories, disaster governance, and the Tokaj empirical case, where the learning cycle itself is less explicitly institutionalized. The visual concentration of darker cells in the Act and Remember columns therefore provides the clearest graphical support for the central finding of the study.

This is the strongest result of the analysis. The central deficit is not the absence of information, participation, or strategy. The central deficit is the weak institutional translation of feedback into adaptive action and the weak retention of action as institutional memory. Institutional learnability can therefore be defined as the capacity to turn Check into Act and Act into Remember.

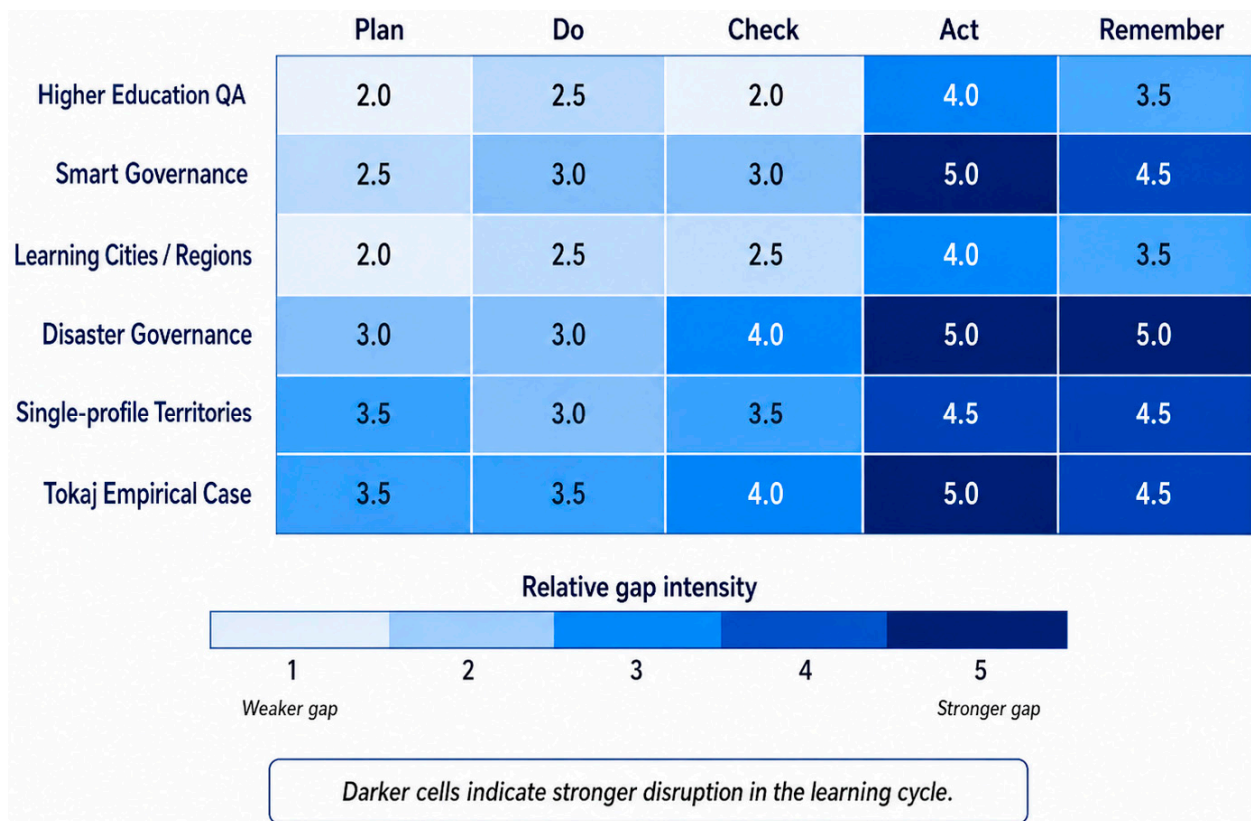


Figure 3. Learning-cycle gap heatmap.

3.5. Single-Profile Territorial Vulnerability and Delayed Learning

The single-profile territory evidence shows that regions organized around one dominant economic, cultural, natural, or symbolic profile can develop specific governance vulnerabilities. Wine regions, mining regions, tourism-dependent destinations, heritage regions, and resource-dependent communities can gain identity, visibility, and economic coordination from their dominant profile. At the same time, the same profile can narrow strategic interpretation and reduce sensitivity to weak signals, alternative development paths, minority concerns, or early warnings.

The literature on resource-dependent regions, tourism-dependent destinations, mining communities, and heritage-based territories repeatedly points to vulnerabilities connected to lock-in, path dependency, fragmented institutional capacity, and delayed learning. The disaster governance evidence adds a further dimension: governance systems often learn most visibly after failure, while preventive learning before failure remains weaker.

The Tokaj empirical material was interpreted within this broader pattern. The case does not serve as a statistical generalization, but as a single-profile regional governance setting in which formal decision-making, stakeholder articulation, community knowledge, and institutional learning capacity can be examined. The empirical material indicates that formal governance structures and decision-making documents exist, but that the conversion of participation, observation, and strategic discussion into a stable learning cycle requires further institutionalization.

A concrete example from the Tokaj material concerns governance episodes in which formal council documents and stakeholder articulations addressed data collection, product-specification issues, regulatory amendments, and regional positioning. The qualitative matrix includes 45 coded governance episodes from 2023–2024, including decisions on price-information/statistical services, amendments to regulatory proposals, and the finalisation of the Tokaji product specification. These materials show that the region is

able to generate formal decisions, stakeholder comments, and strategic discussion. The Act/Remember gap appears because the available records document less clearly how such inputs were translated into a stable feedback-to-action register, recurring revision routine, or institutional memory mechanism that would carry lessons into subsequent planning cycles.

Figure 4 presents the coupling network of obstacle categories. In this network, node size represents the relative centrality of each obstacle category, while line thickness represents the strength of co-occurrence between obstacle categories. The most central node is the Act/adaptation gap, shown in purple at the centre of the network. It is strongly connected to weak institutional memory, institutional silos, formal participation without learning, low trust and legitimacy, and crisis-only learning. This visual structure shows that the Act/adaptation gap is not an isolated weakness, but a relational connector within the wider obstacle system.

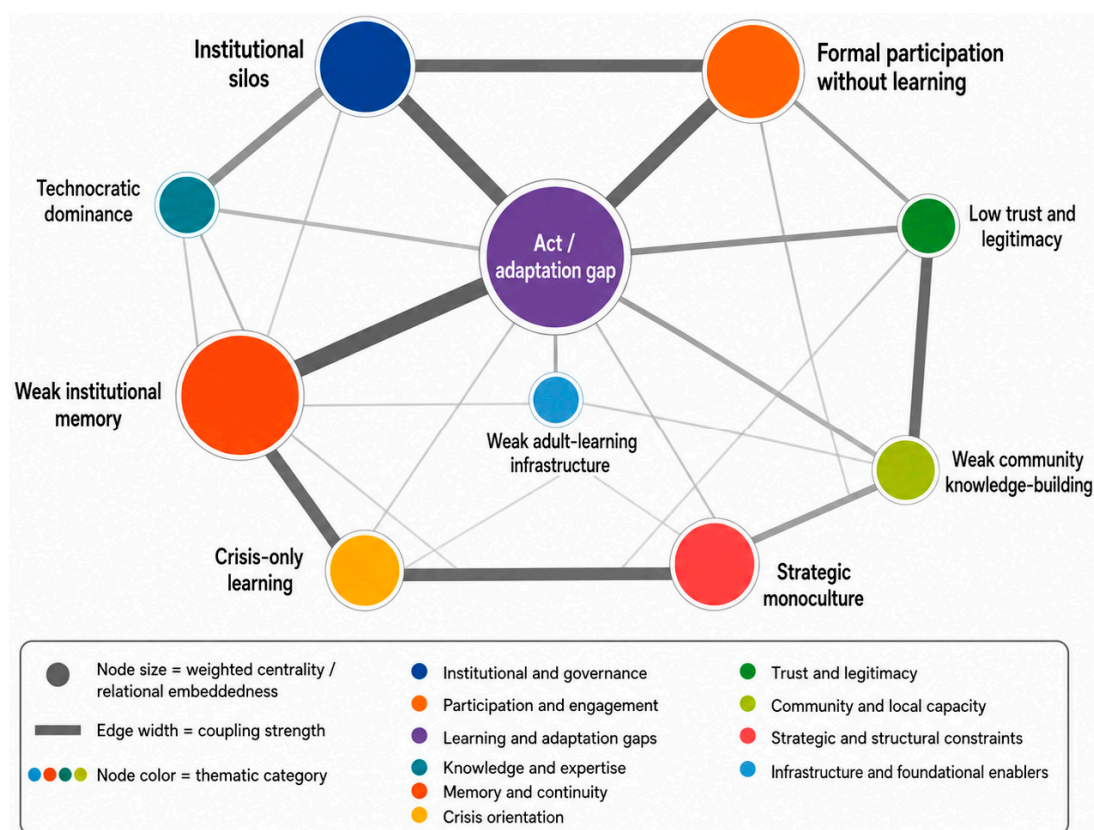


Figure 4. Coupling network of obstacle categories.

Figure 4 should be read as a conceptual–analytical coupling map. It does not claim formal statistical network modelling. Node size reflects relative analytical centrality of obstacle categories, and edge thickness reflects coupling strength based on repeated co-occurrence in the coded material and interpretive linkage within the learning-cycle logic. The underlying coupling logic is documented in the coding and calculation workbooks deposited in the supporting dataset [25].

The thickest connections in Figure 4 are especially important. The strong link between the Act/adaptation gap and weak institutional memory indicates that governance systems struggle not only to act on feedback, but also to retain lessons after action occurs. The connection between weak institutional memory and crisis-only learning shows why regions may repeatedly learn after failure rather than before failure. The connection between low trust and weak community knowledge-building shows that knowledge

co-production depends on legitimacy and visible institutional response, not merely on participation procedures.

The network therefore supports the interpretation that single-profile territorial vulnerability emerges from coupled learning barriers rather than from one isolated governance defect. Single-profile territories are especially vulnerable when community knowledge, weak signals, and stakeholder concerns are not converted into adaptive governance and institutional memory.

3.6. Technology as an Enabling but Non-Substitutive Condition

The smart governance evidence shows that digital tools can make feedback more visible, faster, and more traceable. They can support participatory monitoring, data-informed deliberation, feedback aggregation, documentation, and knowledge circulation. In this sense, technology can strengthen the informational and procedural infrastructure of smart region governance.

However, the analysis also shows that technology does not by itself produce institutional learnability. Digital systems do not automatically generate trust, interpretation, deliberation, stakeholder responsibility, institutional memory, or adaptive policy implementation. A digital participation platform may increase input without increasing adaptation. A dashboard may improve monitoring without strengthening memory. A consultation system may expand engagement without changing decision routines.

Figure 5 synthesizes the integrated smart region learnability model. The left side of the figure shows the input layer: community knowledge, stakeholder feedback, public participation, researcher observation, and digital support tools. These inputs do not directly produce adaptive governance. As the middle part of Figure 5 shows, they must pass through mediating conditions such as trust, cross-sector dialogue, facilitation, leadership, quality-cycle routines, and data interpretation capacity.

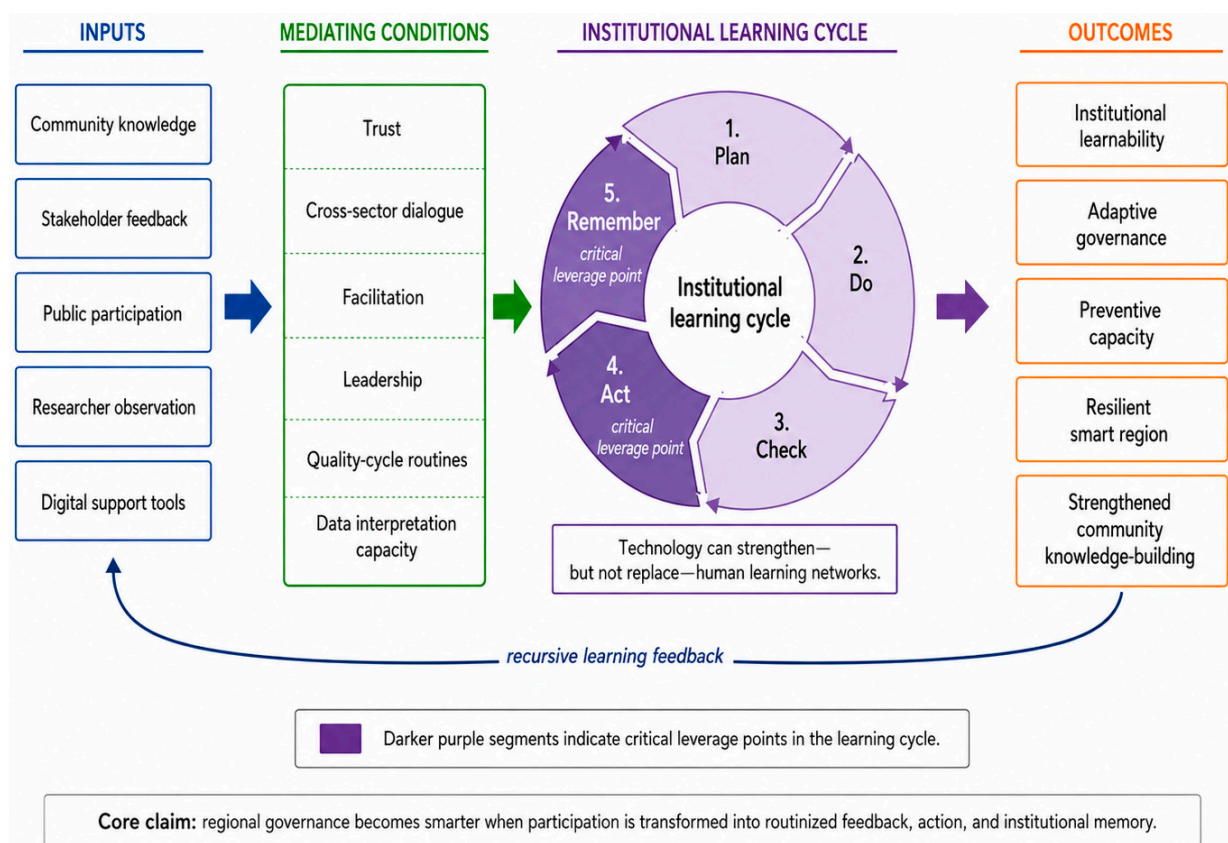


Figure 5. Analytical model of smart region learnability.

The central part of Figure 5 shows the institutional learning cycle. The cycle contains Plan, Do, Check, Act, and Remember. Act and Remember are visually emphasized in darker purple because the previous results identified them as the critical leverage points. This means that smart region governance becomes institutionally learnable only when feedback is converted into adaptive action and when adaptive action becomes institutional memory. The right side of the figure shows the expected outputs: institutional learnability, adaptive governance, preventive capacity, resilient smart region development, and strengthened community knowledge-building.

The figure also clarifies the role of technology. Digital support tools appear as part of the input layer, but not as substitutes for the learning cycle. Their role is to support feedback visibility, traceability, monitoring, and documentation. The model therefore presents technology as an enabling condition within human-centered governance, not as an autonomous source of smartness.

3.7. Integrated Assessment of the Analytical Propositions

The visual and analytical results converge on the same pattern. Figure 2 shows that learning-related obstacles are stronger in smart region governance than in higher education quality assurance. Figure 3 identifies the Act and Remember phases as the main learning-cycle disruption. Figure 4 shows that the Act/adaptation gap is the central connector in the obstacle network. Figure 5 translates these findings into an integrated smart region learnability model. On this basis, the five analytical propositions introduced in the Introduction can be assessed.

Table 1 summarizes the assessment of the five analytical propositions introduced in the Introduction. As shown in Table 1, the strongest support was found for the Act/Remember gap proposition, while the higher education quality-assurance proposition was only partially supported because the learning logic is transferable but the institutional form is not.

Table 1. Assessment of analytical propositions.

Proposition	Assessment	Main Result
P1. Smart region governance requires institutional learnability beyond formal participation and digital support.	Supported	Participation, data, and digital support become meaningful only when converted into shared interpretation, adaptive action, and institutional memory.
P2. Higher education quality assurance provides transferable learning principles for smart region governance.	Partially supported	The learning logic is transferable, but university quality-assurance procedures cannot be copied mechanically by regions.
P3. The main weakness in both higher education quality assurance and smart region governance appears in the Act/Remember phase.	Strongly supported	The strongest disruption occurs where feedback should become action and action should become memory.
P4. Single-profile territories are especially exposed to learning failure when community knowledge is not converted into institutional memory and adaptive governance.	Supported	Single-profile territories show vulnerability connected to strategic narrowing, lock-in, weak memory, and delayed learning.
P5. Technology can strengthen but not replace human learning networks in smart governance.	Supported	Digital tools assist feedback, traceability, and knowledge circulation, but do not replace trust, interpretation, deliberation, and institutional learning.

The support levels in Table 1 were assigned according to evidence convergence. “Strongly supported” was used when the literature evidence, comparative quality-cycle analysis, Tokaj case diagnosis, and visualization outputs all converged. “Supported” was used when at least two evidence streams converged and no major contradictory pattern was

identified. “Partially supported” was used when the general proposition was supported but required qualification, boundary conditions, or a restricted interpretation.

Taken together, the results show that the strongest supported proposition is P3. The Act/Remember gap connects the higher education quality-assurance comparison, the smart governance literature, the single-profile territorial resilience literature, and the Tokaj empirical case. The main analytical result of the study is therefore that smart region governance becomes institutionally learnable only when feedback is converted into adaptive action and adaptive action is retained as institutional memory.

4. Discussion

4.1. From Participation and Digital Tools to Institutional Learnability

The main finding of this study is that smart region governance should be evaluated by its capacity to learn, not only by the amount of data it collects, the number of participation channels it opens, or the digital tools it deploys. This shifts the discussion from participation as input to learnability as institutional conversion capacity within sustainable smart governance.

This finding extends existing smart governance debates. Meijer and Bolívar [5] argue that technology alone does not make a city smarter, because smart urban governance also requires institutional arrangements and human collaboration. The present study supports this position, but adds that collaboration itself is not sufficient unless it becomes part of a learning cycle. Pereira et al. [6] frame smart governance as a matter of stakeholder collaboration and governance arrangements. The present findings suggest that such collaboration must be assessed by whether stakeholder input is converted into adaptive policy routines and institutional memory.

The findings also support the caution raised by Tomor et al. [1], who show that the empirical sustainability outcomes of smart governance remain mixed. This is consistent with the present result that smart governance mechanisms do not automatically produce sustainable or socially inclusive outcomes. Participation, data-informed monitoring, and digital platforms may improve visibility, but visibility does not necessarily produce learning. The evidence therefore suggests that the weakness of many smart governance systems is not the absence of feedback, but the absence of institutionalized mechanisms that translate feedback into action.

Tan and Taeihagh [32] argue that technology-enabled smart cities require social, legal, regulatory, and institutional reforms alongside technical innovation. The present study reinforces this argument by showing where these reforms are most needed: in the transition from feedback to action and from action to memory. This is the point at which smart governance becomes either a learning system or a set of loosely connected participation and monitoring instruments.

The recent smart governance literature has increasingly emphasized public value, resilience, and institutional change. Vrabie [33] states that a city is not smart merely because it is digital, but when digital transformation becomes better governance, participation, resilience, institutional learning, and public value. The present study arrives at a similar conclusion through a different route: structured evidence mapping and regional case diagnosis show that smartness depends on the institutional capacity to learn from participation, feedback, and local knowledge.

The practical implication is that public participation should not be treated as an endpoint. A consultation, survey, meeting, digital platform, or dashboard begins a governance-learning process only if it is followed by interpretation, documentation, action, and reintegration into future decision cycles.

4.2. *The Act/Remember Gap and the Limits of Data-Rich Governance*

The strongest result of the study is the identification of the Act/Remember gap. The results show that the most significant disruption does not occur at the level of planning or even feedback collection. The disruption appears where feedback should be translated into adaptive action and where adaptive action should be retained as institutional memory.

This result has important implications for Smart Cities research because many smart governance instruments operate mainly around the Plan, Do, and Check phases of a learning cycle. Data, monitoring, platforms, citizen feedback, and co-production help define problems, implement activities, and collect feedback, but they do not guarantee that institutions will change routines or retain lessons across political cycles, organizational changes, or territorial development programmes.

The Act/Remember gap therefore explains why governance systems can become data-rich but institutionally poor. A region may have strategies, monitoring systems, stakeholder meetings, public consultations, and digital feedback tools while still failing to learn. In such cases, the problem is not the absence of information. The problem is the weak conversion of information into action and the weak conversion of action into memory.

This result connects smart governance to organizational learning theory. Argyris and Schön [16] define organizational learning as a process that requires changes in action strategies, not only error detection. The present study applies this logic to smart region governance. A region does not learn because it receives feedback. It learns when feedback changes governance routines. It learns more deeply when those changes become part of institutional memory.

The same result also connects smart governance to adaptive governance theory. Folke et al. [18] position adaptive governance as central to resilience in complex systems. The present findings show that adaptive governance requires more than responsiveness. It requires a memory structure through which lessons are retained and future decisions are informed by previous learning. Without this memory structure, governance systems remain vulnerable to repeated errors, delayed reaction, and crisis-only adaptation.

Pahl-Wostl et al. [17] link social learning to multi-actor governance and adaptive capacity. The present study extends this insight by identifying the specific point at which social learning often weakens in smart region governance. Multi-actor participation may occur, but the learning cycle remains incomplete if collective interpretation does not produce adaptive action and institutional memory.

The Act/Remember gap therefore becomes the central diagnostic contribution of the article. It provides a way to evaluate whether smart governance is genuinely learning-oriented or merely participatory and data-intensive. The key evaluative question becomes: what changed because of feedback, and how was that change retained?

4.3. *What Higher Education Quality Assurance Can—And Cannot—Teach Smart Regions*

The comparison with higher education quality assurance should be interpreted carefully. The results do not suggest that smart regions should copy university quality-assurance systems. Higher education and regional governance are different institutional fields. Universities operate with internal organizational structures, formal standards, accreditation routines, and defined responsibilities. Regions operate through multi-actor, politically negotiated, territorially distributed, and often less formalized governance arrangements.

The value of the higher education comparison lies elsewhere. Higher education quality assurance provides an institutional field in which feedback, self-evaluation, stakeholder input, documentation, and improvement planning are already formalized. This makes it useful as an analogical reference system. It shows how feedback can be organized

into recurring cycles, but it also shows that formal cycles do not automatically guarantee organizational learning.

The higher education quality-assurance literature itself is divided on this point. Harvey and Williams [34] conclude that it remains unclear whether quality assurance systems have genuinely enhanced higher education after many years of implementation. This caution is important for the present article because it prevents an overly optimistic transfer of QA logic to regional governance. Gordon [35] argues that tactical responses to quality assurance may fail to build deeper institutional quality culture. This supports the present finding that formal evaluation procedures can remain shallow if they do not generate durable learning.

Temponi [36] emphasizes that continuous improvement in higher education requires organizational commitment and institutional support. This reinforces the idea that PDCA-type cycles are not self-executing mechanisms. They require leadership, interpretation, responsibility, and a culture capable of acting on feedback. More recent empirical evidence also suggests that quality assurance may affect institutional performance through procedural mechanisms without necessarily creating deep quality culture. Ulkhaq et al. [37] report significant direct effects of internal and external quality assurance on institutional performance, but their findings also suggest that quality culture may not always mediate these effects.

This mixed evidence is important for the argument of this article. Higher education quality assurance is useful not because it is complete, but because its incompleteness makes the Act problem visible. It shows that feedback systems can exist without guaranteeing deep institutional learning. This makes higher education a mirror for smart region governance: it demonstrates both the value and the limits of formalized quality cycles.

The transferable element is therefore not a procedure, standard, or accreditation model. The transferable element is the learning logic: feedback must be documented, interpreted, acted upon, and retained. Smart regions need comparable learning discipline, but adapted to public participation, territorial identity, community knowledge, and multi-actor governance.

4.4. Single-Profile Territories, Strategic Lock-In, and Resilience Risk

The results suggest that the Act/Remember gap is especially important in single-profile territories. These territories are organized around one dominant economic, cultural, natural, or symbolic profile. This profile can be a source of identity, coordination, visibility, and development advantage. It can also become a source of strategic narrowing.

The literature on resource-dependent and single-industry regions supports this interpretation. Allison and Hobbs [38] show how adaptive capacity can be constrained by lock-in traps in rural and agricultural systems. This insight is relevant to single-profile smart regions because territorial identity and development strategy may become mutually reinforcing in ways that reduce openness to weak signals. Carson et al. [39] show that path dependence can constrain development options in single-industry towns. This finding is directly relevant to smart region governance because path dependence is not only economic. It is also institutional and cognitive.

Wine regions illustrate this tension particularly well. Grimstad et al. [40] examine adaptive capacity in the Hunter Valley wine region and show that regional transformation depends on institutions, identity, and actor networks. This is relevant to the Tokaj case because wine regions are not merely economic spaces. They are cultural, symbolic, touristic, and institutional territories. Bardsley et al. [41] also show that wine regions must develop adaptive capacity in response to environmental, economic, and governance challenges. This supports the broader claim that single-profile regions need learning capacity, not only branding or strategic coordination.

Mining and heritage territories provide additional evidence. Loginova and Batterbury [42] show that post-mining transitions require adaptation pathways that are socially and institutionally complex. This supports the idea that territorial resilience depends on the capacity to reinterpret inherited economic structures and convert community knowledge into future-oriented governance. Stotten et al. [43] also highlight the relationship between lock-in, community resilience, and place-based development. This strengthens the interpretation that institutional learning is central to resilience in territorially dependent settings.

The present study does not claim that all single-profile territories are weakly learnable. It argues that they are especially exposed to learning failure when dominant narratives prevent weak signals, alternative knowledge, or stakeholder concerns from entering institutional memory. In this sense, weak institutional learning is not merely a procedural weakness. In single-profile territories, it becomes a resilience risk.

4.5. Digital Tools as Learning Infrastructure Rather than Governance Substitutes

The results do not support an anti-technological argument. Digital tools can play an important role in smart region governance. They can help collect feedback, visualize data, trace stakeholder input, document decisions, monitor policy implementation, and preserve institutional knowledge. These functions are directly relevant to the Act/Remember gap.

The problem arises when digital tools are treated as substitutes for governance learning. A digital dashboard can display indicators, but it cannot decide which signals matter. A platform can collect feedback, but it cannot ensure that feedback is interpreted fairly. A database can store information, but it cannot by itself create institutional responsibility. Technology can support memory, but it cannot replace the social and institutional work required to learn.

The results suggest a more precise role for technology: digital tools should be designed as learning infrastructure. This means that smart region systems should not only collect inputs, but also trace how inputs move through the governance cycle. A feedback-to-action register could document which stakeholder concerns were received, how they were interpreted, what response was adopted, and how the result was communicated back to stakeholders. A decision-memory dashboard could record how earlier decisions, warnings, and evaluations influenced later policy adjustments. A weak-signal repository could help regions preserve concerns that do not immediately become formal policy issues but may become important over time.

Such tools would shift smart governance from data collection toward institutional memory. They would also support accountability by making visible whether participation leads to action. This matters because one of the risks of participation-driven governance is symbolic inclusion: citizens and stakeholders may be invited to speak, but they may not be able to see whether their knowledge influenced decisions. Learning infrastructure should therefore make the movement from participation to action visible.

The appropriate role of digital tools is to support the continuity of learning, not to replace the social and institutional work through which learning occurs. In this sense, the study contributes to human-centered smart governance by defining technology as an enabling condition within a broader learning cycle.

4.6. Theoretical and Practical Implications

The study has three theoretical implications for Smart Cities scholarship and practice. First, it contributes to smart governance theory by reframing smartness as institutional learnability. Smartness is not only a matter of digital infrastructure, data availability, citizen

engagement, or service efficiency. It is also the capacity to convert feedback into adaptive action and retain action as institutional memory.

Second, the study contributes to learning city and learning region theory. Learning cities and regions are often discussed in terms of lifelong learning, innovation, partnerships, and community development. The present study adds that territorial learning also requires Act and Remember routines. Without these routines, learning remains rhetorical, episodic, or dependent on individual actors.

Third, the study contributes to quality-cycle thinking by extending the PDCA logic with an explicit Remember phase. In organizational settings, memory may be embedded in procedures, records, and routines. In territorial governance, memory is more fragile because actors, institutions, political mandates, and development priorities change. Making Remember explicit is therefore necessary when quality-cycle thinking is translated into smart region governance.

The practical implications are also clear. Smart regions should develop institutional mechanisms that connect participation to visible action. They should not only ask stakeholders for input, but also document what happened to that input. They should establish routines for reviewing whether earlier feedback changed decisions. They should create institutional memory systems that preserve lessons across political and organizational cycles. They should use digital tools to support traceability and reflection, not only service delivery or public communication.

An Act/Remember audit could become a practical diagnostic tool. Such an audit would ask whether feedback was collected, whether it was interpreted, whether it produced policy change, whether the decision was documented, whether stakeholders received feedback, and whether the lesson was carried into the next planning cycle. This would make smart governance more accountable and more learnable.

Operationally, the audit would cover five diagnostic dimensions: feedback capture, or whether stakeholder input is systematically documented; interpretive translation, or whether inputs are turned into governance-relevant lessons; adaptive response, or whether lessons modify strategies, rules, projects, or resource allocation; institutional memory, or whether lessons are retained beyond project or political cycles; and reuse, or whether previous lessons are explicitly reintroduced into subsequent planning cycles.

The conceptual contribution can therefore be positioned as a diagnostic layer built on, but distinct from, adjacent learning concepts. Institutional learnability does not replace organizational learning, policy learning, adaptive governance, institutional resilience, or learning-region theory. Instead, it integrates their shared mechanisms and focuses specifically on whether governance systems can transform participation, feedback, interpretation, and monitoring signals into adaptive action and retained institutional memory. In this sense, the concept is neither detached from the existing literature nor merely an umbrella term. It adds an evaluative level for diagnosing whether governance systems can learn, act, and remember across cycles. Figure 6 summarizes this positioning.

4.7. Boundary Conditions of the Argument

The argument has clear boundary conditions. The study does not claim that all smart city models are technocratic. It does not claim that all public participation is symbolic. It does not claim that higher education quality assurance is a superior governance model. It also does not claim that PDCA can be transferred mechanically from universities to regions.

The argument is more specific. Smart governance should be assessed not only by its technological capacity or participatory design, but by its ability to institutionalize learning. This assessment is especially relevant for single-profile territories, where strategic lock-in, weak institutional memory, and delayed learning can become resilience risks.

The study also does not claim that Tokaj represents all smart regions. Tokaj is used as a diagnostic case because it illustrates how a single-profile territory can be examined through the lens of institutional learnability. The transferability of the findings depends on analytical similarity, especially to regions where territorial identity, resource dependence, heritage, tourism, or dominant economic profile strongly shape governance.

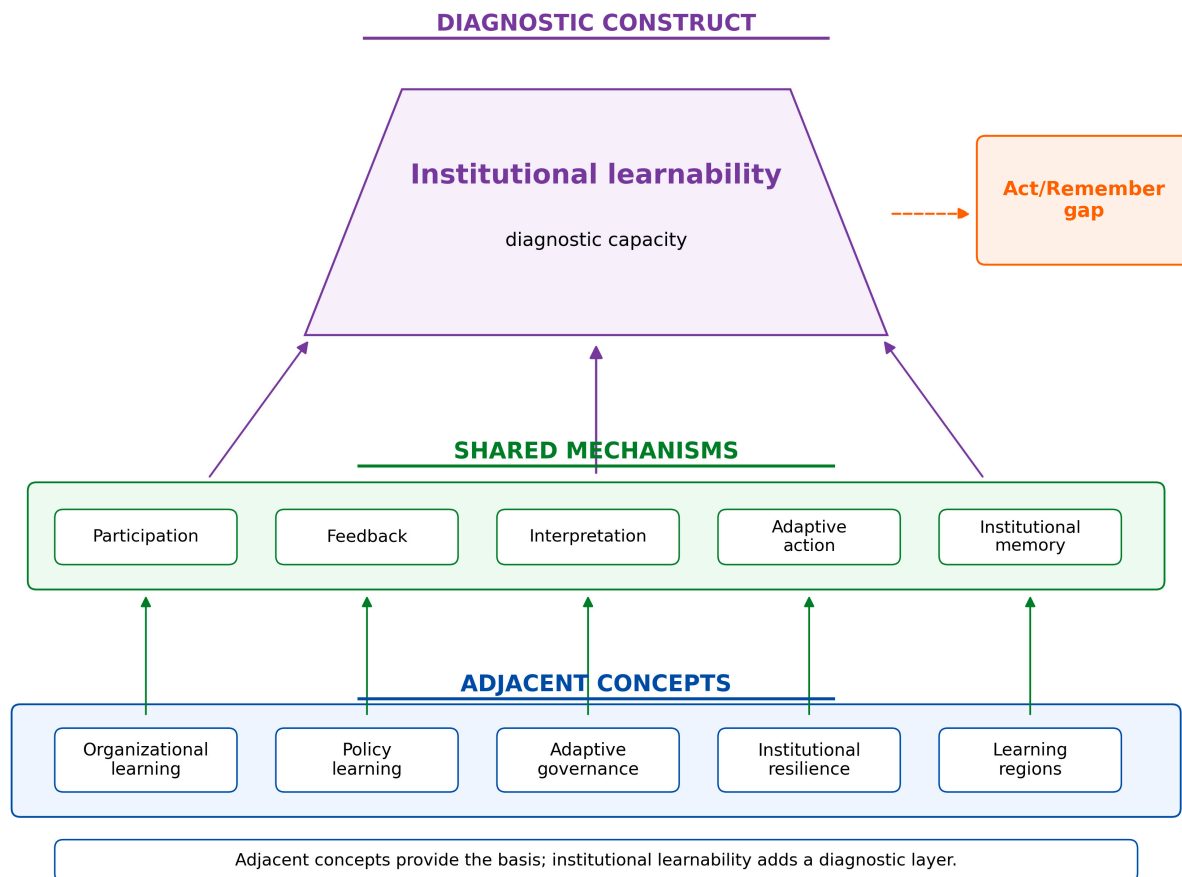


Figure 6. Conceptual positioning of institutional learnability as a diagnostic construct.

In metropolitan or economically diversified regions, the Act/Remember gap may appear differently. Multi-profile territories may have more institutional redundancy, more specialized agencies, and more diverse knowledge infrastructures, which can reduce dependence on a single territorial narrative. At the same time, their learning gaps may become more fragmented across sectors, departments, data systems, and participation arenas. In such contexts, the diagnostic question is less whether one dominant profile blocks learning and more whether dispersed feedback streams can be coordinated into shared action and institutional memory.

The core claim is therefore bounded but transferable: smart region governance becomes institutionally learnable when feedback is converted into adaptive action and adaptive action is retained as memory. This claim can be tested, refined, and extended in other smart city and smart region contexts.

5. Limitations

5.1. Scope of the Evidence Map

The study used PRISMA-ScR-informed structured evidence mapping, but it was not designed as a full systematic review or meta-analysis. Its aim was conceptual and diagnostic rather than exhaustive. The evidence map was constructed to identify recurring patterns across smart governance, learning regions, higher education quality assurance,

territorial resilience, and disaster learning. It therefore supports theoretical integration and framework development, but it does not provide complete bibliometric coverage of each field.

5.2. Diagnostic Role of the Tokaj Case

The Tokaj Wine Region was used as an embedded diagnostic case, not as a statistically representative sample of smart regions. The case supports analytical transferability rather than statistical generalization. Its relevance lies in its character as a single-profile territory where regional identity, economic profile, cultural heritage, strategic discourse, and governance participation are strongly connected. Further research should examine whether the Act/Remember gap appears in other types of regions, including metropolitan smart cities, multi-profile territories, industrial transition regions, and digitally advanced municipalities.

5.3. Interpretive Coding and Researcher Positionality

The coding framework was structured and auditable, but it remained interpretive. Obstacle fields, diagnostic layers, and learning-cycle phases required analytical judgment. The researcher's dual position between higher education strategic development and regional governance participation provided access and contextual insight, but it also required reflexive control. The study addressed this limitation by using explicit coding categories, repository-based documentation, and transparent methodological descriptions. Nevertheless, future studies should test the framework with multiple coders and intercoder reliability procedures.

The deposited coding and calculation files make this interpretive logic traceable, but they do not eliminate the need for analytical judgment. For this reason, the revised framework should be understood as a transparent diagnostic procedure rather than as a fully standardized measurement instrument. Future applications should test the scoring logic with multiple coders, stakeholder validation, and intercoder comparison.

5.4. Analytical Status of the Propositions

The propositions were assessed through evidence convergence rather than experimental testing. They should therefore be understood as analytical propositions, not causal hypotheses in the experimental sense. The study can show that evidence from several domains converges around the Act/Remember gap, but it cannot estimate causal effect sizes or test predictive relationships. Future research could operationalize institutional learnability as a measurable construct and examine its relationship with policy adaptation, stakeholder trust, resilience outcomes, or implementation performance.

5.5. Transferability of the Model

The proposed model is most directly applicable to single-profile, place-based, identity-dependent, or resource-dependent territories. Its transferability to large metropolitan smart cities, highly diversified regions, or technologically advanced urban platforms requires further testing. The model may also need adaptation in contexts with different administrative structures, legal frameworks, data infrastructures, or civic participation cultures. Further comparative studies should examine whether the Plan–Do–Check–Act–Remember logic can support smart governance diagnostics across different territorial and institutional settings.

6. Conclusions

This article examined smart region governance as an institutional learning problem. Its central finding is that smart governance becomes institutionally learnable only

when feedback is converted into adaptive action and adaptive action is retained as institutional memory. The strongest result of the study is therefore the identification of the Act/Remember gap: the point at which participation, stakeholder feedback, local knowledge, and data-informed signals fail to become durable governance change.

The study contributes to Smart Cities research by shifting attention from technological sophistication and participation mechanisms toward institutional learnability. Digital tools, public participation, and stakeholder engagement are necessary components of sustainable smart governance, but they remain incomplete unless they enter a structured learning cycle. A smart region is therefore not simply a region with more data, more platforms, or more consultation; it is a region capable of interpreting feedback, acting on it, documenting the consequences, and carrying lessons into future policy cycles.

The comparison with higher education quality assurance helped clarify this point. Higher education does not provide a procedural model that can be copied by regions. Its relevance lies in its learning logic: feedback, self-evaluation, stakeholder input, documentation, and continuous improvement are formally recognized as institutional routines. The analysis showed that even in higher education the Act phase can remain fragile. This makes the comparison useful not because quality assurance is complete, but because it reveals the difficulty of turning evaluation into sustained institutional change. For smart region governance, the lesson is not to import university procedures, but to develop analogous learning infrastructures suited to multi-actor territorial governance.

The findings are especially relevant for single-profile territories. Wine regions, mining regions, heritage territories, tourism-dependent destinations, and resource-dependent communities often derive strength from a dominant territorial identity. At the same time, this dominant profile can create strategic narrowing, path dependence, and delayed learning. In such settings, institutional learnability is not only an administrative capacity. It is a resilience condition. Regions that cannot retain weak signals, community knowledge, stakeholder concerns, and previous lessons are more likely to learn only after failure.

The practical implication is clear. Smart regions should not evaluate participation only by the number of meetings, surveys, platforms, or stakeholders involved. They should evaluate whether participation produces visible change. This requires feedback-to-action registers, decision-memory systems, annual regional learning reviews, stakeholder response mechanisms, and digital tools designed to support traceability and institutional memory. Technology can strengthen these processes by making feedback visible and decisions traceable, but it cannot replace trust, deliberation, interpretation, leadership, and collective responsibility.

The article therefore proposes institutional learnability as a diagnostic capacity of sustainable smart region governance. The extended learning cycle—Plan, Do, Check, Act, and Remember—offers a practical and theoretical framework for examining whether smart governance systems can learn from their own participation and feedback mechanisms. The main conclusion is that the future of smart regions depends not only on intelligent technologies, but on institutions capable of learning intelligently.

In this sense, institutional learnability should be understood as both a theoretical concept and a practical diagnostic orientation. The theoretical contribution lies in distinguishing learning capacity from participation and data availability. The practical contribution lies in making the movement from feedback to action and from action to memory visible, documentable, and open to audit.

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Institutional Review Board Statement: The study used publicly accessible governance records and anonymized stakeholder survey materials. No directly identifiable personal data are included

in the shared dataset. The materials were processed and shared in accordance with responsible research-data management principles.

Informed Consent Statement: The stakeholder survey was conducted using anonymized responses, and no directly identifiable personal data are included in the public dataset. Public council documents were used as publicly accessible governance records.

Data Availability Statement: The research materials supporting this study are available on Figshare: [25]. Institutional learnability and community knowledge-building in smart region governance: Research materials from the Tokaj Wine Region (2023–2025) [Data set]. Figshare. <https://doi.org/10.6084/m9.figshare.32261742>. The uploaded package includes a README, file manifest, checksums, empirical governance materials, anonymized survey materials, PRISMA-ScR evidence-mapping files, coding and calculation workbooks, and final analytical figures.

Conflicts of Interest: The author declares no conflicts of interest.

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