

# Reconceptualizing Fonts as Digital Infrastructure in Sri Lanka

**EGODAWATTAH. P**

Mooniak(PVT)Ltd.,Colombo, Sri Lanka  
pathum@mooniak.com

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**Abstract** – Despite a decade of interventions in Sri Lankan typography—including international conferences, workshops, and open-source font releases—Sinhala and Tamil scripts continue to suffer from inadequate typographic infrastructure. This paper proposes a paradigm shift: understanding fonts not as commercial products but as critical digital infrastructure and public goods. The persistent fonts problem manifests through legacy-encoding systems rendering archives machine-unreadable, systematic neglect of Tamil script in multilingual contexts, and rampant piracy undermining commercial models. Root causes include market failure due to the non-excludable and non-rivalrous nature of fonts, conceptual misunderstanding of fonts as consumer products rather than infrastructure, and institutional gaps in standards governance. Drawing on infrastructure theory (Star, 1999; Tilson et al., 2010) and public goods economics, this paper articulates how fonts perform essential functions in encoding information, enabling communication, and empowering communities. Two project frameworks—a signage typeface system for national road infrastructure and a crowdsourced font library—demonstrate different provision models for font infrastructure. By reconceptualizing fonts as shared digital infrastructure, this study provides theoretical and practical frameworks for multilingual equity in Sri Lanka and comparable contexts.

**Keywords:** Fonts as Infrastructure; Typography; Public goods, Sinhala Script; Tamil Script; Digital Infrastructure

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## I. Introduction

Why does Sri Lanka lack adequate fonts? This deceptively simple question requires moving beyond surface-level explanations—piracy, market size, or technical complexity—to examine deeper structural and conceptual failures. After a decade of practice-based research spanning font development, community building through the Akuru Collective, and establishing the Institute of Typography, measurable progress has been achieved: Google Fonts distribution, open-source releases, and international collaboration. Yet the fundamental problem persists, suggesting systemic rather than technical barriers.

The issue is not producing more fonts within existing models, but reimagining fonts as critical infrastructure (Star, 1999) requiring fundamentally different approaches to provision, governance, and sustainability. Infrastructure theory provides analytical tools for understanding why market-based font provision fails for smaller language communities. Public goods economics (Mansell & Steinmueller, 2020) explains the persistent free-rider problems and underinvestment plaguing Sri Lankan typography.

International precedents demonstrate viable alternatives. The United States Federal Highway Administration developed purpose-designed signage fonts (Clearview, FHWA Standard Alphabets) recognizing road signage as public infrastructure requiring specialized typography (Garvey et al., 2004). The Netherlands commissioned ANWB-Uu typefaces for national road signage, embedding typographic standards in infrastructure planning. Russia's PT Sans project created open-source typefaces specifically for public sector use, treating fonts as public goods. India's Centre for Development of Advanced Computing (CDAC) developed comprehensive font families for Indic scripts, demonstrating how government-led initiatives address market failures in smaller language markets.

This paper reframes typography as national digital infrastructure, merging economic theory, design policy, and linguistic justice into a unified design-research narrative. The aim is threefold: (1) to diagnose why conventional approaches fail to provide adequate typographic infrastructure for Sinhala and Tamil scripts, (2) to articulate a theoretical framework understanding fonts as infrastructure and public goods, and (3) to propose actionable provision models demonstrating alternative approaches to sustainable font development. This analysis offers both theoretical grounding and practical strategies for addressing typographic inequity in multilingual contexts with potential applicability to similar language communities globally.

## I. The Problem: Dimensions and Impacts

### A. Problem Dimensions

The fonts problem in Sri Lanka manifests across interconnected dimensions, each revealing infrastructure failures with concrete impacts on communication, education, and social equity.

The Legacy-Encoding Crisis represents perhaps the most urgent dimension. A significant portion of digital content in Sinhala and Tamil remains trapped in legacy-encoded fonts—proprietary

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systems that mapped local script characters to English keyboard positions. This data is effectively machine-unreadable. While Unicode provides international standards enabling cross-platform compatibility and machine processing, legacy font persistence means decades of government documents, archives, and educational materials cannot be properly indexed, searched, or processed. Impact: In an era of Large Language Models and AI-powered services, Sinhala and Tamil are systematically excluded from technological advancement. Government efficiency is compromised when historical records cannot be searched electronically. Educational institutions cannot digitize legacy materials for modern learning management systems.

The Infrastructure Gap manifests as critical shortage of high-quality, properly engineered fonts serving actual communication needs. Most available fonts were designed for print publishing—contexts with entirely different requirements than digital displays, mobile interfaces, or wayfinding systems. Impact: Scripts are forced into ill-fitting technological contexts, compromising readability, functionality, and user dignity. Road signage uses fonts designed for book typography, reducing legibility at speed and distance. Educational materials on tablets and phones suffer from poor rendering. Government websites fail basic accessibility standards.

The Piracy Paradox creates a vicious cycle undermining commercial provision. Even major corporations routinely use unlicensed fonts. Piracy discourages investment in type design, leading to fewer quality options, which encourages more piracy. Impact: The traditional commercial model—based on individual licenses and copyright enforcement—has demonstrably failed in the Sri Lankan context. Designers cannot sustain professional practice. Innovation stagnates. The market remains trapped in equilibrium of low quality and low investment.

Systematic Tamil Marginalization in multilingual contexts reveals how typography manifests linguistic hierarchy. Tamil text consistently appears smaller, in inferior typefaces, or as obvious afterthought in signage, packaging, and government communications. Impact: When Tamil text appears smaller or in inferior typefaces alongside Sinhala and English, it communicates social subordination. Typography becomes daily manifestation of structural inequity, undermining language policy goals and reinforcing marginalization.

Cultural Erosion threatens typographic heritage and knowledge systems. For minority communities, inadequate digital support can mean disappearance of entire writing traditions. When specific ligatures, character combinations, or diacritical marks cannot be properly encoded or rendered, knowledge systems built on these distinctions become inaccessible to future generations. Impact: Languages, words, and ideas are endangered because fonts cannot support the full range of writing systems. Historical texts cannot be properly digitized. Contemporary writing lacks expressive range available to dominant languages.

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## **B. Language Support Framework**

Gerry Leonidas (2019) proposes an eight-level framework defining degrees of support for writing systems:

- Level 0: No encoding support in digital space
- Level 1: Simple representation (ASCII-like encodings)
- Level 2: Standard encoding allowing interchange (Unicode)
- Level 3: Basic authoring support (single style)
- Level 4: Fundamental functional support for education, business, administration
- Level 5: Accessibility and new uses (optical sizes)
- Level 6: Extended functional support referencing conventions
- Level 7: Market-oriented support for products and services

Sinhala and Tamil currently operate between levels 3 and 5—basic functional support exists, but extended functionality remains underdeveloped. The gap between levels 5 and 7 is precisely where market failure is most acute for smaller language communities. Moving from level 5 to level 7 requires substantial investment in specialized typefaces, sophisticated OpenType features, and platform-specific optimization—investments that commercial markets alone cannot justify for languages with limited revenue potential.

## **C. Comparative Global Context**

Sri Lanka's situation parallels challenges faced by other language communities. The Netherlands recognized typography's role in national infrastructure, commissioning purpose-designed signage fonts ensuring legibility and national identity. Russia's PT Sans project addressed similar market failures for Cyrillic scripts through government commissioning of open-source typefaces for public sector use. India's CDAC initiative demonstrates how government-led font development can systematically address infrastructure gaps across multiple scripts (Devanagari, Tamil, Gujarati, etc.), recognizing that commercial markets underserve languages with smaller speaker populations relative to development costs (Nanavati & Purao, 2010).

These precedents demonstrate that advanced economies recognize typography as infrastructure requiring coordinated provision beyond market mechanisms. Sri Lanka's challenge is adapting these models to local context, resources, and governance structures.

## **II. Root Causes**

### **A. Market Failure and Economic Structure**

Fonts exhibit characteristics of public goods in economic theory—they are non-excludable and non-rivalrous (Mansell & Steinmueller, 2020). Once a font file exists, one person's use does not diminish another's ability to use it, and preventing unauthorized use is technically and legally difficult. This creates the "free-rider problem": individuals and organizations benefit without contributing to production.

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In Sri Lanka's relatively small market, commercial font development economics are particularly challenging. Investment required to design, engineer, and maintain professional typeface families is substantial—typically \$15,000–\$50,000 for basic families, exceeding \$100,000 for comprehensive multilingual systems. Yet the potential paying customer base is limited, and license enforcement is weak. The result is systematic underinvestment relative to actual need.

### ***B. Conceptual Misunderstanding***

More fundamentally, there is widespread failure to recognize fonts as infrastructure. Governments invest in roads, electrical grids, and telecommunications networks because these are understood as foundational systems enabling economic activity (Tilson et al., 2010). Yet digital typography—equally essential to communication, education, and commerce—is treated as a consumer product rather than public infrastructure.

This conceptual gap has profound implications. Infrastructure requires long-term investment, standardization, maintenance, and coordinated planning (Star, 1999). Without viewing fonts through this lens, development remains fragmented, duplicative, and unsustainable. The systemic barriers are not technical—they are organizational and conceptual.

### ***C. The Heartbleed Analogy***

The 2014 Heartbleed vulnerability in OpenSSL offers instructive parallel. OpenSSL is open-source software providing security for millions of websites—critical digital infrastructure used by major corporations and governments worldwide. Yet it was maintained by just a few volunteers with minimal funding. The bug, which allowed attackers to access sensitive data, went undetected for over two years because the project lacked testing resources.

Like OpenSSL, fonts are infrastructure simultaneously critical and neglected. Major corporations and government agencies depend on fonts for communication, yet assume market forces or volunteer efforts will adequately provide and maintain them. Both cases demonstrate consequences when we fail to recognize and support essential digital commons.

### ***D. Institutional and Policy Gaps***

No government agency or institution has taken responsibility for typographic standards and infrastructure. Decisions about character encoding, glyph design, and technical specifications are made ad-hoc, often by international bodies with limited local context understanding. Meanwhile, design education rarely includes rigorous type design training.

Sri Lanka's language policy mandates multilingual communication in government contexts but provides no guidance or resources for typographic implementation. The result is inconsistent, often poor-quality multilingual signage and documents that comply with the letter of law while undermining its spirit.

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### **E. Technical Complexity**

Engineering requirements for complex scripts like Sinhala and Tamil are substantial. These scripts require sophisticated rendering engines to handle contextual forms, conjunct consonants, and vowel signs that change position based on base characters. Developing fonts that work reliably across operating systems, applications, and rendering environments requires specialized expertise that is scarce.

However, technical challenges are ultimately solvable given adequate resources. The real barriers are organizational: coordinating stakeholders, establishing standards, ensuring sustainable funding, and maintaining long-term stewardship.

## **III. Methodology**

This research employs practice-based methodology (Friedman et al., 2006), positioning design practice as a form of inquiry that generates theoretical insights through iterative development, implementation, and reflection. The analysis emerges from extended engagement with Sri Lankan typography ecosystems spanning font development, community organizing, and institutional establishment.

### **A. Research Approach**

**Practice as Inquiry:** Rather than testing predetermined hypotheses, this research understands design practice itself as knowledge production. The decade-long engagement with Sinhala and Tamil typography—developing fonts, organizing the Akuru Collective, establishing the Institute of Typography, collaborating with international partners—generated empirical observations about systemic barriers that quantitative methods alone could not reveal.

**Stakeholder Engagement:** Research findings emerge from sustained dialogue with multiple stakeholder groups: type designers and design educators experiencing market failures firsthand; government officials managing signage and documentation systems; minority language communities navigating typographic marginalization; international typography organizations providing comparative perspectives; and software developers implementing font rendering systems.

**Design as Synthesis:** The two project frameworks proposed are not hypothetical but syntheses of lessons learned through practice. They represent tested models responding to observed failures in existing provision mechanisms.

### **B. Data Sources**

Analysis draws on:

- Direct experience developing commercial and open-source fonts
- Financial and usage data from font distribution (Google Fonts, independent releases)

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- Documentation from Akuru Collective events (2017-2021): conference proceedings, workshop outcomes, community feedback
- Comparative analysis of international font infrastructure projects
- Consultation with stakeholders across design, government, and technology sectors

### **C. Limitations**

This study focuses specifically on Sri Lanka and employs qualitative rather than quantitative methods. While financial data supports market failure analysis, the research does not include comprehensive economic modeling of alternative provision mechanisms. The proposed project frameworks represent informed designs requiring empirical validation through implementation. Generalizability to other contexts depends on similarity of market conditions, governance structures, and linguistic diversity.

The practice-based approach provides depth of understanding possible only through extended engagement but trades breadth for depth. Findings are most applicable to language communities facing similar combinations of market size, script complexity, and governance capacity.

## **IV. Theoretical Framework: Fonts as Infrastructure**

### **A. Defining Infrastructure**

Infrastructure refers to fundamental facilities and systems serving societies—both physical structures (roads, bridges, utilities) and essential services (education, healthcare) necessary for economic operations (Star, 1999). Infrastructure is characterized by:

- **Capital Intensity:** Requires significant upfront investment critical for supporting economic activities. Costs cannot be recovered through short-term transactions.
- **Long-Term Investment:** Involves long-term planning with benefits accruing over years or decades. Infrastructure decisions shape possibilities for generations.
- **Enabling Function:** Enables or enhances other economic activities. Infrastructure value lies not in itself but in what it makes possible (Tilson et al., 2010).
- **Network Effects:** Value increases as more people use it. Communications protocols become more valuable as more systems adopt them.
- **Externalities:** Generates significant positive externalities—benefits exceeding what can be captured through direct user fees. A well-educated population benefits society beyond individual recipients.

### **B. Fonts as Digital Infrastructure**

Digital typefaces exhibit all infrastructure characteristics:

- **Capital Intensity:** Creating professional typeface families requires substantial investment. Basic Latin alphabets require 200-300 hours of skilled design work. Complex scripts like Sinhala or Tamil require 500-1000+ hours due to character numbers, contextual forms, and technical specifications. This includes character design, spacing and kerning, OpenType

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feature programming, hinting for screen rendering, cross-platform testing, and documentation.

- **Long-Term Value:** Well-designed typefaces serve language communities for decades. Helvetica (1957) remains among the world's most-used typefaces. Times New Roman (1931) is still default in many applications. Sinhala types from the Dutch Press in Ceylon (1737) influenced typography for two centuries. This long time horizon makes fonts ill-suited to typical commercial product cycles.
- **Enabling Function:** Fonts enable virtually all textual communication in digital space—education (textbooks, materials, assessment), government (official documents, public communications, signage), commerce (contracts, invoices, advertising), media (newspapers, websites, broadcast graphics), personal communication (email, social media), and accessibility (large print, screen readers). When fonts are inadequate or missing, all these activities are compromised.
- **Network Effects:** Value of standardized, widely-available fonts increases as adoption grows. When government, education, and business use compatible font infrastructure: documents exchange reliably across organizations, training and skills become transferable, production costs decrease through standardization, innovation can build on shared foundation, and accessibility improves through consistent implementation.
- **Positive Externalities:** High-quality font infrastructure generates benefits far exceeding what individual users pay. Well-implemented signage fonts improve road safety for all users. Accessible fonts enable participation by people with visual impairments. Fonts preserving cultural and linguistic heritage maintain options and knowledge for future generations. These externalities cannot be captured through font licenses—precisely why market provision is insufficient.

### C. *Five Functions of Font Infrastructure*

Drawing on this understanding, fonts perform five essential functions as infrastructure:

Function	Description	Examples
Encode Information	Transform spoken language into visual format that can be stored, shared, and processed digitally across platforms and generations	Unicode encoding enabling cross-platform compatibility; archival preservation of historical texts; machine-readable data formats
Enable Communication	Facilitate clear and effective communication by making written text readable and understandable across languages and contexts	Educational materials; government documents; business communications; multilingual signage
Enrich Meaning	Enhance meaning through stylistic expression and emphasis beyond basic legibility	Legal documents requiring formal authority; children's books needing friendly accessibility; wedding

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Function	Description	Examples
		invitations expressing cultural tradition
Enforce Identities	Establish and reinforce identities—personal, corporate, cultural—through typographic choice	National branding on currency and documents; corporate visual identity systems; cultural expression in minority language contexts
Empower Communities	Support language and script diversity, including minority and indigenous groups, enabling digital participation	Minority script support enabling digital literacy; accessibility features for print-disabled users; preservation of linguistic diversity

This framework demonstrates that fonts are not merely aesthetic choices but functional infrastructure determining who can participate in digital society and how effectively languages can serve their communities.

**D. Infrastructure vs. Public Goods: Critical Distinctions**

While fonts share characteristics with both infrastructure and public goods, distinctions matter for understanding provision models. Many infrastructures are public goods (highways, GPS), but not all infrastructure is non-excludable or non-rivalrous (toll roads, congested networks). Some infrastructure is provided privately with usage fees.

Fonts occupy an interesting position. Digital font files are pure public goods—non-excludable and non-rivalrous. But font development and maintenance services are not. This suggests hybrid models may be most appropriate: the fonts themselves as public goods, but development and maintenance services as publicly or collectively funded infrastructure projects.

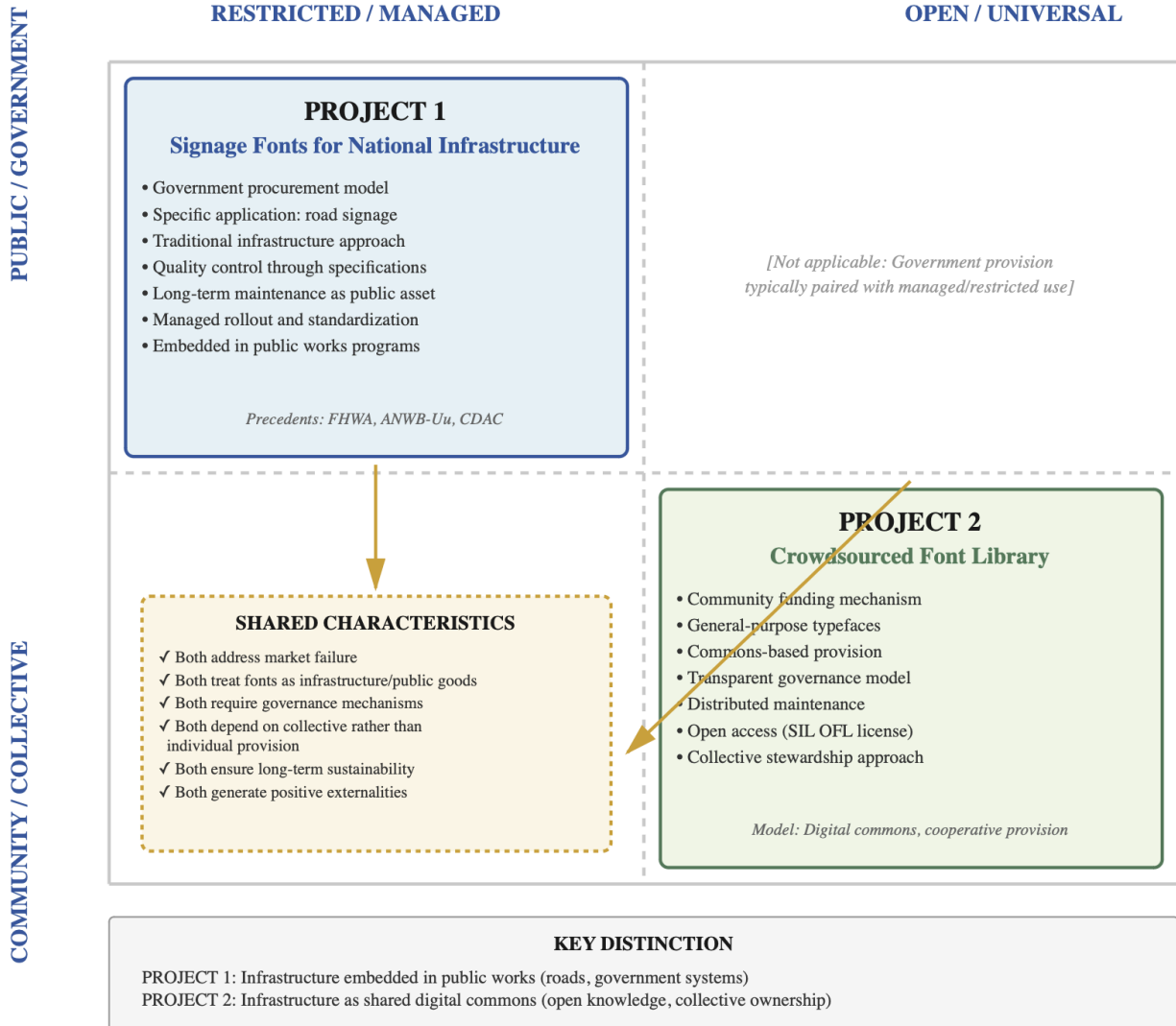
**E. Implications of Infrastructure Thinking**

Viewing fonts as infrastructure fundamentally changes questions we ask:

- Not "Can we afford this?" but "Can we afford not to have this?"
- Not "How do we prevent piracy?" but "How do we ensure sustainable provision?"
- Not "What will the market provide?" but "What does our society require?"
- Not "How do we sell fonts?" but "How do we maintain font infrastructure?"
- Not individual solutions but coordinated systems

This reframing moves fonts from consumer products to public investment, from market competition to coordinated provision, from short-term transactions to long-term stewardship.

# Font Infrastructure Provision Models: Comparative Framework



## V. Project Frameworks: Alternative Provision Models

The path toward resolution requires practical interventions testing new models. Two project frameworks embody different aspects of infrastructure provision: one demonstrating fonts as traditional infrastructure embedded in public works, the other showing fonts as public goods requiring community provision.

### A. Project 1: Signage Fonts for National Road Infrastructure

- Objective: Develop custom typeface system for Sri Lankan road signage addressing functional requirements, linguistic equity, and national identity.

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- Scope: Nine-font family across three scripts (Sinhala, Tamil, English) with three width variants each (regular, narrow, wide), plus comprehensive implementation guidelines.
- Rationale: International precedents demonstrate purpose-designed signage fonts significantly improve functionality while establishing national identity. Current Sri Lankan signage suffers from inconsistent font usage, improper Tamil text scaling, and fonts designed for print misapplied to signage contexts.
- Key Parameters:
  - Safety-focused design maximizing reading distance and recognition time at speed
  - Simultaneous three-script design ensuring visual harmony and linguistic equity
  - Width variants addressing different text string lengths across languages
  - Enhanced distinction between similar characters
  - Robust rendering in adverse conditions (rain, glare, night)
- Infrastructure Model: Public procurement as part of infrastructure development. Fonts as government assets available for all official use. Demonstrates traditional infrastructure provision model embedded in public works, similar to FHWA and ANWB-Uu precedents.
- Timeline: 18-24 months from requirements analysis to deployment specifications.
- Anticipated Challenges: Coordination across multiple government agencies (Road Development Authority, Urban Development Authority, provincial councils); establishing and enforcing standards; training fabricators and designers; managing transition from existing signage; ongoing maintenance and quality control.
- Scalability: Once developed, fonts and specifications can be applied to expanding road networks and adapted for other government signage (parks, public buildings, transit systems). Templates reduce implementation costs for subsequent projects.

## **B. Project 2: Crowdsourced Font Library**

- Objective: Establish community-funded font library providing open-access Sinhala and Tamil typefaces while developing sustainable governance model.
- Scope: Twelve new typeface releases over three years, plus infrastructure for ongoing community provision including governance mechanisms, transparent financial management, and intellectual property frameworks.
- Rationale: After demonstrating that market-based provision fails for smaller language communities, alternative models are necessary. Community provision of infrastructure—analogue to community-managed water systems or cooperative electrical systems—addresses market failure through collective action.
- Infrastructure Model: Community provision of public goods. Demonstrates alternative to market or government provision when both fail. Transparent governance addresses free-rider problem through social incentives rather than exclusion.
- Timeline: Initial 12-month pilot with 99 founding members, followed by evaluation and potential scaling.
- Anticipated Challenges: Sustaining member engagement beyond initial enthusiasm; managing governance at scale if successful; balancing open access with financial

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sustainability; ensuring technical quality standards; addressing diverse stakeholder needs within limited resources.

- Scalability: If pilot succeeds, model can expand membership, increase annual font releases, and potentially replicate for other language communities. Governance framework and financial transparency mechanisms provide a template for similar initiatives.

## **VI. Conclusion**

### **A. Synthesis of Aim and Approach**

This research set out to diagnose why conventional approaches fail to provide adequate typographic infrastructure for Sinhala and Tamil scripts, articulate a theoretical framework understanding fonts as infrastructure and public goods, and propose actionable provision models. Through practice-based methodology combining extended engagement with Sri Lankan typography ecosystems and analysis grounded in infrastructure theory, three key findings emerge:

First, the fonts problem is fundamentally systemic rather than technical. Market failure, conceptual misunderstanding, and institutional gaps create persistent underinvestment despite demonstrable need and available technical expertise.

Second, infrastructure theory and public goods economics provide powerful analytical frameworks for understanding why commercial provision fails and what alternatives might succeed. Fonts exhibit all characteristics of infrastructure—capital intensity, long-term value, enabling function, network effects, positive externalities—and should be governed accordingly.

Third, viable alternatives exist. International precedents and the two project frameworks demonstrate that public procurement, community provision, and hybrid models can successfully provide font infrastructure when properly designed and governed.

### **B. Contributions**

This research contributes theoretically by providing rigorous economic and infrastructure analysis of typography provision, filling a gap in design research that often treats fonts as purely aesthetic concerns. The five-function framework articulates fonts' role as infrastructure across encoding, communication, meaning, identity, and empowerment.

Practically, the two project frameworks offer actionable models adaptable to different contexts and resources. They demonstrate how to translate theoretical understanding into concrete interventions addressing real needs.

Methodologically, the practice-based approach demonstrates how extended engagement with design ecosystems generates insights impossible through conventional research methods, validating design as inquiry in infrastructure planning contexts.

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### **C. Global Relevance and Transferability**

While grounded in Sri Lankan context, this framework has implications for minority language communities globally facing similar challenges. The analytical tools—market failure diagnosis, infrastructure thinking, public goods economics—apply wherever commercial provision underserves linguistic diversity. The provision models—public procurement, community funding, hybrid governance—offer templates adaptable to local conditions. Comparable contexts include:

- Indigenous language communities in Canada, Australia, New Zealand requiring digital typography infrastructure for cultural preservation
- Regional language movements in India, Indonesia, Philippines developing digital literacy despite market underinvestment
- Minority scripts in Europe (Sámi, Basque, Welsh) navigating similar tensions between Unicode support and quality font availability
- Emerging digital orthographies in Africa and Southeast Asia requiring coordinated infrastructure development

The framework's transferability depends on shared characteristics: market size insufficient for commercial viability, script complexity requiring specialized expertise, multilingual contexts with hierarchical language relationships, and governance capacity for coordinated intervention. Sri Lanka's experience developing provision models under these constraints offers lessons for comparable situations globally.

### **D. Future Directions**

The infrastructure framework opens several research and practice directions:

- **Standards Development:** Establishing technical specifications, quality metrics, and governance structures for font infrastructure requires sustained institutional work. Who defines adequate support levels? How are quality standards enforced? What governance mechanisms ensure accountability?
- **Economic Modeling:** While this analysis identifies market failure, more sophisticated economic modeling could quantify underinvestment, estimate optimal provision levels, and evaluate cost-effectiveness of alternative funding mechanisms.
- **Implementation Research:** The proposed project frameworks require empirical validation. Pilot implementations would generate data on governance effectiveness, community engagement, technical challenges, and scalability.
- **Comparative Studies:** Systematic comparison of font provision models across countries and language communities would identify success factors, failure modes, and contextual dependencies, building a knowledge base for infrastructure planning.
- **Policy Development:** Translating infrastructure thinking into actual government policy requires bridging design research and public administration, developing policy frameworks that recognize typography's infrastructural role.

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## **E. Final Reflection**

After a decade of practice, I am convinced technical challenges of type design are solvable. The real barriers are conceptual and organizational. Until we recognize fonts as infrastructure—essential as roads or electricity—we will continue producing isolated interventions rather than sustainable systems. Until we develop governance models suited to fonts' nature as public goods, we will continue experiencing market failure.

The question is not whether Sri Lanka needs better fonts. The question is whether we can organize ourselves to provide and maintain the typographic infrastructure our languages and cultures require. These two project frameworks are offerings toward that goal—not final solutions but practical experiments in new models. Their success or failure will teach us how to proceed.

Solving the fonts problem requires more than producing more fonts. It requires shifting how we conceptualize, provision, and govern typographic infrastructure. This paper provides theoretical foundation and practical frameworks for that shift, grounded in practice, analyzed through infrastructure theory, and oriented toward actionable intervention. The work continues.

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