Language Documentation and Revitalization

Successor Formation, Structural Barriers, and Community-Governed Language Futures

Wanhong HUANG
huangwanhong@serendip.ngo

Working draft, August 2026

Abstract

Language documentation, vitality assessment, maintenance, revitalization, and reclamation address related dimensions of threatened-language futures. Their objects remain distinguishable: documentary resources may endure while learning pathways contract; programmes may attract participants while material barriers restrict sustained participation; standards may aid teaching while distributing linguistic authority unevenly. This position paper develops a philosophical and formal synthesis centred on successor formation and community-governed language futures. The literature discussion reconstructs antecedent work on documentation, intergenerational transmission, socialization, situated practice, new speakers, political economy, language rights, capabilities, and Indigenous governance. Within that synthesis, *generative linguistic continuity* receives the limited status of a proposed diagnostic term for the capability to form successors, sustain situated practices, create and receive expressions, and govern future trajectories. The formal core separates documentary capacity, effective opportunity, realized participation, direct and regenerative successors, viable trajectories, barrier interactions, and reference constraints. Conditional results establish documentation–generativity underdetermination, an opportunity ceiling, partial profile comparability, and trajectory contraction under nested fixed-reference rules. Constructed cases, objections, and evidence gates delimit empirical use. The resulting framework remains revisable and requires longitudinal evidence, community-specified objects, and explicit normative premises.

Keywords: language documentation; language revitalization; language reclamation; successor formation; structural barriers; new speakers; language futures; capabilities

Discussion Paper Note

This paper is a preliminary discussion paper intended to share an evolving idea and invite further dialogue, criticism, revision, and independent development.

The paper develops a researcher-origin synthesis concerning successor formation, structural barriers, and community-governed language futures. It assigns *generative linguistic continuity* and *linguistic becoming* the status of proposed diagnostic concepts. The argument enters conversation with established work on reversing language shift, vitality assessment, documentary linguistics, language socialization, situated practice, language maintenance and revitalization, language reclamation, new speakers, linguistic continuity, political economy, language rights, capabilities, and Indigenous data governance. Similar or more complete formulations may appear in other intellectual, cultural, professional, or disciplinary traditions. The literature review records a bounded comparative pass; systematic genealogy, multilingual review, and originality assessment remain open.

The author accepts responsibility for the definitions, distinctions, formal constructions, research design, argument, citations, and conclusions presented here. Any errors of interpretation, formulation, calculation, or attribution remain the author's responsibility. Dialogue-assisted drafting preserves sole human authorship and responsibility.

The arguments should be understood as provisional and historically situated. Readers are encouraged to question, revise, extend, reinterpret, or independently develop the ideas. Where appropriate, acknowledgment of this paper as one point of encounter in the development of related work is appreciated.

Responsible Use and Rights Reservation

The author encourages good-faith discussion, criticism, independent development, and responsible use of the knowledge presented in this work. The author reserves all rights and remedies available under applicable law concerning unlawful conduct, harmful or abusive exploitation, improper commercial appropriation, infringement of applicable intellectual-property or other legal rights, and conduct contrary to applicable national, regional, or international law.

This reservation preserves the ability to respond to misuse and harmful appropriation while supporting legitimate academic inquiry, criticism, independent reasoning, and further development of related ideas.

Notices

Status. This working draft is circulated for discussion. Its concepts, statement numbers, formal constructions, cases, and conclusions remain revisable.

Licence. This work is made available under a Creative Commons Attribution–NonCommercial 4.0 International Licence (CC BY-NC 4.0), subject to the rights reservation stated on the preceding page.

Statement on the use of language models. Drafting, literature discovery, formal criticism, and LaTeX assistance were conducted in dialogue with OpenAI Codex. The author selected the research question, accepted or rejected proposed formulations, checked the cited references, and bears sole responsibility for the definitions, taxonomy, formal constructions, arguments, conclusions, and remaining errors.

Related research programme. This paper is the third study in an integrated series on co-experience knowledge, transmission, and injustice. The first develops co-experience knowledge, symbolization, continuity, and regeneration [13]. The second studies interpretive power, epistemic standing, and responsibility across co-experience transmission [14]. The present paper develops the language-continuity branch. Planned studies address culture, institutional translation, political economy, and AI mediation under separate evidence requirements.

Suggested citation. Huang, W. *Language Documentation and Revitalization: Successor Formation, Structural Barriers, and Community-Governed Language Futures.* Working draft, 2026.

1 Introduction

This section establishes the research problem, the paper's provisional position, its contribution boundary, and the order of argument. The method combines conceptual analysis, a bounded review of verified literature, normative reconstruction, a typed formal model, conditional derivations, and constructed comparison cases. Philosophical and disciplinary analysis supplies the premises and objects that the formal component later represents.

A language can persist in several senses. Recordings, transcriptions, grammars, dictionaries, teaching materials, and digital corpora can remain available. Speakers can continue using a repertoire in homes, ceremonies, workplaces, schools, public institutions, and online settings. Learners can attain competence. Later participants can form further learners and new domains. Communities can also revise standards, create expressions, negotiate authority, and decide how language enters changed circumstances. These achievements support one another, yet each has its own evidence and failure conditions.

The distinction becomes urgent when a visible success in one dimension stands for the whole. A large archive can preserve indispensable resources while successor pathways contract. Enrolment can rise while time, employment, care, travel, stigma, or scarce interlocutors limit participation. A standard can support teaching and mutual intelligibility while narrowing legitimate speakerhood. Digital reach can widen access while shifting authority toward platforms or outside institutions. Speaker counts can record current capacity while leaving future regenerative depth uncertain.

Established scholarship already supplies multidimensional and historically situated descriptions. Fishman's reversing-language-shift framework centres intergenerational transmission and functional domains [7]. UNESCO's vitality framework uses nine factors, including intergenerational transmission, speaker numbers and proportions, domains, response to new media, education materials, policies, attitudes, and documentation [31]. The Expanded Graded Intergenerational Disruption Scale develops a functional status scale tied to intergenerational transmission [19]. Documentation theory distinguishes documentary and descriptive projects and develops multidimensional standards of resource portability [11, 3]. Revitalization, reclamation, maintenance, new-speaker, and repertoire scholarship provides context-sensitive accounts of goals, programmes, authority, variation, migration, and social change [9, 12, 23, 18, 24, 20, 26]. The present proposal therefore begins inside a mature, internally diverse field and treats architectural synthesis as its possible contribution.

The paper advances a conditional synthesis. *Generative linguistic continuity* names a community's continuing capability to generate new speakers, situated uses, expressions, practices, interpretations, and revisions through accessible social, material, institutional, and symbolic relations over a declared horizon. *Linguistic becoming* names the historically situated processes through which participants acquire, use, transmit, contest, hybridize, and transform linguistic repertoires while developing authority and practical options concerning future trajectories. These are proposed working terms. They organize a relation among established fields and acquire value only through additional discrimination. Song's *relational linguistic continuity* develops a distinct political-philosophical account of sustained language-sharing relations and linguistic survival [30]. Section 2 specifies the overlap and the difference.

Three claims organize the argument. First, documentary capacity leaves generative continuity underdetermined. This is a logical and diagnostic claim; documentation can remain a necessary or highly effective support in particular settings. Second, barriers can interact, so isolated programme indicators can misdescribe effective opportunities. This is an empirical hypothesis whose direction depends on setting, outcome scale, horizon, and identification design. Third, continuity governance should evaluate effective, community-legitimated trajectory sets across differently situated participants. This normative claim depends on further premises concerning community authority, individual refusal and mobility, restricted knowledge, intergenerational relations, and revision.

The formal model occupies a bounded role within the larger argument. The philosophical sections determine the objects, normative premises, and legitimate sources of specification. The formal sections then type those commitments and derive four limited results: documentation and generativity vary independently inside the declared state space; realized interaction is bounded by effective opportunity; plural continuity profiles form a partial order; and a nested fixed-reference rule can contract the viable trajectory set. The model also defines direct and regenerative successor status, barrier-interaction estimands, bottleneck pathways, and effective intervention sets. These constructions organize inquiry. Fieldwork, measurement, causal design, historical interpretation, and community review determine empirical adequacy.

The paper's potential contribution lies in joining five elements within one explicit architecture: documentary capacity, relational opportunity, successor depth, viable trajectories, and option-sensitive safeguards. The contribution remains secondary to established community practices and disciplinary tools whenever those already provide equal or stronger discrimination. A new vocabulary earns retention only when it changes a justified conclusion about evidence, intervention, authority, or trajectory.

The manuscript proceeds from terminology and conceptual objects through disciplinary traditions, philosophical commitments, formalization, and empirical obligations. Section 2 locates the vocabulary. Sections 3 and 4 distinguish the objects of continuation and the roles of documentary resources. Sections 6–8 reconstruct vitality, revitalization, socialization, speakerhood, political economy, rights, and governance. Section 9 develops the normative argument. Sections 10–13 present the formal model and derivations. Section 14 tests the framework through four constructed cases. Sections 15 and 16 state objections, evidence gates, and future directions. Section 17 gives the resulting position.

2 Terminology, Scope, and Conceptual Genealogy

This section establishes the paper's public vocabulary and the status of its proposed concepts. It first maps established field terms to their principal research objects, then distinguishes the paper's working concept from an existing philosophical use of *linguistic continuity*. The method is terminological reconstruction from the verified literature used in this paper.

The title uses *language documentation* and *language revitalization* because these phrases provide established and readily identifiable disciplinary entry points. Documentary linguistics concerns the creation of multipurpose records of linguistic practices [11]. Revitalization scholarship addresses organised efforts to expand use, learning, domains, and supporting conditions [9, 12, 23]. *Language vitality*, *language maintenance and shift*, *language reclamation*, and *new speakers* identify adjacent objects and traditions with their own histories [31, 26, 18, 24].

The phrase *linguistic continuity* also has prior uses. Song defines *relational linguistic continuity* as a condition in which individuals can continue forming human relations and interacting with others who share a language of origin or socialisation, and uses that condition in an argument for linguistic survival [30]. Other uses can concern historical persistence, intergenerational relations, or sustainability. This plurality gives the phrase philosophical relevance while limiting its precision as an unqualified disciplinary title.

The present paper uses *generative linguistic continuity* for a different, though compatible, analytic purpose. The proposed term joins documentary resources, effective learning opportunities, successor-forming relations, situated use, innovation, and trajectory governance. Song's concept places shared-language relations and linguistic survival at the centre of a rights argument. The present concept places the production and governance of future linguistic capacities at the centre of a diagnostic architecture. The relation between the two concepts is one of partial overlap; shared-language relations can constitute both a valued end and a mechanism of successor formation.

Table 1 records the division of labour among the main terms. The table is a bounded

research map; an exhaustive disciplinary taxonomy and evidence for the proposed synthesis require separate work.

Claim 2.1 (Terminological discipline)**.** *The proposed term earns continued use only when its joint representation of successor depth, structural barriers, and governed future options changes a warranted research or policy conclusion relative to established vocabularies.*

This retention condition makes conceptual economy part of the paper's method. Empirical work can use the established term that most closely names its object. The proposed synthesis becomes useful where a decision crosses several objects, such as an archive-to-learning pathway, a portfolio of material and pedagogical supports, or a conflict between reference standards and new-speaker participation.

3 Language Futures as a Compound Research Object

This section develops the paper's conceptual object before formal measurement. It distinguishes the bearer, content, process, horizon, and authority of continuation, then separates persistence, reproduction, and becoming. The analysis treats language futures as compound because resources, capacities, practices, relations, institutions, and authorisations can follow different trajectories.

3.1 Language as Repertoire, Practice, and Relation

This subsection specifies the ontological commitments carried into the model. Language is treated as a historically organized field of symbolic resources, embodied capacities, situated practices, participant relations, institutions, and contested authorizations.

Language documentation makes durable symbolic resources available. Language socialization scholarship emphasizes acquisition of language and sociocultural competence through socially organized participation [29]. Situated-learning theory describes learning through participation in communities of practice [17]; its transfer to language settings remains an empirical question. Pennycook's account of language as local practice connects linguistic activity with place, repetition, sedimented resources, and situated action [27]. Mufwene's ecological approach places language change and vitality in interacting internal and external conditions [22]. Together, these traditions support a plural object extending beyond an abstract code.

The plural object also resists a fixed boundary among named languages, varieties, and repertoires. L"upke argues for support of vital repertoires in contexts where bounded-language assumptions fit poorly [20]. Leonard's reclamation approach connects the object called language with colonial definitions and Indigenous goals [18]. The model therefore requires a declared unit and permits overlap, multilingual practice, hybridization, and revision of its unit during inquiry.

The philosophical issue concerns identity across change. Continuation can attach to at least six bearers: a documented symbolic resource; embodied capacities among participants; recurrent practices in particular domains; relations among speakers and learners; institutions that organise access and authority; and a governed space of possible future forms. These bearers support different identity conditions. Exact token preservation may matter for a ceremonial recording. Family interaction may matter through recurring relationships and roles. An urban learner network may continue a language through emergent forms and distributed participation. A single identity criterion would collapse these differences.

The relevant content of continuation also varies. Phonological, lexical, grammatical, pragmatic, narrative, ceremonial, interactional, and political contents can follow distinct paths. Communities may rank them differently across contexts. The framework therefore begins with an explicit specification of the bearer, content, horizon, participant group, and governing authority. Formal variables introduced later represent the result of that specification; selection occurs through the preceding substantive process.

Table 1: Terminological division of labour in the paper

Term	Primary research object	Role in the present argument
Language documentation	durable, contextualised, accessible, and governed records of linguistic practices	documentary capacity and resource pathways
Language vitality and endangerment	current conditions across transmission, speakers, domains, policy, attitudes, media, and resources	multidimensional status evidence
Language maintenance and shift	stability and change in habitual language use across social processes and domains	historical and sociological trajectory description
Language revitalization	organised efforts to expand learning, use, domains, institutions, and support	intervention repertoire and programme comparison
Language reclamation	community-centred recovery and decolonial redefinition of language goals and authority	political history, object specification, and governance
Relational linguistic continuity	continuing shared-language relations used in a defence of linguistic survival	philosophical antecedent concerning relational value
Generative linguistic continuity	proposed capability for successor formation, situated practice, expression, revision, and trajectory governance	internal diagnostic synthesis tested in this paper

Claim 3.1 (Object specification)**.** *A warranted claim about a language future identifies the bearer and content of continuation, the relevant participants, the temporal horizon, and the authority through which these elements were selected.*

The claim supplies a philosophical precondition for measurement. Speaker counts, archive size, classroom enrolment, interaction hours, and institutional recognition each concern a different aspect of the compound object. Their combination requires an account of why the selected aspects matter and how they relate.

Definition 3.2 (Generative linguistic continuity)**.** *Generative linguistic continuity is a community's continuing capability to generate new speakers, situated uses, expressions, practices, interpretations, and revisions through accessible social, material, institutional, and symbolic relations over a declared horizon.*

The term *generate* concerns successor capacities and activities. It includes childhood and adult acquisition, intergenerational and peer relations, renewed domains, creative expression, interpretation, teaching, and further transmission. The definition accommodates a wide range of desired trajectories. It assigns positive value to none of them by definition.

3.2 Persistence, Reproduction, and Becoming

This subsection distinguishes three structural roles in continuity. The distinction clarifies which evidence supports each judgment and how preservation can accompany transformation.

Persistence concerns the continued availability of a resource, form, participant capacity, practice, or institution. *Reproduction* concerns successor formation through which a pattern, competence, or practice continues. *Becoming* concerns the creation and negotiation of future forms, domains, relations, identities, and authorizations. A single process can perform all three roles. A recorded narrative persists as an artifact, enters teaching that supports successor

competence, and becomes material for a new genre. Another artifact can persist with little present access or uptake.

Definition 3.3 (Linguistic becoming)**.** *Linguistic becoming is the historically situated process through which participants and communities acquire, use, transmit, contest, hybridize, and transform linguistic repertoires while developing authority and practical options concerning their future trajectories.*

The definition treats change as an object of inquiry and leaves the value of innovation and inherited standards to situated judgment. Communities can value ceremonial fidelity, intergenerational intelligibility, new urban forms, local varieties, or several of these at once. Participants can also disagree across age, place, proficiency, institutional role, and relation to restricted knowledge.

Table 2 separates the three roles and their evidential signatures.

The distinction between generative and reproductive relations remains open in valuation. Faithful reproduction can protect a threatened ceremonial register. Innovation can support daily use and can also displace a valued distinction. The task is to identify the relation, target, horizon, governing authority, and effects.

4 Documentation as Resource, Relation, and Governance

This section analyses documentation as a resource-producing practice, a network of relations, and a governance arrangement. It reconstructs documentary contributions, traces the bridge from resources to revitalization, and states the additional evidence required for claims about successor formation.

4.1 Documentary Objects and Capacities

This subsection identifies the objects and achievements of documentary work. The analysis separates record creation, description, portability, use-oriented design, and governance because each can vary within the same project.

Himmelmann distinguishes documentary linguistics from language description and treats documentation as the creation of a multipurpose record of linguistic practices [11]. Bird and Simons identify seven dimensions of portability for language resources: content, format, discovery, access, citation, preservation, and rights [3]. These distinctions show that an archive is already a structured socio-technical and governance achievement. Coverage, context, usability, rights, and preservation can vary substantially. Austin's analysis of documentation for revitalization further shows that corpus content, younger and less fluent speakers, contemporary contexts, interactional routines, family language, metadata, and records of revitalization processes can affect practical usefulness [1]. Documentary design therefore influences which future activities a resource can support.

Documentation can support language futures through several pathways. It can preserve evidence, help learners and teachers, sustain research, supply materials for reclamation, support claims to history and identity, and allow later reinterpretation. Restrictions and risks can concern consent, access, sensitive knowledge, data authority, decontextualization, and long-term maintenance. Community-based research approaches make relations among researchers and communities part of project design [4]. The CARE Principles emphasize collective benefit, authority to control, responsibility, and ethics in Indigenous data governance [8].

4.2 Resource-to-Practice Pathways

This subsection reconstructs the reasoning that connects documentary resources with language use and learning. Its purpose is to identify the intermediate conditions that a broad continuity

Table 2: Structural roles within linguistic continuity

Role	Primary object	Characteristic evidence	Characteristic uncertainty
Persistence	resource, competence, practice, or institution across time	archival integrity, access, repeated use, retained competence, institutional survival	continuing availability can have limited practical uptake
Reproduction	successor relation and resulting capacity	learning trajectories, interaction, feedback, later competent participation and teaching	attainment can remain fragile or domain-specific
Becoming	future forms, domains, relations, and authorizations	novel uptake, genre development, contested standards, expanded options, revised governance	innovation can widen or contract valued continuities

claim must establish.

A documentary resource first needs discoverability, authorised access, intelligibility, technical usability, and contextual information for the intended participants. It then needs translation into an activity: teaching, self-study, conversation, curriculum design, performance, place-based interpretation, artistic creation, research, or another community-selected practice. That activity requires time, skill, interlocutors, institutions, material support, and legitimacy. Repeated participation can contribute to competence and situated use. Successor formation adds a further transition in which participants become able to sustain or renew relevant learning relations.

This chain provides an argument structure:

1. documentary evidence establishes the availability and properties of resources;
2. generative-continuity claims concern capacities, practices, relations, and future options;
3. a warranted inference from resources to generative continuity therefore specifies and investigates the intervening access, activity, participation, and successor mechanisms.

The third step turns a broad association into a programme of inquiry. It also allows several evidential outcomes. A resource may support research and historical interpretation while current learning pathways remain limited. Another resource may have modest scale and high local uptake because speakers, teachers, and families created it around present activities. Austin's account supports this attention to the content and context of documentation for revitalization purposes [1].

The paper's documentation claim is therefore narrow. Documentary strength leaves relational opportunity, present practice, successor formation, novelty, and trajectory agency open until additional connections are specified. This underdetermination motivates a plural profile. Preservation and living practice retain distinct roles, while access remains governed by applicable authority, rights, restrictions, and purposes.

Claim 4.1 (Documentary underdetermination)**.** *Documentary capacity alone leaves the state of generative linguistic continuity underdetermined; a continuity judgment requires evidence about the pathways connecting resources with participants, practices, successors, and trajectory governance.*

The claim expresses logical underdetermination within the framework and a methodological caution for empirical research. Its scope leaves comparative ranking open. Documentation can be urgent, ethically required, or foundational in a particular setting. The appropriate conclusion identifies the documentary achievement and then states the further pathways under examination.

5 Successor Formation as a Research Object

This section develops the temporal and relational centre of the proposal. It first distinguishes acquisition from successor-forming participation, then identifies the distributed activities through which regenerative capacity can emerge. The purpose is conceptual specification; formal indicators appear in Section 11.

Intergenerational transmission occupies a central place in Fishman's programme, UNESCO vitality assessment, and EGIDS [7, 31, 19]. The present model retains that priority while broadening the successor relation. Children, adult learners, peers, returning members, mobile speakers, and new speakers can participate in different pathways. The relevant relation can occur in families, schools, ceremonies, workplaces, media, community programmes, or distributed networks.

Successor depth separates two achievements. A participant may acquire a declared capacity over the chosen horizon. That participant may also enter relations through which later participants acquire, use, transform, or transmit the repertoire. The second achievement describes regenerative participation. A one-time increase in learner numbers records direct successor formation; evidence of later sustaining relations records additional temporal depth.

Regeneration can remain distributed. One participant can teach vocabulary, another organises practice, another creates media, elders authorise access, families sustain use, and institutions fund time. The model's individual indicators serve as a minimal skeleton. Group and network extensions remain a research obligation.

The successor relation also contains a normative choice. A study must specify which capacities count, who can recognise them, which forms of participation carry standing, and how variation enters the criterion. A threshold based only on standardised fluency can obscure organisers, receptive speakers, cultural workers, families, and learners who sustain interaction. A threshold broad enough to include every affiliation can lose diagnostic force. The defensible unit depends on the activity and the community-governed purpose.

Claim 5.1 (Successor-relational focus)**.** *Successor formation should be studied as a relation among participants, activities, resources, institutions, and authorisations across time, with individual competence treated as one component of that relation.*

The claim changes the evidence sought. Assessment expands from enrolment and proficiency toward interaction histories, role transitions, opportunities to contribute, peer and family networks, teaching or organising activity, institutional durability, and the emergence of later successor pathways. The expansion remains compatible with established intergenerational measures and supplies an additional mechanism-oriented layer.

6 Vitality, Maintenance, and Revitalization Traditions

This section locates the proposal within established traditions of vitality assessment, language maintenance and shift, and revitalization practice. It reconstructs their objects and methodological strengths, then identifies the narrower coordination task assigned to the proposed framework. Later sections treat socialization, speakerhood, political economy, rights, and governance in greater depth.

6.1 Vitality and Intergenerational Disruption

This subsection examines assessment frameworks that already treat continuity as multidimensional and functionally situated. Its role is to prevent novelty claims based on rediscovering established distinctions.

Fishman's graded disruption framework and programme of reversing language shift places intergenerational transmission and domains of use at the centre of diagnosis and action [7].

Table 3: Antecedent frameworks and comparative roles

Framework cluster	Established contribution used here	Comparative role of the proposed model
Vitality and disruption	multidimensional status, transmission, functions, domains, attitudes, policy, resources	represent profile comparison and intervention trajectories without a default scalar
Documentation and portability	multipurpose records, context, formats, discovery, access, citation, preservation, rights	connect differentiated documentary capacity to successor pathways
Socialization and situated practice	competence through organized participation, local activity, and practice communities	specify opportunity, realized participation, and regenerative depth
Revitalization and maintenance	contextual planning, households, schools, programmes, mobility, resources, evaluation	compare portfolios through barriers, access, and declared horizons
Reclamation, repertoires, and new speakers	decolonial goals, fluid repertoires, authenticity, ownership, changing speaker communities	represent trajectory plurality and reference-constraint effects
Political economy and ecology	economic disruption, livelihoods, migration, policies, internal and external conditions	define testable interactions and pathway bottlenecks
Rights, capabilities, and governance	language claims, effective freedom, community authority, collective benefit, responsibility, ethics	state bridge premises and handle conflicts among collective and individual positions

UNESCO's expert framework identifies nine factors and explicitly cautions that a single factor alone supplies an incomplete assessment [31]. Lewis and Simons expand the graded scale into EGIDS, linking levels to identity functions, intergenerational use, and institutional conditions [19]. These are major antecedents to any claim that archives or aggregate speaker counts provide only partial evidence.

The three frameworks also encode different purposes. Fishman's programme connects diagnosis with staged efforts to reverse disruption. UNESCO provides a factor-based assessment whose dimensions can move independently. EGIDS offers a functional scale for describing status and orienting intervention. A responsible synthesis preserves these purposes because a diagnostic profile, a status scale, and a programme sequence answer different questions. Their coexistence supplies a precedent for methodological plurality.

The proposed continuity profile retains their multidimensional orientation and changes the formal question. A scale assigns a level according to defined criteria. A profile preserves possible incomparability among cases, and a viable-trajectory set represents reachable futures under interventions and constraints. The added value is conditional: it appears when two cases with similar status levels require different evidence or portfolios because their barriers, successor relations, or option sets differ.

Status assessment and causal explanation also require separation. A low domain score identifies a condition. Mechanism and programme effects require additional evidence. The formal barrier contrast in Section 12 is designed to make this evidential gap visible.

6.2 Revitalization, Maintenance, and Programme Plurality

This subsection situates the paper beside broad programme literatures. It emphasizes contextual planning and preserves the diversity of established intervention forms.

Grenoble and Whaley present language revitalization through local contexts, goals, literacy, policy, resources, and programme construction [9]. The Routledge handbook edited by Hinton,

Huss, and Roche spans theory, ethics, documentation, households, schools, adult learning, new speakers, and regional experience [12]. Olko and Sallabank provide practitioner-oriented guidance designed for context-sensitive planning [23]. Pauwels analyses maintenance and shift across family, community, institutional, and mobile multilingual settings [26]. This literature already supports portfolio reasoning and context-specific intervention sequences.

Current institutional practice supplies concrete designs. The First Peoples' Cultural Council describes community-led programmes including mentor–apprentice immersion, youth initiatives, planning, documentation, and technology [6]. Its programme descriptions establish the existence and intended structure of these interventions. Independent longitudinal evaluation remains necessary for comparative causal conclusions.

The paper adds an option-sensitive representation. A technically offered programme becomes an effective option only when participants can access it and when it satisfies legitimate safeguards. Mentor availability, paid time, transport, childcare, disability access, digital connectivity, safety, and institutional stability can change that intersection. This framing treats material support as part of language infrastructure.

Maintenance, revitalization, and reclamation also imply different temporal orientations. Maintenance can focus on sustaining present use. Revitalization can seek expansion or renewal under current conditions. Reclamation can reorganise the authority, history, and community purposes through which language work becomes intelligible. A project can combine all three. Terminological choice should follow the participants' own goals and the historical structure of the case.

Claim 6.1 (Programme plurality)**.** *Programme evaluation should begin from declared community purposes, the relevant stage of change, and the available social and material pathways; intervention categories acquire meaning through that situated architecture.*

The claim gives programme plurality an epistemic role. Comparisons remain possible when researchers specify the target activity, participant group, time horizon, implementation process, and outcome. Generalisation then concerns mechanisms and conditions, while programme names alone carry limited causal information.

7 Socialization, Speakerhood, and Linguistic Change

This section develops the social mechanisms and political categories involved in successor formation. It reconstructs learning through participation, examines speakerhood and authority, and places innovation within the practical life of language communities. The method joins language-socialization and situated-practice perspectives with reclamation and new-speaker research.

7.1 Socialization, Practice, and Linguistic Ecology

This subsection develops the relational mechanism behind successor formation. It connects participation with capacity while preserving multiple acquisition pathways.

Language socialization research treats language acquisition and socialization through language as linked processes organized in cultural interaction [29]. Situated learning connects learning with legitimate participation in social practice [17]. Pennycook emphasizes language as local practice, and Mufwene analyses language vitality and change through ecological conditions [27, 22]. Kulick's ethnographic study connects language shift with socialization, self, value, and cultural reproduction in a specific Papua New Guinean setting [15]. Its case supplies a warning against abstracting language choice from social worlds.

The model uses these traditions to motivate an opportunity–participation–capacity pathway. The equation remains intentionally open about functional form. Participants also learn through

recordings, texts, media, self-study, observation, and innovation. Relational interaction is one important pathway among several. The model records alternative inputs explicitly and invites empirical comparison.

The pathway also clarifies the relation between instruction and participation. A class can create knowledge about forms, regular contact with peers, and an institutional point of entry. Families, workplaces, ceremonies, arts, digital spaces, and public services can provide different pragmatic demands and forms of recognition. Successor formation depends on how these sites connect. A learner who completes a course yet lacks interlocutors faces a pathway discontinuity; a participant with modest formal proficiency may sustain a dense practice network and contribute substantially to continuity.

This relational view changes the unit of diagnosis. Capacity remains embodied by persons, while its exercise depends on other persons, places, routines, artefacts, and institutional permissions. The formal opportunity variable later represents this situated dependence. Its components require qualitative investigation before quantification.

Ecological language encourages system thinking and can also invite loose biological analogy. The present use is socio-institutional: conditions interact, feedback occurs, and interventions can have indirect effects. Transfers of biological selection laws, organismic unity, or extinction narratives require a separate analogy warrant.

7.2 Reclamation, Repertoires, and New Speakers

This subsection addresses the politics of the language object and of legitimate speakerhood. It supplies the main antecedents for trajectory plurality and reference constraints.

Leonard develops language reclamation through decolonization of the object called language and through Indigenous community goals [18]. L"upke argues that vital repertoires can provide a more fitting object than bounded named languages in some multilingual settings [20]. These approaches challenge models that define success as return to an externally fixed earlier state.

New-speaker research analyses people who acquire and use minority languages outside conventional native-speaker trajectories and examines changing communities, legitimacy, and authority [24]. O'Rourke and Ramallo show how linguistic authority and authenticity become contested among new speakers in contemporary Galicia [25]. Dorian's analysis of purism and compromise in revitalization shows how standards and variation can affect participation [5]. These sources place fixed-reference governance within an established problem area.

The paper's formal contribution is a simple inclusion result. When a fixed reference rule narrows the admissible control and practice set, the reachable viable-trajectory set can only stay equal or contract. The theorem leaves the normative status of reference standards open. Standards can protect ceremonial forms, restricted knowledge, intelligibility, historical evidence, or pedagogical coherence. The relevant inquiry concerns authority, purpose, scope, revision, and effects across differently situated speakers.

Speakerhood is therefore both a descriptive and an institutional category. Descriptively, participants differ in repertoires, competencies, frequency of use, domains, histories of acquisition, and relations to place. Institutionally, programmes and communities can assign recognition, correction authority, teaching roles, access, and representational standing. These assignments influence participation and can feed back into learning opportunities.

Purism, compromise, and variation should be analysed through their functions and distributions. A reference form can stabilise materials and support intergenerational intelligibility. The same form can acquire exclusionary effects when correction practices stigmatise learners or erase local variation. An innovative form can widen ordinary use and can also weaken a distinction valued by custodians. Evaluation therefore needs evidence about the object protected, the authority exercised, the participants affected, and the available revision process.

Claim 7.1 (Speakerhood as governed participation)**.** *Research on language futures should*

examine speakerhood through demonstrated practices, situated relations, and governance processes, with fluency measures retained as one important evidential component.

The claim preserves linguistic assessment while widening the inquiry. It directs attention toward who receives opportunities to speak, teach, correct, create, represent, and decide. This distribution matters both for present participation and for the formation of later successors.

8 Political Economy, Rights, and Community Governance

This section situates language learning and use within distributions of time, income, mobility, institutions, recognition, and authority. It first reconstructs material conversion conditions, then connects effective opportunity with language rights, capabilities, and Indigenous governance. The aim is to prevent pedagogical indicators from absorbing political-economic constraints.

8.1 Political Economy and Material Conditions

This subsection places language trajectories within livelihood, education, mobility, demographic, and institutional structures. Its role is to prevent motivational explanations from absorbing constrained opportunity.

Harbert connects language endangerment with economic development and material circumstances [10]. Pauwels treats mobility and changing multilingual constellations as part of maintenance and shift [26]. May places language claims within ethnicity, nationalism, education, mobility, and political structure [21]. The broad revitalization literature likewise covers households, schools, institutions, technologies, and resources [12].

These literatures support a barrier-sensitive account. Paid employment can conflict with immersion schedules. Housing and migration can disperse interlocutors. School policy can expand teaching while limiting daily domains. Stigma can reduce realized participation even where programmes exist. Care obligations, disability, documentation status, and digital infrastructure can distribute access unequally. Several barriers can reinforce or offset one another.

The distinction between resources and effective opportunities is central. A funded course, archive, media platform, or public-service right supplies an available resource or formal entitlement. Participants convert that resource into activity under heterogeneous conditions. Work schedules, transport, caregiving, health, legal status, confidence, discrimination, technical access, and local institutional capacity shape conversion. The resulting inequality can appear even when programme eligibility is formally equal.

Material structures also influence the domains in which linguistic capacities carry practical value. Employment, housing, education, healthcare, administration, media, and migration policy distribute the occasions on which a language can be used and the costs associated with its use. These structures can change the expected benefits of learning and the density of available interlocutors. An explanation centred on individual motivation therefore remains incomplete when institutional arrangements organise the opportunity field.

The paper formalizes interaction through a controlled contrast. Its empirical use demands more than a list of barriers or a before–after programme comparison. It requires a declared outcome scale, causal design, temporal ordering, uncertainty, and attention to selection into participation.

Claim 8.1 (Material conversion)**.** *An intervention becomes an effective linguistic opportunity through participant-specific conversion conditions; programme availability and formal entitlement therefore require separate measurement from accessible and sustained participation.*

The claim is compatible with several causal structures. Material support may directly increase attendance, indirectly widen interlocutor networks, or alter institutional recognition. A pedagogical intervention may strengthen confidence and thereby improve later opportunity

conversion. The barrier model in Section 12 represents interaction among these mechanisms without prespecifying their empirical direction.

8.2 Language Rights, Capabilities, and Indigenous Governance

This subsection identifies normative resources for evaluating trajectory options. It distinguishes formal entitlement, effective opportunity, collective authority, individual position, and culturally governed restriction.

Political theory contains competing rationales for language rights and competing accounts of individual and collective claims [16]. May develops language and minority rights within political and educational contexts while addressing essentialism and mobility [21]. The capability approach evaluates what people are effectively able to be and do, with selection and specification shaped by the application [28]. These resources motivate the distinction among listed, accessible, and admissible interventions.

For Indigenous peoples, the United Nations Declaration on the Rights of Indigenous Peoples affirms rights concerning languages, education, cultural institutions, traditions, and media within a wider framework of self-determination [32]. The CARE Principles articulate Collective Benefit, Authority to Control, Responsibility, and Ethics for Indigenous data governance [8]. Community-based language research likewise places research relations and community goals inside methodology [4]. These frameworks retain their political, legal, and community-specific contexts.

A formal option set can record an authority condition after the relevant authority and procedure have been established. Questions concerning community constitution, internal disagreement, collective rights, preference representation, and local protocols remain matters for legitimate substantive procedures. This division of labour motivates the normative architecture in Section 9.

Rights and capabilities address different parts of the architecture. Rights can establish claims, duties, protections, and institutional standing. Capability analysis asks whether persons and groups possess substantive opportunities to pursue selected activities. Indigenous governance frameworks centre collective benefit, authority, responsibility, and ethics within particular political histories. The proposed framework uses these traditions cumulatively: entitlement, effective opportunity, and legitimate authority remain separate analytical questions.

The relationship between collective and individual positions requires explicit reasoning. Collective authority can protect shared institutions, restricted knowledge, and the conditions of intergenerational life. Individuals retain interests in participation, privacy, movement, affiliation, and refusal. A language programme can strengthen collective capacity while distributing burdens unevenly. A policy can widen individual access while displacing community control. Governance evaluation therefore needs both levels and a procedure for identifying conflicts.

8.3 Framework Retention Conditions

This subsection states the conditions for retaining the proposed terminology and model. It compares discriminative value, empirical tractability, community relevance, and conceptual cost.

Proposition 8.2 (Comparative discrimination)**.** *The generative-continuity framework earns a distinct research role in a case when its successor-depth, barrier-interaction, trajectory-set, or option-access distinctions change a warranted conclusion concerning evidence, intervention, authority, or evaluation relative to a strong application of established frameworks.*

Table 3 makes the comparison explicit. Established vitality, revitalization, reclamation, repertoire, new-speaker, capability, and governance approaches remain the preferred vocabulary whenever they provide the needed discrimination. The proposed framework serves as a coordination device while its joint distinctions carry practical or inferential work.

9 Normative Commitments and Trajectory Governance

This section develops the normative premises that constrain the formal model. It first identifies plural grounds of concern, then distinguishes trajectory agency from scalar growth, connects community authority with differentiated participant positions, and states the safeguards and bridge premises required for intervention assessment. The discussion uses political philosophy as a source of explicit premises while preserving community-specific authority and historical context.

9.1 Plural Grounds of Linguistic Concern

This subsection identifies several reasons for caring about language futures and clarifies their distinct implications. The analysis treats relational life, effective freedom, knowledge, identity, historical repair, and collective self-determination as potentially convergent grounds whose relative force remains case-specific.

A language can matter through relationships among family members, peers, elders, places, and institutions. Song's account of relational linguistic continuity gives shared-language interaction a direct role in defending linguistic survival [30]. A language can also matter as an effective capability: people may value the practical possibility of learning, speaking, creating, receiving services, educating children, or participating in public life through it [28]. These two grounds can converge because relationships sustain capabilities and capabilities sustain relationships. Their distinction remains useful when an individual has formal competence but few interlocutors, or when a dense network offers belonging while access is uneven.

Additional grounds arise from knowledge, identity, history, and political authority. Linguistic practices can carry environmental, ceremonial, narrative, technical, and place-based knowledge. They can organise personal and collective identification. Colonial schooling, dispossession, stigma, and administrative exclusion can make reclamation part of historical repair and self-determination [18, 21, 32]. Each ground directs attention toward different evidence and duties. Knowledge preservation can emphasise custodianship and context. Effective freedom can emphasise access and conversion conditions. Historical repair can emphasise authority, resources, and institutional change.

Plural grounds also create conflicts. Public access may support learning while violating restrictions on culturally governed knowledge. Standardisation may facilitate education while redistributing authority among varieties and speakers. A collective project may ask substantial labour from individuals who face competing obligations. A policy that promotes one named language may alter relations within a multilingual repertoire. Normative analysis must state which ground supports each recommendation and whose burdens enter the judgment.

Claim 9.1 (Normative plurality)**.** *Language-future evaluation should state the relational, capability, epistemic, historical, or self-determination grounds supporting each judgment and should trace their implications for differently situated participants.*

This claim prevents a general appeal to "language value" from carrying the whole argument. It also preserves the possibility that several grounds support the same intervention for different reasons, or that a programme advances one ground while burdening another. The formal profile represents selected consequences only after those grounds have been specified.

9.2 Trajectory Agency

This subsection defines the positive normative object. The proposal concerns effective authority and practical options over future linguistic pathways.

Definition 9.2 (Trajectory agency)**.** *Trajectory agency is the effective and revisable capacity of legitimate participants and institutions to shape, pursue, contest, or refuse linguistic pathways under conditions that preserve relevant access, information, voice, and safety.*

Trajectory agency concerns both collective and individual positions. A community can seek intergenerational continuity, ceremonial protection, public services, education, urban domains, or reclamation. Individual participants can seek learning, mobility, privacy, refusal, or affiliation across several communities. These positions can reinforce one another and can conflict.

The model therefore represents a set of viable trajectories. Set size alone supplies an incomplete normative measure. One additional option can impose costs on others, expose restricted knowledge, or undermine a valued practice. Conversely, a narrow option set can express a legitimate protective decision. Evaluation must consider the content, distribution, authority, and consequences of available paths.

Claim 9.3 (Option-bearing continuity)**.** *Language-continuity governance should evaluate effective, community-legitimated trajectory sets available to differently situated participants, together with the distribution of authority, burdens, benefits, and revision powers across those trajectories.*

The claim is provisional. It relies on normative premises concerning self-determination, effective opportunity, intergenerational relations, and protection from coercion. Language rights and capability theory provide important resources while leaving application-specific disagreements open [16, 28].

9.3 Community Authority and Differentiated Standing

This subsection identifies the plural positions that enter continuity governance. It avoids representing a community as a unitary preference and avoids treating outside expertise as automatic authority.

Relevant positions can include elders, fluent speakers, learners, new speakers, children and future participants, families, mobile members, teachers, cultural custodians, restricted-knowledge holders, programme staff, researchers, funders, public institutions, and platform providers. Their standing differs by object and decision. A custodian can hold authority over restricted material; a learner can hold direct knowledge of access barriers; a teacher can assess pedagogy; a public institution can carry service duties; a community government can exercise collective authority; an individual can retain privacy and refusal interests.

Internal disagreement is a normal feature of linguistic becoming. Generations can value different domains. Speakers can disagree about variation, orthography, loanwords, teaching standards, public access, or technology. Mobility can produce overlapping communities and distributed authority. A defensible procedure identifies the object and scope of each decision, the participants affected, the relevant mandates, reasons, appeals, and revision dates.

Indigenous governance requires particular care. UNDRIP and CARE articulate collective rights and authority within histories of dispossession and extraction [32, 8]. Their use in a project should follow relevant community institutions and protocols. Political authority and long-term relation remain necessary beyond a generic participation workshop.

9.4 Safeguards and Normative Bridges

This subsection states the conditions that connect model outputs with intervention judgments. It separates diagnostic results from recommendations.

The admissible intervention set should record at least the following safeguards where relevant: legitimate community authority, informed and continuing participation, individual refusal, mobility, privacy, restricted-knowledge governance, accessible participation, benefit return,

accountability, and revision. Each safeguard needs an institutional interpretation. A checkbox supplies weak evidence when participants lack information, practical alternatives, or safe contestation.

Table 4 records the main inferential bridges.

The bridges keep formal and normative claims separate. An opportunity deficit becomes an intervention reason only after a premise establishes that access matters in the case. A contracted trajectory set becomes a concern only when excluded paths carry legitimate claims. A community can also choose concentration of effort, delayed public access, or a protected reference standard for defensible reasons.

9.5 Intergenerational Relations and Revisability

This subsection develops the temporal conflict inside continuity. Present participants act with inherited resources and affect the practical options of later participants.

Future participants are absent from current consultation. Their interests can be represented through continuity goals, reversibility, documentation, institutional durability, environmental and material supports, and procedures for later revision. Such representation remains fallible. Invocations of future generations can also justify present coercion or impose identity obligations on children.

The paper therefore treats revisability as a core safeguard. Standards, access rules, metrics, programme designs, and declared state regions should carry review procedures and record the reasons for their selection. Reversibility can be limited by language loss, archive destruction, speaker mortality, institutional closure, or platform dependence. These asymmetries justify attention to option preservation while leaving the substance of desired futures open.

9.6 Reference Standards and Linguistic Change

This subsection formulates the concern associated with fixed authenticity or reference rules. It treats standards through their functions, authorities, participant effects, and revision procedures.

Reference standards can support pedagogy, dictionaries, examinations, mutual intelligibility, ceremonial integrity, historical comparison, and protection against external distortion. They can also concentrate correction authority, stigmatize learners, exclude mobile or mixed speakers, narrow acceptable innovation, or make ordinary use costly. Dorian's work on purism and compromise and new-speaker research provide established analyses of these tensions [5, 24, 25].

The paper uses *fossilization* only as a diagnostic risk: a governance arrangement treats one reference state as exhaustive of legitimate future language and suppresses valued participation or transformation through that treatment. Empirical application requires evidence of the rule, its authority, correction practices, participant responses, and trajectory effects. Mere standardization supplies insufficient evidence.

10 Formal State and Continuity Profile

This section introduces the typed state, documentary profile, continuity profile, and comparison relation. Its objective is to prevent substitution among conceptually distinct achievements while retaining their causal connections. The formal statements are definitions and conditional model consequences.

10.1 Domains, Units, and Symbols

This subsection fixes the model's domains and symbol dependencies. Every empirical application must supply a locally defensible unit, horizon, and measurement protocol.

Table 4: Normative bridges from continuity evidence to governance judgment

Diagnostic result	Additional normative premise	Governance implication under the premise
Low effective opportunity	participants should have practical access to chosen learning and use pathways	remove identified time, cost, mobility, safety, or access barriers
Weak successor depth	declared continuity goals include regenerative capacity over the horizon	support later teaching, peer formation, domains, and institutional durability
Unequal effective option sets	relevant participants merit substantively accessible options	redistribute supports and redesign inaccessible programmes
Reference-set contraction	excluded trajectories carry legitimate value or participation claims	revise scope, authority, or review procedure of the standard
Restricted knowledge exposure risk	legitimate custodians hold authority over access conditions	narrow access, transform records, or apply community-governed controls
Barrier interaction	coordinated relief is feasible and proportionate	evaluate portfolios against isolated interventions

Let c index a declared community or participant configuration, v a declared language, variety, or repertoire unit, $d \in \mathcal{D}$ a practice domain, $i, j \in \mathcal{P}$ participants, and $t \in \{0, 1, \ldots\}$ time. Let H be a finite evaluation horizon. Community and repertoire boundaries can overlap and change; their declarations form part of the model record.

Definition 10.1 (Language generative-condition state)**.** *For the declared unit and time, the language state is*

$$\mathcal{L}_t = (\Sigma_t, R_t, H_t, P_t, S_t, I_t, A_t, B_t), \tag{F-LANG-001}$$

where Σ_t contains symbolic resources and documentation, R_t relational structure, H_t participant capacities, P_t living practices and domains, S_t material and socioeconomic supports, I_t institutional and digital infrastructure, A_t authority and agency relations, and B_t barriers.

The tuple is typed. A recording belongs primarily to Σ_t; access rights can enter A_t and I_t; mentorship belongs to R_t and P_t; income support enters S_t; stigma can enter B_t; participant competence enters H_t. One intervention can alter several components.

Assumption 10.2 (Declared analytic frame)**.** *Each application records the unit, participant positions, practice domains, horizon, data governance, thresholds, and revision procedure before assigning profile values.*

This assumption limits false precision. A score for "speaker" or "domain" can change with the task, register, interlocutor, and governing definition. The model permits sensitivity analysis across several defensible frames.

10.2 Documentary Capacity

This subsection differentiates documentary resources through five coordinates. Its role is to represent documentation as a substantive capacity with internal structure.

Definition 10.3 (Documentary-capacity profile)**.** *Define*

$$\mathbf{D}_t = (d_t^{\mathrm{cov}}, d_t^{\mathrm{ctx}}, d_t^{\mathrm{port}}, d_t^{\mathrm{gov}}, d_t^{\mathrm{ped}}) \in [0, 1]^5, \tag{F-LANG-010}$$

where the coordinates represent corpus coverage, contextual richness, technical portability, legitimate governance and access, and pedagogical usability.

Coverage concerns the practices, speakers, genres, varieties, and domains represented. Context includes interactional, historical, pragmatic, and cultural information. Portability includes persistent formats, discovery, citation, preservation, and technical use, drawing conceptually on Bird and Simons [3]. Governance concerns authority, rights, restrictions, consent scope, access, and revision. Pedagogical usability concerns the relation between resources and locally validated learning practices.

Each coordinate requires several indicators. The normalized interval is a reporting convention, and its values acquire meaning only through the indicator definitions. Table 5 places these coordinates beside the generative profile.

10.3 Generative-Continuity Profile

This subsection defines a plural outcome profile and its comparison relation. The construction preserves trade-offs and makes aggregation choices explicit.

Definition 10.4 (Generative-continuity profile)**.** *For horizon H, define*

$$\mathbf{G}_H(\mathcal{L}_t) = \big(T_H, R_H, P_H, N_H, A_H\big) \in [0,1]^5, \tag{F-LANG-002}$$

where T_H represents successor formation, R_H accessible relational density, P_H participation in living domains, N_H production and uptake of new expressions, and A_H effective agency over linguistic trajectories.

The coordinates support multiple indicators and qualitative evidence. T_H can distinguish direct and regenerative successors. R_H can record effective interaction pathways. P_H can preserve differences among family, ceremonial, educational, occupational, civic, artistic, and digital domains. N_H concerns situated novelty and uptake, while A_H concerns effective authority, choice, contestation, and revision.

Definition 10.5 (Continuity-profile order)**.** *For $\mathbf{z}, \mathbf{z}' \in [0,1]^m$, define*

$$\mathbf{z} \succeq_C \mathbf{z}' \quad \Longleftrightarrow \quad z_k \geq z'_k \quad \textit{for every declared coordinate } k. \tag{F-LANG-011}$$

Proposition 10.6 (Partial profile comparison)**.** *The relation $\succeq_C$ is a partial order and is generally incomplete.*

Proof. Reflexivity follows from $z_k \geq z_k$. Antisymmetry follows because $z_k \geq z'_k$ and $z'_k \geq z_k$ imply equality in every coordinate. Transitivity follows coordinatewise. For incompleteness, let $\mathbf{z} = (0.8, 0.3)$ and $\mathbf{z}' = (0.4, 0.9)$. Each vector exceeds the other in one coordinate, so the profiles are incomparable. □

The proposition is elementary and substantively important. A total ranking requires weights, substitution rates, thresholds, or a priority ordering. These additions can be useful, but they encode normative and empirical judgments. Reporting them openly supports contestation and sensitivity analysis.

10.4 State Transition and Admissible Intervention

This subsection defines the transition architecture. It places intervention effects within background conditions and governance safeguards.

Let u_t be an intervention portfolio and W_t contain migration, demographic, economic, political, environmental, and technological conditions. Define

$$\mathcal{L}_{t+1} = \Phi(\mathcal{L}_t, u_t, W_t). \tag{F-LANG-003a}$$

Table 5: Core symbols and empirical interpretation

Symbol	Object	Candidate evidence	Principal caution
$\mathbf{D}_t$	documentary-capacity profile	corpus audit, metadata, formats, access rules, teaching use	normalized coordinates depend on declared indicators
$\mathbf{G}_H$	generative-continuity profile	successor trajectories, relational access, practice, novelty, agency	coordinates permit partial comparison and remain horizon-specific
o_{ijtd}	effective opportunity	time, cost, travel, safety, mutual availability, permissions	opportunity supports possibility and leaves uptake open
x_{ijtd}	realized participation	longitudinal observation, activity records, participant reports	frequency can conceal quality and coercion
h_{it}	situated capacity vector	task performance, practice observation, plural assessment	thresholds can impose external standards
$\mathcal{V}_H$	viable trajectory set	dynamics, controls, declared regions, uncertainty	model reachability requires separate legitimacy judgment

For a local approximation around a declared baseline,

$$\Delta \mathbf{G}_H \approx J_S \Delta S + J_I \Delta I + J_R \Delta R - J_B \Delta B + \varepsilon. \tag{F-LANG-003b}$$

The Jacobians are estimands or model specifications. Their signs remain hypotheses. Nonlinear Φ is required for threshold, feedback, saturation, and path-dependent effects.

Let $\mathcal{U}_t^{\text{tech}}$ contain technically available interventions. Define the admissible set

$$\mathcal{U}_t^{\text{adm}} = \left\{ u \in \mathcal{U}_t^{\text{tech}} : \mathsf{S}_t(u) = 1 \right\}, \tag{F-LANG-004}$$

where S_t combines declared conditions of authority, participation, refusal, mobility, privacy, restricted-knowledge governance, and revision. Each condition requires rules, evidence, and a conflict procedure supplied through external institutions.

11 Successor Formation and Viable Trajectories

This section develops the formal pathway from effective opportunity to participation, competence, successor depth, and viable trajectories. It states exact consequences of the definitions and marks the empirical assumptions needed for application.

11.1 Effective Opportunity and Realized Participation

This subsection distinguishes programme availability from occasions on which participation is practically possible. The relation supplies a minimal opportunity ceiling.

Let $o_{ijtd} \in [0, 1]$ denote participant i's effective opportunity to interact with participant j in domain d at time t. The measure incorporates mutual availability, time, cost, location, mobility, safety, access permissions, and relevant infrastructure. Let x_{ijtd} denote realized participation.

Definition 11.1 (Opportunity–participation bound)**.**

$$0 \leq x_{ijtd} \leq o_{ijtd} \leq 1. \tag{F-LANG-012}$$

Proposition 11.2 (Opportunity ceiling)**.** *For a declared interaction edge and occasion,* $o_{ijtd} = 0$ *implies* $x_{ijtd} = 0$.

Proof. Substitution gives $0 \leq x_{ijtd} \leq 0$, hence $x_{ijtd} = 0$. □

The result follows from the definition and carries a limited interpretation. Zero effective opportunity forces zero realized interaction on the declared edge and occasion. Positive opportunity leaves uptake contingent on desire, trust, fatigue, relevance, quality, and alternative commitments.

Table 6 separates three intervention sets.

Definition 11.3 (Effective intervention option set)**.**

$$\mathcal{U}_t^{\text{eff}}(i) = \mathcal{U}_t^{\text{tech}} \cap \mathcal{U}_t^{\text{acc}}(i) \cap \mathcal{U}_t^{\text{adm}}. \tag{F-LANG-016}$$

Intersection yields $\mathcal{U}_t^{\text{eff}}(i) \subseteq \mathcal{U}_t^{\text{tech}}$. Strict inclusion occurs when a listed programme is inaccessible or fails a safeguard. The result formalizes the difference between nominal provision and effective capability, drawing a bounded connection with capability theory [28].

11.2 Situated Capacity Transition

This subsection supplies a dynamical skeleton for competence change. It represents interaction-dependent learning alongside attrition, self-study, media, innovation, and unmodelled inputs.

Let $h_{it} \in [0,1]^r$ be participant i's capacities across declared practices. Define

$$h_{i,t+1} = \Pi_{[0,1]^r}\left[h_{it} + \alpha_i \sum_{j,d} x_{ijtd}\Psi_d(h_{jt}, h_{it}, q_{ijtd}) - \delta_i h_{it} + \nu_{it}\right], \tag{F-LANG-013}$$

where q_{ijtd} is interaction quality, Ψ_d is a practice-specific learning function, α_i is sensitivity, δ_i attrition, ν_{it} other inputs, and Π projection onto the bounded domain.

Assumption 11.4 (Empirical transition specification)**.** *Any fitted use of (F-LANG-013) supplies measurement models for* h, x, q*, a defensible temporal interval, functional-form checks, uncertainty, and treatment of unobserved participation and selection.*

When every $x_{ijtd} = 0$, the specified interaction term vanishes and the update depends on prior capacity, attrition, and ν_{it}. This algebraic result avoids a stronger social claim. Asynchronous resources and individual practices can contribute substantially through ν_{it}. Conversely, frequent interaction can yield limited learning when feedback, safety, domain breadth, or mutual competence is weak.

11.3 Direct and Regenerative Successors

This subsection formalizes successor depth. It separates attained capacity from later participation in a further successor-forming relation.

Let $\mathcal{H}^* \subseteq [0,1]^r$ be a declared region of situated competence and practice. Define

$$s_i^{(1)}(t,H) = \mathbf{1}\{h_{i,t+H} \in \mathcal{H}^*\} \tag{F-LANG-014a}$$

and

$$s_i^{(2)}(t,H) = s_i^{(1)}(t,H) + \mathbf{1}\left\{\exists k:\ E_{ik}^{[t,t+H]} = 1\ \wedge\ h_{k,t+H} \in \mathcal{H}^*\right\}, \tag{F-LANG-014b}$$

where $E_{ik}^{[t,t+H]}$ denotes a qualifying successor-forming relation.

The second indicator records regenerative participation and can be reported separately from the sum. Threshold choice is consequential. A ceremonial specialist, conversational peer, early learner, teacher, and media creator can occupy different practice regions. Empirical studies should use a vector or several threshold regions where a single region hides this structure.

Table 6: Intervention availability and effective choice

Set	Membership condition	Characteristic exclusion
$\mathcal{U}_t^{\text{tech}}$	programme or intervention can be technically supplied	unavailable technology, staff, or legal power
$\mathcal{U}_t^{\text{acc}}(i)$	participant i can practically reach and use the option	cost, schedule, distance, care, disability, stigma, safety, digital exclusion
$\mathcal{U}_t^{\text{adm}}$	option satisfies declared authority and safeguard conditions	invalid mandate, privacy risk, restricted-knowledge conflict, absent refusal or review
$\mathcal{U}_t^{\text{eff}}(i)$	option belongs to all three preceding sets	any technical, access, or admissibility failure

Remark 11.5 (Distributed regeneration)**.** *Regenerative capacity can belong to a network whose members provide complementary functions. A later extension should define group-level successor formation through temporal hypergraphs or multiplex networks, with authority and care work represented explicitly.*

11.4 Viable Trajectory Set

This subsection moves from one-step outcomes to horizon-indexed pathways. It represents continuity as reachability under declared conditions and admissible controls.

Let $K_t \subseteq \mathfrak{L}$ be a declared acceptable state region. Different governance processes can produce several candidate regions. Define

$$\mathcal{V}_H(\mathcal{L}_t; K, \mathcal{U}^{\text{adm}}) = \left\{ (\mathcal{L}_{t+1}, \ldots, \mathcal{L}_{t+H}) : \begin{array}{l} \exists (u_t, \ldots, u_{t+H-1}),\ u_\tau \in \mathcal{U}_\tau^{\text{adm}}, \\ \mathcal{L}_{\tau+1} = \Phi(\mathcal{L}_\tau, u_\tau, W_\tau), \\ \mathcal{L}_\tau \in K_\tau \quad \forall \tau \in [t+1, t+H] \end{array} \right\}. \quad \text{(F-LANG-015)}$$

The construction resembles a finite-horizon viability set. Its role here is diagnostic. A path can include continuation, reclamation, hybridization, migration-linked use, return, innovation, or chosen discontinuation if it satisfies the declared regions and controls. Membership states that a trajectory is reachable within the model. Legitimacy, justice, and desirability require the bridge premises developed in Section 9.

Open Problem 11.6 (Plural threshold governance)**.** *Develop procedures for constructing and revising several legitimate regions $K_t^{(1)}, \ldots, K_t^{(m)}$ under internal disagreement, asymmetric standing, overlapping communities, and uncertain future conditions.*

12 Barrier Interactions and Intervention Portfolios

This section represents structural barriers as pathway conditions and causal estimands. Its objective is to connect political-economic discussion with testable research designs while preserving uncertainty, scale dependence, and path dependence.

12.1 Barrier Typing

This subsection organizes barriers by the mechanism through which they alter opportunities, participation, capacity, successor relations, practices, or authority. The types guide evidence collection, with ordering left to the application.

Table 7 emphasizes mechanism and observation. The same surface barrier can enter different pathways. Travel cost can reduce mentor contact, increase online use, or promote a distributed

Table 7: Barrier types, mechanisms, and candidate observations

Barrier type	Candidate mechanism	Candidate observation	Common diagnostic risk
Economic	employment schedules, income loss, housing, programme precarity	time use, costs, income, funding duration, participant attrition	interpreting constrained uptake as weak commitment
Institutional	curriculum, credentials, service rules, correction authority	policies, admission, assessment, staffing, appeals	treating formal provision as effective access
Relational	scarce interlocutors, weak feedback, conflict, disrupted family or peer ties	network histories, interaction quality, trust, domain observation	counting encounters without their organization
Mobility and care	distance, migration, transport, caregiving, disability access	travel time, residence histories, care schedules, accessibility audit	assuming a territorially fixed and fully available population
Stigma and authority	anticipated sanction, authenticity policing, status hierarchy	interviews, observed correction, participation patterns, institutional discourse	attributing silence to preference alone
Technological	connectivity, platform dependence, input support, data governance	device and network access, system audit, terms, failure records	equating online visibility with controlled continuity

peer network. School support can expand learning while concentrating standards. Digital tools can widen practice domains and create dependence on proprietary infrastructure.

12.2 Controlled Barrier Interaction

This subsection defines a scale-specific interaction contrast. It separates descriptive co-occurrence from causal interaction.

For binary barriers b_1, b_2, outcome Y, and intervention regime u, define

$$\begin{aligned}\mathcal{I}_Y(u) = \mathbb{E}[Y \mid do(b_1 = 1, b_2 = 1, u)] - \mathbb{E}[Y \mid do(b_1 = 1, b_2 = 0, u)] \\ - \mathbb{E}[Y \mid do(b_1 = 0, b_2 = 1, u)] + \mathbb{E}[Y \mid do(b_1 = 0, b_2 = 0, u)].\end{aligned} \tag{F-LANG-017}$$

Proposition 12.1 (Additive-scale interaction remainder)**.** *If the controlled difference of b_1 is equal at both values of b_2 on the chosen outcome scale, then $\mathcal{I}_Y(u) = 0$. A nonzero value records departure from that additive relation.*

Proof. Let $\mu_{ab} = \mathbb{E}[Y \mid do(b_1 = a, b_2 = b, u)]$. Equality of controlled differences gives $\mu_{11} - \mu_{01} = \mu_{10} - \mu_{00}$. Rearrangement gives $\mu_{11} - \mu_{10} - \mu_{01} + \mu_{00} = 0$. □

The result defines interaction, while evidence determines its presence. Its value changes with the outcome scale. An interaction on probability can disappear on an odds or log scale. Timing also matters: employment displacement can precede migration, which then changes relational density. Multi-barrier settings require higher-order terms or a structural model.

Claim 12.2 (Barrier-interaction hypothesis)**.** *Economic, institutional, relational, mobility, care, stigma, and technological barriers can interact, producing continuity effects that differ from the sum of their isolated effects on a declared scale.*

This claim remains an empirical hypothesis. Identification can use randomized programme components where ethically and practically appropriate, natural experiments, interrupted time series, panel designs, matched comparison, qualitative process tracing, or mixed methods. Each design has distinct assumptions. Community priorities should determine whether an estimand is useful and acceptable.

12.3 Pathway Bottlenecks

This subsection represents continuity pathways as time-respecting networks. It supplies a complementary diagnostic to average barrier effects.

Let $G_t = (V, E_t)$ be a temporal graph whose nodes include participants, programmes, domains, resources, and institutions. Assign each edge e an effective accessibility $a_e \in [0, 1]$. For a time-respecting path π, define

$$A(\pi) = \min_{e \in \pi} a_e, \qquad A^*_{i \to g} = \max_{\pi : i \rightsquigarrow g} A(\pi), \tag{F-LANG-018}$$

where g is a declared generative outcome.

Proposition 12.3 (Zero-cut bottleneck)**.** *In a finite temporal graph, if every time-respecting path from i to g contains an edge with accessibility zero, then $A^*_{i \to g} = 0$.*

Proof. Every path minimum equals zero. The maximum of these minima therefore equals zero. □

The max–min form captures a bottleneck interpretation. It can miss beneficial redundancy, cumulative exposure, substitution, and complementarities among several weak paths. A flow or multiplex extension can address these patterns. The model's benefit lies in locating a broken link: a high-quality archive and strong curriculum remain disconnected from successor formation if every path contains an inaccessible edge.

12.4 Portfolio Evaluation

This subsection combines causal interactions and bottlenecks into an intervention strategy. The method compares portfolios through profiles and trajectories.

Suppose $u^{(1)}$ funds teaching materials, $u^{(2)}$ funds mentor time, $u^{(3)}$ supports transport and care, and $u^{(4)}$ creates a living-use domain. Their combined effect can differ from the sum of separate effects because each can open a different edge in the same pathway. Portfolio evaluation should therefore report:

1. the state components and pathway edges each element targets;
2. the participant groups for whom each element is effectively accessible;
3. the expected direct effects, interactions, delays, and spillovers;
4. the continuity-profile change and resulting viable trajectories;
5. the authority, privacy, refusal, restriction, and revision conditions;
6. uncertainty, rival explanations, and stopping or redesign rules.

An intervention can improve one coordinate and weaken another. A standardized curriculum can expand access while reducing local variation. A public corpus can support learning while violating knowledge restrictions. A paid immersion programme can increase competence while remaining fragile after funding ends. Partial-order reporting preserves these tensions before any scalar decision rule is introduced.

13 Documentation, Reference Constraints, and Formal Limits

This section derives the paper's exact non-entailment and set-inclusion results. Its role is to state what follows from the model, what remains empirical, and which normative conclusions require bridge premises.

13.1 Documentation–Generativity Countermodels

This subsection constructs two witness states. The witnesses establish logical underdetermination inside the typed model.

Because $\mathbf{D}$ and $\mathbf{G}$ are separately typed, choose

$$(\mathbf{D}_A, \mathbf{G}_A) = ((1,1,1,1,1),(0,0,0,0,0)) \tag{F-LANG-019a}$$

and

$$(\mathbf{D}_B, \mathbf{G}_B) = ((\epsilon,\epsilon,\epsilon,\epsilon,\epsilon),(g_T, g_R, g_P, g_N, g_A)), \qquad \epsilon > 0, \quad g_k > 0. \tag{F-LANG-019b}$$

State A represents maximal documentary capacity with absent generative coordinates. State B represents sparse documentation with positive successor, relation, practice, novelty, and agency coordinates.

Proposition 13.1 (Documentation–generativity underdetermination)**.** *Within the declared state space, maximal documentary capacity fails to entail positive generative continuity, and sparse documentary capacity fails to entail absent generative continuity.*

Proof. State A is a counterexample to the first implication. State B is a counterexample to the second. Both satisfy the coordinate domains. □

The proposition concerns the model class. Prevalence and causal effects remain empirical. Settings can exhibit strong connections: documentation can support curricula, self-study, teacher preparation, reclamation, historical evidence, and new media. The result requires analysts to state and test those connections.

13.2 Reference-Constrained Trajectories

This subsection represents a fixed-reference rule as a restriction on admissible controls or practices. It derives the resulting set relation.

Let $\mathcal{U}_t^{\mathrm{ref}} \subseteq \mathcal{U}_t^{\mathrm{adm}}$ contain controls satisfying a declared reference constraint, such as an authorized lexical, grammatical, register, orthographic, or speaker-status rule.

Proposition 13.2 (Reference-constrained inclusion)**.** *For fixed initial state, dynamics, background conditions, horizon, and acceptable-state regions,*

$$\mathcal{V}_H(\mathcal{L}_t; K, \mathcal{U}^{\mathrm{ref}}) \subseteq \mathcal{V}_H(\mathcal{L}_t; K, \mathcal{U}^{\mathrm{adm}}). \tag{F-LANG-020}$$

Proof. Every control sequence in $\mathcal{U}^{\mathrm{ref}}$ also belongs to $\mathcal{U}^{\mathrm{adm}}$. A state trajectory witnessed by the narrower sequence therefore has a witness in the wider set. □

Proposition 13.3 (Strict trajectory contraction)**.** *The inclusion in (F-LANG-020) is strict when an otherwise admissible control generates a trajectory in K outside the reference-constrained viability set.*

Proof. Let τ^* be the trajectory and $u^* \in \mathcal{U}^{\mathrm{adm}} \setminus \mathcal{U}^{\mathrm{ref}}$ its witness. Then τ^* belongs to the wider viability set. The absence of a reference-conforming witness excludes τ^* from the narrower set, establishing a proper subset. □

The theorem expresses option contraction and leaves the ranking of sets open. A reference constraint can protect valued resources or relations. Normative concern arises when excluded trajectories carry legitimate claims and the governing authority, purpose, scope, or review procedure fails the relevant standards.

Table 8: Derivation chain and epistemic status

Step	Transition	Status	Remaining obligation
1	typed state to separate profiles	definition	validate units and indicators
2	profiles to witness countermodels	exact model consequence	estimate empirical relations and prevalence
3	opportunity bound to zero-participation result	exact definitional consequence	measure effective opportunity
4	participation to capacity update	proposed dynamic	identify functions, parameters, and alternative inputs
5	capacity to direct and regenerative successor status	proposed threshold construction	govern thresholds and extend to networks
6	states and controls to viable trajectories	set definition	specify dynamics, uncertainty, regions, and horizons
7	technical, accessible, admissible sets to effective options	exact intersection consequence	justify access and safeguard criteria
8	four controlled means to interaction	exact contrast definition	establish identification and outcome validity
9	edge capacities to bottleneck access	exact graph diagnostic	compare flow and multiplex alternatives
10	nested reference controls to trajectory inclusion	exact set consequence	assess authority, purpose, and effects
11	diagnostic outputs to intervention judgment	normative bridge	defend rights, capability, authority, and proportionality premises

13.3 Dependency Structure

This subsection assembles the derivation chain and its status. Table 8 distinguishes exact steps from empirical and normative obligations.

Definitions yield conceptual consequences within the model; empirical support enters through measurement and research design. The opportunity ceiling is exact because opportunity is defined as an upper bound. The barrier-interaction contrast becomes an empirical quantity under a valid design. The trajectory inclusion is exact under nested sets, while the interpretation of exclusion depends on substantive values.

13.4 Model-Class Limitations

This subsection identifies the main mathematical and conceptual limitations and converts them into explicit revision targets.

First, normalized coordinates can hide qualitative differences and measurement uncertainty. Second, state decomposition can imply cleaner boundaries than lived repertoires possess. Third, deterministic viability suppresses stochastic shocks and model uncertainty. Fourth, individual successor indicators can obscure distributed care, organization, and collective competence. Fifth, binary barriers simplify intensity and timing. Sixth, max–min pathways suppress redundancy and cumulative exposure. Seventh, fixed-reference constraints can act on practices, recognition, resources, or institutions in ways that a control-set restriction only approximates. Eighth, every normative predicate depends on legitimate institutions and situated interpretation.

These limitations support several extensions: interval-valued profiles; stochastic reachable sets; multiplex successor networks; heterogeneous-agent models; qualitative comparative analysis; causal diagrams with time-varying confounding; and participatory procedures for revising units, indicators, and thresholds. Mathematical development should answer a demonstrated need.

14 Comparative Trajectory Reconstructions

This section tests the model through four constructed cases. Each case is purely hypothetical and combines patterns documented in the literature. The method holds selected dimensions apart to test whether the framework changes the diagnosis, evidence demand, or intervention portfolio.

Table 9 previews the coordinate contrasts. The cases function as counterexample probes and research-design templates.

14.1 Archive-Rich Broken Succession

This subsection tests the documentary-under-determination claim. It constructs a setting with high-quality records and weak relations connecting those records to future practice.

Suppose a corpus has broad coverage, contextual metadata, stable formats, clear citation, and long-term preservation. Access follows a legitimate governance protocol. Most fluent speakers have died, adult learners have little paid time, teaching expertise is scarce, and everyday domains have contracted. Learners can consult the archive, yet they rarely receive situated feedback or enter sustained practice.

The documentary profile **D** is high. The generative profile can contain low R_H, P_H, and T_H, with uncertain N_H and A_H. A corpus-centred diagnosis would describe a major preservation success. The generative diagnosis agrees and asks an additional question: which pathways connect the resource to successor capacity and later practice?

The case changes intervention reasoning. Further recording may remain urgent, especially where knowledge faces irreversible loss. At the same time, paid learning time, teacher formation, contextual interpretation, access procedures, peer practice, and new domains can become complementary portfolio elements. Allocation remains case-specific, with competing irreversibilities and pathway gaps made explicit.

14.2 Relationally Intensive Programme with Weak Infrastructure

This subsection tests the difference between direct success and regenerative durability. It draws on the existence of mentor–apprentice and immersion designs while leaving programme effectiveness open [6].

Suppose a small mentor–apprentice programme produces intensive, high-quality participation and substantial competence gains. Mentors carry heavy time burdens, apprentices lose income, travel is difficult, funding is renewed annually, and few later teaching positions exist. The programme generates several direct successors while its regenerative and institutional pathways remain fragile.

Equation (F-LANG-013) locates the strong interaction pathway. Equations (F-LANG-014a) and (F-LANG-014b) separate competence attainment from later successor formation. The viability set can contract sharply after a funding shock. The case suggests longitudinal outcomes beyond graduation: later practice domains, peer networks, teaching activity, material support, and the formation of further participants.

The normative analysis also records burden. A programme can achieve valued outcomes while concentrating unpaid coordination, emotional work, or cultural responsibility in a few people. Sustainability includes the conditions of those sustaining it.

14.3 Mobile New-Speaker Network

This subsection tests territorial assumptions and authority conflicts. It constructs a dispersed network whose participants create new practices across cities, family locations, and digital spaces.

Suppose adult new speakers use a minority language in online groups, artistic production, periodic gatherings, and some family relations. They create expressions for urban work and

Table 9: Constructed cases for continuity-profile discrimination

Case	Strong coordinates	Fragile coordinates	Principal analytical consequence
Archive-rich broken succession	coverage, formats, preservation	effective access, interaction, living domains, successor depth	documentary achievement leaves regenerative continuity open
Relationally intensive programme	interaction quality, direct competence	mentor capacity, income support, institutional duration, regenerative scale	relational success can remain structurally fragile
Mobile new-speaker network	peer relations, digital domains, novelty	recognition, local services, platform control, distributed authority	continuity can cross place while legitimacy conflicts intensify
Funded reference-constrained programme	materials, staffing, formal access	learner legitimacy, variation, innovation, revision authority	resource expansion can accompany trajectory-set contraction

digital life. Some established speakers welcome the new domains; others contest pronunciation, grammar, borrowing, or claims to speaker identity. Public services remain concentrated in one territory, and the digital network depends on a commercial platform.

The case can yield high N_H, moderate R_H, and growing T_H, paired with contested A_H and infrastructure risk. A bounded territorial model would miss part of the continuity. A simple growth account would miss authority and platform dependence. New-speaker scholarship already supplies the substantive vocabulary of legitimacy and ownership [24, 25]; the trajectory model organizes its relation to access, domain creation, and future options.

Relevant interventions might include interoperable community-governed infrastructure, periodic in-person practice, public-service expansion, plural pedagogical standards, and procedures for contesting linguistic authority. Community and participant judgments determine which forms fit the case.

14.4 Funded Reference-Constrained Programme

This subsection tests the fixed-reference inclusion result. It constructs a programme with extensive resources and a narrow rule concerning legitimate language.

Suppose an institution funds teachers, materials, media, assessments, and public events. A reference variety receives exclusive recognition. Learner innovations, mixed registers, and regional variants are systematically corrected or excluded from certification. Some participants gain competence and confidence; others reduce participation or create unofficial domains.

The programme can raise documentary, institutional, and direct-successor coordinates. At the same time, $\mathcal{U}^{\mathrm{ref}}$ can exclude trajectories available under a wider admissible set. Strict contraction follows only where an excluded trajectory lacks a conforming substitute. Empirical research must therefore trace actual rules, correction practices, participant responses, alternative domains, and longer-term successor activity.

The governance outcome remains open. A protected reference variety can carry legitimate ceremonial, historical, pedagogical, or intelligibility functions. A plural architecture could assign it a scoped domain while recognizing other trajectories elsewhere. Review procedures can respond to evidence about participation and continuity.

Table 10: Case-specific evidence and intervention consequences

Case	Additional evidence required	Portfolio consequence under supportive findings
Archive-rich broken succession	resource use, feedback pathways, participant time, pedagogical fit, living domains	join preservation with access, teaching, practice, and material support
Relationally intensive programme	competence trajectories, mentor burden, funding durability, later teaching and domains	support mentor capacity, livelihoods, network multiplication, and institutional continuity
Mobile new-speaker network	distributed interaction, authority disputes, public access, platform governance, innovation uptake	support portable infrastructure, plural domains, and legitimate conflict procedures
Reference-constrained programme	rule scope, authority, corrections, exclusions, learner trajectories, protected functions	retain, narrow, pluralize, or revise standards according to purpose and effects

14.5 Cross-Case Discrimination

This subsection compares the decisions supported by the cases. Table 10 records the additional evidence and portfolio implication produced by each contrast.

The framework earns a role in these cases because the same visible success supports different next questions. The cases also expose limits. Community-specific scholarship and governance can render the generic categories too coarse. In that event, the framework should be revised or set aside.

15 Objections and Revision Boundaries

This section presents the strongest objections to the proposal and states corresponding revision conditions. It addresses conceptual inflation, measurability, normativity, community conflict, abstraction, and the politics of intervention.

15.1 Redundancy with Vitality and Revitalization Research

This subsection examines whether the proposal merely renames established multidimensional frameworks. The objection has substantial force.

Vitality scales already include transmission, domains, attitudes, policy, education, and documentation [31, 19]. Revitalization handbooks already integrate community goals, households, institutions, teaching, documentation, new speakers, resources, and evaluation [2, 12, 23]. Reclamation and repertoire approaches already challenge bounded and colonial language objects [18, 20].

The response is comparative and modest. The proposed architecture contributes only if explicit successor depth, partial profile order, viable trajectory sets, effective-option intersections, or barrier estimands improve a decision or research design. A systematic review can show that an established framework already contains these functions. That result would support merger and terminological contraction.

15.2 Measurement and False Precision

This subsection addresses the risk that normalized vectors conceal judgment and invite technocratic ranking.

Every coordinate contains choices about units, thresholds, indicators, missing data, and aggregation. Participant reports, ethnography, interaction records, and performance tasks can

disagree. Small communities can face privacy risks from granular data. Quantification can transfer authority toward funders or analysts.

The framework responds through profiles, uncertainty intervals, qualitative evidence, provenance records, and participatory revision. A scalar index requires a separate published rule. Some cases should remain qualitative. The formalism earns use through clarified dependencies, even where numbers remain absent.

15.3 Generativity as a Normative Bias

This subsection examines whether generativity privileges growth, innovation, reproduction, or indefinite continuation.

The concern identifies a real ambiguity. Generativity can be heard as productivity, expansion, fertility, or entrepreneurial novelty. The paper uses it in a narrower capability sense: successor formation, situated use, interpretation, transformation, and revisable options. A community can prioritize faithful practice, protected domains, limited access, or chosen discontinuation. A participant can refuse an inherited identity or teaching role.

The term should be withdrawn where it distorts community aims or imports an unwanted metaphor. The model can then retain its profile and trajectory distinctions under local vocabulary.

15.4 Community Authority and Internal Difference

This subsection addresses the danger of treating collective authority as a unified voice. It also examines the inverse danger of dissolving political authority into individual preference.

Communities contain differences in age, gender, class, place, clan, proficiency, institutional role, and historical experience. Some actors hold legitimate custodial authority; some arrangements reproduce domination. Individual exit can protect freedom and can also result from imposed material constraints. A generic balancing formula would conceal these relations.

Applications therefore need domain-specific governance: political and legal authority, cultural protocol, participant standing, dissent channels, affectedness, restricted knowledge, and review. The formal predicates serve as places to record these judgments, while resolution comes from legitimate external procedures.

15.5 Interventionism and Burden Transfer

This subsection examines whether continuity programmes place preservation burdens on communities while leaving structural causes intact.

Language shift can arise within colonization, economic displacement, schooling, labor markets, land loss, migration, stigma, and public-service exclusion. A programme centred on speaker motivation can individualize these structures. It can also ask elders, families, and learners to supply unpaid labor for an outcome valued by institutions.

The barrier model directs inquiry upstream and records burden distribution. A portfolio can include livelihood, time, transport, childcare, public services, anti-discrimination, institutional change, and community-controlled infrastructure alongside teaching and documentation. The specific response requires evidence, authority, and feasibility.

15.6 Static Formalism and Historical Process

This subsection addresses the tension between typed variables and historical, contested practice.

The state vector can freeze a moving repertoire and underrepresent colonial history, changing identities, affect, conflict, and emergent meaning. The viable-trajectory set depends on a transition map that researchers rarely know. A short horizon can reward visibility, while a long horizon can amplify speculative assumptions.

The appropriate response combines archival research, ethnography, oral history, participant interpretation, institutional analysis, and longitudinal data. Formal variables should be revised when field evidence exposes a poor distinction. Historical narrative remains part of explanation; a state vector supplies a complementary representation.

16 Research Design and Evidence Gates

This section converts the framework into a staged research programme. It identifies data requirements, causal designs, governance conditions, and criteria for retaining, revising, or abandoning the model.

16.1 Participatory Specification

This subsection establishes the first evidence gate. It defines the analytic frame through legitimate and revisable procedures before measurement begins.

A project should record the language or repertoire unit, participants, domains, horizons, desired and protected trajectories, restricted knowledge, authority structure, individual safeguards, candidate indicators, and revision schedule. It should also document disagreement. Community-based research models and Indigenous governance principles supply relevant guidance while retaining their own local and political authority [4, 8].

The output is a model card for the application. It names who selected each coordinate, whose position is missing, what decisions the model may inform, and which uses remain outside scope. A material governance dispute pauses promotion from exploratory analysis to decision support.

16.2 Longitudinal Mixed Evidence

This subsection specifies the observational architecture. It joins resource audits with relational, practical, institutional, and participant evidence.

Candidate sources include corpus and access audits; participant and interlocutor histories; time use; programme records; situated competence assessments; ethnographic observation; domain mapping; interviews; institutional documents; economic and mobility measures; records of correction and dispute; successor activity; and later teaching or practice formation. Data minimization and restricted access can take priority over completeness.

At least three temporal layers are useful: current conditions, direct successor outcomes, and regenerative outcomes. Measurement intervals should match actual learning and institutional processes. Attrition and missingness can carry substantive information, especially when barriers cause programme exit.

16.3 Causal and Comparative Designs

This subsection states the identification gate for barrier and intervention claims. It separates descriptive profiles from causal contrasts.

Randomization may be possible for timing or optional programme components, subject to ethics and authority. Natural experiments, policy discontinuities, phased implementation, longitudinal panels, synthetic controls, matched comparisons, and interrupted time series can support other contrasts. Small populations and heterogeneous contexts often limit statistical designs. Process tracing, realist evaluation, comparative case analysis, and participant accounts can test mechanisms and identify failures hidden by aggregate outcomes.

Every causal claim should state treatment, comparator, outcome, unit, horizon, identification assumptions, interference, missingness, uncertainty, and transport limits. Equation (F-LANG-017) should be estimated only when its intervention interpretation fits the setting. Otherwise, the barrier table remains a qualitative hypothesis map.

Table 11: Evidence gates for programme and model claims

Claim level	Required evidence	Promotion condition	Revision trigger
Documentary capacity	differentiated audit of coverage, context, portability, governance, pedagogy	indicators validated for declared use	resource quantity diverges from access or utility
Direct successor formation	longitudinal situated-capacity evidence	threshold and horizon legitimately specified	threshold lacks practice relevance or differential validity
Regenerative continuity	later relation, practice, and successor evidence	qualifying pathways observed across the horizon	outcome depends on unsupported exceptional labor
Barrier mechanism	temporal and process evidence with rivals	mechanism survives comparison and sensitivity checks	plausible rival explains the same pattern
Causal intervention effect	defensible identification design and uncertainty	assumptions and transport scope remain credible	positivity, measurement, interference, or attrition failure
Trajectory legitimacy	authority, participation, safeguards, dissent, revision	governing process meets declared standards	exclusion, coercion, exposure, or unresolved mandate
Framework utility	comparison with established tools	model changes a warranted decision or evidence plan	equal discrimination with lower-burden established method

16.4 Programme Evaluation Profile

This subsection proposes a compact reporting structure. Table 11 ties evaluation claims to evidence gates and failure conditions.

The final row imposes an economy principle. A model that adds terminology and data burden while leaving conclusions unchanged should be simplified or abandoned.

16.5 Future Formal Directions

This subsection identifies extensions whose value depends on empirical demand. It keeps mathematical development subordinate to conceptual and practical discrimination.

Open Problem 16.1 (Stochastic linguistic viability)**.** *Define confidence regions or robust viability kernels under transition uncertainty, rare shocks, participant turnover, and uncertain intervention uptake.*

Open Problem 16.2 (Distributed successor capacity)**.** *Represent regenerative continuity across multiplex networks of teaching, care, organization, authorization, media production, and domain maintenance.*

Open Problem 16.3 (Plural trajectory aggregation)**.** *Develop procedures for comparing several participant- and community-specific trajectory sets while preserving vetoes, restricted knowledge, individual refusal, and legitimate collective authority.*

Open Problem 16.4 (Reference-rule dynamics)**.** *Model reference standards as revisable institutions whose effects on intelligibility, learning, protection, recognition, innovation, and participation vary over time.*

Open Problem 16.5 (Documentation pathway effects)**.** *Estimate when documentary coverage, contextual richness, portability, governance, and pedagogy strengthen direct and regenerative successors through distinct causal pathways.*

These questions require interdisciplinary collaboration among community institutions, speakers and learners, linguists, educators, historians, political theorists, economists, statisticians, and technology researchers. Community authority and benefit should shape the collaboration from its design stage.

17 Conclusion

This section consolidates the paper's position, formal results, and revision conditions. It states a bounded proposal for research and governance.

The paper has treated language futures as a compound philosophical and empirical object. Documentation, present practice, relational access, successor formation, expressive creation, and trajectory agency can support one another while remaining analytically distinct. Relational, capability, epistemic, historical, and self-determination grounds can support concern for these dimensions through different premises. Within this architecture, *generative linguistic continuity* names a proposed diagnostic capability, and *linguistic becoming* names the historically situated acquisition, use, contestation, hybridization, and transformation through which future forms and relations emerge.

The literature already supplies multidimensional vitality assessment, intergenerational disruption scales, documentation standards, socialization, situated practice, contextual revitalization, reclamation, relational linguistic continuity, repertoire analysis, new-speaker research, political economy, rights, capabilities, and Indigenous governance. The proposed architecture claims a narrow role: it joins documentary profiles, opportunity ceilings, successor depth, viable trajectories, barrier interactions, and reference constraints in a form that can expose additional evidence and intervention requirements.

The exact results are limited. Separate typed coordinates establish the underdetermination of generativity by documentation inside the model. The opportunity bound yields a zero-opportunity ceiling. Coordinatewise comparison produces an incomplete partial order. Nested reference constraints yield trajectory-set inclusion and possible strict contraction. Barrier interaction, competence dynamics, thresholds, and viability require empirical specification. Normative recommendations require bridge premises concerning authority, access, refusal, mobility, privacy, restricted knowledge, intergenerational relations, and revision.

The framework remains useful when it changes a warranted conclusion or clarifies an unresolved dependency. It should merge with stronger established approaches where they already perform the same work, lose coordinates that fail validation, and yield to community-specific concepts where its vocabulary distorts the object. Its practical aspiration is concise: preservation efforts can protect linguistic resources while also widening the legitimate relations and options through which people create linguistic futures.

References

[1] Peter K. Austin. Language documentation and language revitalization. In Justyna Olko and Julia Sallabank, editors, *Revitalizing Endangered Languages: A Practical Guide*, pages 199–219. Cambridge University Press, 2021.

[2] Peter K. Austin and Julia Sallabank, editors. *The Cambridge Handbook of Endangered Languages*. Cambridge University Press, 2011.

[3] Steven Bird and Gary Simons. Seven dimensions of portability for language documentation and description. *Language*, 79(3):557–582, 2003.

[4] Ewa Czaykowska-Higgins. Research models, community engagement, and linguistic fieldwork: Reflections on working within canadian indigenous communities. *Language Documentation & Conservation*, 3(1):15–50, 2009.

[5] Nancy C. Dorian. Purism vs. compromise in language revitalization and language revival. *Language in Society*, 23(4):479–494, 1994.

[6] First Peoples' Cultural Council. Language programs. Official programme description, 2026. Accessed 2026-08-30.

[7] Joshua A. Fishman. *Reversing Language Shift: Theoretical and Empirical Foundations of Assistance to Threatened Languages*. Multilingual Matters, 1991.

[8] Global Indigenous Data Alliance. CARE principles for indigenous data governance. Institutional principles, 2019.

[9] Lenore A. Grenoble and Lindsay J. Whaley. *Saving Languages: An Introduction to Language Revitalization*. Cambridge University Press, 2006.

[10] Wayne Harbert. Endangered languages and economic development. In Peter K. Austin and Julia Sallabank, editors, *The Cambridge Handbook of Endangered Languages*, pages 403–422. Cambridge University Press, 2011.

[11] Nikolaus P. Himmelmann. Documentary and descriptive linguistics. *Linguistics*, 36(1):161–196, 1998.

[12] Leanne Hinton, Leena Huss, and Gerald Roche, editors. *The Routledge Handbook of Language Revitalization*. Routledge, 2018.

[13] Wanhong Huang. Co-experience knowledge and its continuity: Emergence, symbolization, and regeneration. Working draft, 2026.

[14] Wanhong Huang. The transmission of co-experience knowledge: Interpretive power, epistemic standing, and responsibility. Working draft, 2026.

[15] Don Kulick. *Language Shift and Cultural Reproduction: Socialization, Self, and Syncretism in a Papua New Guinean Village*. Cambridge University Press, 1992.

[16] Will Kymlicka and Alan Patten, editors. *Language Rights and Political Theory*. Oxford University Press, 2003.

[17] Jean Lave and Etienne Wenger. *Situated Learning: Legitimate Peripheral Participation*. Cambridge University Press, 1991.

[18] Wesley Y. Leonard. Producing language reclamation by decolonising 'language'. *Language Documentation and Description*, 14:15–36, 2017.

[19] M. Paul Lewis and Gary F. Simons. Assessing endangerment: Expanding fishman's GIDS. *Revue Roumaine de Linguistique*, 55(2):103–120, 2010.

[20] Friederike Lüpke. Supporting vital repertoires, not revitalizing languages. In Leanne Hinton, Leena Huss, and Gerald Roche, editors, *The Routledge Handbook of Language Revitalization*, pages 475–485. Routledge, 2018.

[21] Stephen May. *Language and Minority Rights: Ethnicity, Nationalism and the Politics of Language*. Routledge, 2 edition, 2012.

[22] Salikoko S. Mufwene. *The Ecology of Language Evolution*. Cambridge University Press, 2001.

[23] Justyna Olko and Julia Sallabank, editors. *Revitalizing Endangered Languages: A Practical Guide*. Cambridge University Press, 2021.

[24] Bernadette O'Rourke, Joan Pujolar, and Fernando Ramallo. New speakers of minority languages: The challenging opportunity. *International Journal of the Sociology of Language*, 2015(231):1–20, 2015.

[25] Bernadette O'Rourke and Fernando Ramallo. Competing ideologies of linguistic authority amongst new speakers in contemporary galicia. *Language in Society*, 42(3):287–305, 2013.

[26] Anne Pauwels. *Language Maintenance and Shift*. Cambridge University Press, 2016.

[27] Alastair Pennycook. *Language as a Local Practice*. Routledge, 2010.

[28] Ingrid Robeyns. *Wellbeing, Freedom and Social Justice: The Capability Approach Re-Examined*. Open Book Publishers, 2017.

[29] Bambi B. Schieffelin and Elinor Ochs, editors. *Language Socialization across Cultures*. Cambridge University Press, 1986.

[30] Seunghyun Song. Relational linguistic continuity. *Nations and Nationalism*, 29(1):70–84, 2023.

[31] UNESCO Ad Hoc Expert Group on Endangered Languages. Language vitality and endangerment. Technical report, UNESCO Intangible Cultural Heritage Section, 2003.

[32] United Nations General Assembly. United nations declaration on the rights of indigenous peoples. Resolution 61/295, 2007.