

The Lexicon of Crisis: A Psycho-Forensic Linguistic Architecture for Real-Time Suicide Risk Detection Integrating Big Data, Corpus Evidence, and Theoretical Frameworks Psycho-Forensic Linguistic Surveillance Initiative (PFLSI)

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ABSTRACT

Suicide claims over 700,000 lives annually and remains one of the most preventable yet persistent crises in global public health. The Psycho-Forensic Linguistic Surveillance Initiative (PFLSI) is a longitudinal, multi-paper research programme dedicated to constructing a culturally calibrated, big-data-enabled computational framework for the early detection of suicidal ideation through systematic lexical and discourse analysis. Series Paper 1, Ishfaq, Ahmad, and Sultan (2025), established a validated corpus of N=140 Pakistani suicide notes (1998–2023), identifying gendered thematic markers, pronoun patterns, apologetic discourse, and darkness metaphors using Sketch Engine. Series Paper 2, Ishfaq and Sultan (2026), expanded the empirical base to a 452,000-token Suicide Discourse Corpus (SDC) drawn from four heterogeneous English-language sources: crisis helpline transcripts, Reddit communities, published personal narratives, and farewell notes — and applied rigorous Keynes analysis (G^2), USAS semantic domain profiling, Mutual Information collocational analysis, and grammatical frequency analysis against a matched 449,800-token control corpus. Together, these studies produced converging, large-scale empirical evidence for a distinctive and statistically robust lexical signature of suicidal crisis: elevated pain, absolutist, death, and isolation vocabulary; depleted future-tense, positive-evaluative, and social solidarity language; and culturally specific registers of honor-shame discourse and relational guilt absent from Western corpora. The present paper, synthesizes and substantially advances these foundations along three critical axes. First, it develops a unified, seven-framework theoretical architecture, integrating Shneidman's psychache theory, Joiner's Interpersonal Theory of Suicide, Beck's cognitive model of hopelessness, O'Connor's Integrated Motivational-Volitional model, Pennebaker's Linguistic Relativity Theory, Lakoff and Johnson's Conceptual Metaphor Theory, and Menon's Narrative-Crisis Model, demonstrating how each

framework's predictions are empirically instantiated in the combined corpus evidence of Series Papers 1 and 2. Second, it presents the complete architectural specification of the Psycho-Forensic Linguistic Surveillance (PFLS) pipeline, a proposed seven-layer big-data NLP system designed to ingest heterogeneous text streams, extract theoretically grounded linguistic features, apply culturally calibrated multilingual modelling, stratify real-time risk across four tiers, and generate explainable clinician alerts with SHAP-attributed feature rationale. Third, it addresses the ethical, policy, and governance dimensions of responsible deployment, articulating an ethical minimalism framework for linguistic surveillance in suicide prevention. Together, the three papers of the PFLSI programme constitute a paradigm shift: repositioning language itself as the earliest accessible biomarker of psychological crisis, and providing the empirical, theoretical, and architectural foundations for a next-generation, population-level suicide prevention infrastructure.

Keywords— psycho-forensic linguistics; suicidal ideation; big data NLP; corpus linguistics; lexical biomarkers; suicide prevention; cultural calibration; PFLSI

1. Introduction

1.1 The Global Imperative and the Linguistic Turn in Suicide Research

Suicide remains one of humanity's most devastating and stubbornly persistent public health failures. With more than 700,000 deaths annually and an estimated twenty attempts for every completed suicide, the human cost is immeasurable, and the inadequacy of current early-detection infrastructure is a matter of urgent scientific and policy concern (WHO, 2023; Ruch et al., 2019). Standard clinical screening instruments — the Columbia Suicide Severity Rating Scale, the Beck Scale for Suicidal Ideation, the PHQ-9 — depend on the clinical encounter, and research consistently demonstrates that between 20 and 45 percent of those who die by suicide had no contact with mental health services in the year preceding their death (Luoma, Martin, & Pearson, 2002; Pirkis & Burgess, 1998). The gatekeeper of the clinical encounter is, for a substantial fraction of the most at-risk individuals, a gate that is never opened.

Language offers a qualitatively different kind of access. Human beings are compulsive communicators, continuously externalizing their inner lives through written and digital discourse in ways that are largely unguarded and unmanaged. If suicidal ideation leaves systematic and identifiable traces in natural language — and the evidence now strongly suggests that it does — then language may constitute one of the earliest, most accessible, and most continuously available signals of psychological crisis available to researchers, clinicians, and system designers alike.

This insight is the organizing conviction of the Psycho-Forensic Linguistic Surveillance Initiative (PFLSI), a planned multi-paper research programme with the ambition of constructing a scientifically rigorous, culturally calibrated, and ethically grounded computational framework for the early detection of suicidal ideation through systematic lexical and discourse analysis. The present paper is the third in this series, and its task is to synthesize, theoretically unify, and architecturally operationalize the empirical foundations established in its two predecessors.

1.2 The PFLSI Programme: Series Overview

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The PFLSI programme has to date produced two foundational empirical studies, each advancing the programmer's agenda along distinct but complementary methodological trajectories. Table 1 provides a structured overview of the three papers in the series, including the present contribution.

Table 1: Overview of the PFLSI Research Series (Papers 1–3)

Paper	Title (Abbreviated)	Journal / Venue	Core Contribution	Year
Series 1	Decoding Despair: A Multidisciplinary Psycho-Forensic Linguistic Approach to Suicide Notes	Journal of Psychology, Health and Social Challenges, Vol. 3(2), pp. 83-89	N=140 Pakistani suicide note corpus; gendered thematic taxonomy; forensic-linguistic markers	2025
Series 2	Language of Stress: A Corpus-Based Study to Detect Early Signs of Suicide Through Lexical Choice	Journal of Applied Linguistics and TESOL (JALT), Vol. 9(1), pp. 862-880	452,000-token SDC vs. MCC; keyness analysis (G^2); USAS semantic domain profiling; collocational MI	2026
Series 3 (Present)	The Lexicon of Crisis: A Psycho-Forensic Linguistic Architecture for Real-Time Suicide Risk Detection Integrating Big Data, Corpus Evidence, and Theoretical Frameworks	Current submission	Unified theoretical integration; PFLS pipeline architecture; culturally calibrated multilingual NLP roadmap	2026

Note: SDC = Suicide Discourse Corpus; MCC = Matched Control Corpus; G^2 = log-likelihood keyness statistic; MI = Mutual Information; USAS = UCREL Semantic Analysis System.

Series Paper 1, Ishfaq, Ahmad, and Sultan (2025), established the empirical foundation of the PFLSI programme by analyzing N=140 Pakistani suicide notes spanning 1998 to 2023, covering both handwritten and digital formats, through a convergent mixed-

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methods design integrating psycholinguistics, forensic linguistics, and corpus analysis using Sketch Engine. The study's key findings included: the identification of robust gendered thematic patterns (apologetic and relational-guilt discourse predominating in female notes; professional failure and existential isolation predominating in male notes); the documentation of culturally specific linguistic registers, including izzat honor-discourse absent from Western corpora; confirmation of first-person pronoun elevation, darkness metaphors, and hopelessness markers as cross-gender constants; and statistically significant chi-square differences across gender categories ($p < 0.05$). Series Paper 2, Ishfaq and Sultan (2026), substantially scaled the empirical base by constructing a purpose-built 452,000-token Suicide Discourse Corpus (SDC) from four heterogeneous sources — crisis helpline transcripts, Reddit communities (r/Suicide Watch, r/depression), published first-person narratives, and farewell notes — and subjecting it to rigorous Keynes analysis (log-likelihood G^2), USAS semantic domain profiling, Mutual Information collocational analysis, and grammatical category frequency analysis against a 449,800-token Matched Control Corpus. The study's landmark findings included: pain and suffering lemmas with the largest effect size in the study (Cohen's $d = 1.27$); death-related lemmas at $d = 1.08$; first-person singular pronoun elevation ($d = 0.74$); future-tense depletion ($d = -0.64$); and the discovery of the collocation tired of existing as a paradigm case of indirect lexical suicidal displacement — circumventing direct death-reference while encoding the desire for cessation.

Series Paper 3, the present contribution, takes as its primary mandate the theoretical unification of these empirical findings, the construction of a complete architectural specification for the PFLS pipeline, and the articulation of the ethical and governance framework required for responsible deployment. It does not introduce a new empirical corpus but instead performs the synthetic and architectural work that transforms two rich empirical datasets into the foundation of a deployable system.

1.3 Statement of the Problem

Three convergent gaps motivate the specific contribution of the present paper. First, although Series Papers 1 and 2 have established the existence and statistical robustness of suicidal lexical signatures, the theoretical integration of their findings across multiple psychological and linguistic frameworks has not yet been systematically performed. Each framework — Shneidman's psychache theory, Joiner's Interpersonal Theory of Suicide, Beck's cognitive model, O'Connor's IMV model, Pennebaker's Linguistic Relativity Theory, Lakoff and Johnson's Conceptual Metaphor Theory, and Menon's Narrative-Crisis Model — provides a partial account; the program requires a unified theoretical architecture that coordinates their explanatory contributions.

Second, the empirical corpus evidence of Series Papers 1 and 2 has not yet been operationalized into a deployable computational architecture. The PFLS pipeline envisioned by the program must be specified at a level of technical detail sufficient to guide subsequent engineering work, including its seven layers of processing, its culturally calibrated multilingual modules, its risk stratification logic, and its explainability and governance infrastructure.

Third, the ethical dimensions of a population-level linguistic surveillance system for suicide prevention have not been addressed with the depth and specificity they demand.

The present paper articulates a principled ethical framework for the PFLS pipeline's design and deployment, addressing privacy, consent, algorithmic harm, epistemic justice, and the specific legal and cultural constraints of the Pakistani socio-legal context.

1.4 Research Objectives and Questions

1. To develop a unified seven-framework theoretical architecture that systematically maps the predictions of each theoretical framework onto the corpus evidence of Series Papers 1 and 2, demonstrating the convergent explanatory power of the integrated model.
2. To present the complete architectural specification of the PFLS pipeline as a seven-layer big-data NLP system, providing sufficient technical detail to guide system development in subsequent phases of the programme.
3. To articulate a principled ethical, governance, and policy framework for the responsible deployment of language-based suicide risk detection at population scale, with particular attention to the South Asian and Pakistani socio-cultural context.

1.5 Research Questions

1. How do the seven integrated theoretical frameworks, taken together, account for the patterns of lexical signature, semantic domain distribution, collocational structure, and grammatical frequency documented in Series Papers 1 and 2?
2. What are the architectural principles, technical specifications, and cultural calibration requirements that must govern a PFLS pipeline capable of real-time, multilingual, culturally sensitive suicide risk stratification?
3. What ethical, governance, and policy principles must be embedded in the PFLS system's design and deployment to ensure proportionality, epistemic justice, algorithmic accountability, and cultural sensitivity?

2. The Cumulative Empirical Evidence Base: Synthesising Series Papers 1 and 2

2.1 Series Paper 1: Psycho-Forensic Linguistic Markers in Pakistani Suicide Notes

Ishfaq, Ahmad, and Sultan (2025) established the empirical cornerstone of the PFLSI programme through analysis of a uniquely valuable dataset: N=140 Pakistani suicide notes collected between 1998 and 2023, balanced across gender (70 female, 70 male) and format (handwritten and digital), and analysed using Sketch Engine corpus tools within a mixed-methods design integrating qualitative thematic coding and quantitative frequency and collocational analysis.

The study's gendered findings are the programme's most culturally distinctive contribution. Female-authored notes were characterised by an apologetic-relational discourse cluster centred on apologetic language (74%), negative self-descriptors encoding worthlessness and shame (63%), family obligation framing organised around the Pakistani concept of *izzat* (56%), and coercion or forced-circumstances lexis (41%) — a pattern reflecting the psychological pressures imposed by patriarchal gender norms, forced sexual relationships, and honour-linked identity threat in Pakistani women's lives. Male-authored notes were characterised by a provider-failure cluster centred on professional and financial failure vocabulary (67%), social isolation and

loneliness (59%), and existential hopelessness (71%) — a pattern reflecting the psychosocial pressure of masculine provider identity and social disconnection.

Critically, Ishfaq et al. (2025) demonstrated format-invariance: digital and handwritten notes showed no statistically significant differences in hopelessness marker frequency, negative self-descriptor density, or emotional intensity, despite structural and stylistic differences. This finding has major implications for the PFLS pipeline, establishing that both formats can be analysed within the same feature-extraction framework without systematic performance degradation. The study also documented culturally specific markers — particularly izzat honour-shame discourse and domestic entrapment metaphors — that are entirely absent from Western English-language corpora and that must be accommodated by culturally specific lexical modules in any deployment-ready system.

2.2 Series Paper 2: Large-Scale Corpus Evidence for the Lexical Signature of Suicidal Discourse

Ishfaq and Sultan (2026) dramatically expanded the empirical scale of the programme, applying rigorous corpus-linguistic methods to a 452,000-token Suicide Discourse Corpus (SDC) drawn from four heterogeneous sources. The multi-source design was specifically intended to test whether the linguistic signature of suicidal ideation is consistent across registers, contexts, and populations — or whether it is an artefact of any single genre or platform. The answer is unambiguous: the signature is consistent, statistically robust, and theoretically interpretable across all four sources.

The keyness analysis (log-likelihood G^2) produced 1,847 significant positive keywords and 1,213 significant negative keywords. The top positive keywords form a theoretically coherent cluster: pain ($G^2=1,654$), nothing ($G^2=1,489$), never ($G^2=1,301$), alone ($G^2=1,288$), burden ($G^2=998$), worthless ($G^2=986$), hopeless ($G^2=898$), and escape ($G^2=789$) map directly onto the constructs of Shneidman's psychache theory, Joiner's IPTS, Beck's cognitive model, and O'Connor's IMV model. The top negative keywords — laugh, funny, weekend, plan, future, tomorrow, friend — paint the complementary portrait of suicidal discourse as a linguistic world from which humour, anticipation, social pleasure, and temporal openness have systematically withdrawn.

The USAS semantic domain analysis revealed that the domain of future temporal reference (T1.3) was depleted from 4.47% in the MCC to 1.89% in the SDC — a more than halving of future-orientation that directly instantiates Beck's hopelessness construct at corpus scale. Social exclusion (S1.2) was elevated while friendship and solidarity (S1.1) was depleted. These domain-level patterns confirm that the lexical signature operates not at the level of individual word choices alone but at the level of systematic semantic field organisation — with whole domains of meaning expanding while others contract.

The collocational analysis of Ishfaq and Sultan (2026) produced the programme's perhaps most practically significant single finding: the collocation tired of existing (Mutual Information = 7.2). This construction encodes the desire to cease to be without using the words death, suicide, kill, or die, circumventing direct reference through semantic displacement. Its systematic frequency in the SDC demonstrates that suicidal discourse is characterised by productive indirect expressional strategies that simple keyword detection systems will systematically miss — a finding with direct

implications for the feature engineering priorities of the PFLS pipeline.

2.3 Convergence and Complementarity: What the Two Studies Establish Together

Read together, Series Papers 1 and 2 establish three properties of suicidal lexical signatures that are critical for the programme's computational agenda. First, cross-scale consistency: the markers identified in the 140-note Pakistani corpus of Series Paper 1 — pain vocabulary, pronoun elevation, hopelessness markers, social isolation language, darkness metaphors — are confirmed and dramatically amplified at the 452,000-token scale of Series Paper 2. This cross-scale replication substantially increases confidence in the robustness of the identified patterns.

Second, cross-cultural specificity: Series Paper 1 identifies culturally specific features — izzat discourse, domestic entrapment metaphors, relational guilt — that are absent from the Western English-language SDC of Series Paper 2. This divergence is not a weakness of the programme but one of its most important findings: it demonstrates that universal core features of suicidal discourse (pain, isolation, hopelessness, absolutism) co-exist with culturally specific registers, and that any deployment-ready system must incorporate both.

Third, indirect expressional routes: both studies document linguistic strategies that encode suicidal ideation without naming it. Series Paper 1 documents izzat-register shame-escape framing; Series Paper 2 documents tired of existing and the end it collocational clusters. These indirect routes define the frontier problem for computational detection: the system must be capable of recognising suicidal meaning not only when it is explicitly stated but when it is embedded in circumlocutions, metaphors, and semantically displaced formulations.

3. Integrated Theoretical Architecture: Seven Frameworks in Convergence

The present paper proposes that the full explanatory power of the PFLSI programme's findings is accessible only through the integrated application of seven complementary theoretical frameworks, each illuminating a distinct dimension of suicidal discourse and generating specific, testable predictions that the corpus evidence of Series Papers 1 and 2 confirms. Table 4, presented in Chapter 5, provides a systematic mapping of each framework's core constructs, lexical predictions, and corpus confirmation. Here, the frameworks are presented as an integrated architecture whose convergence is the programme's central theoretical contribution.

3.1 Shneidman's Psychache Theory (1993, 1996): The Organisational Role of Pain

Edwin Shneidman's psychache theory positions unbearable psychological pain — the excruciating sense that one's most fundamental psychological needs cannot be met — as the necessary and sufficient cause of suicide. The theory's most powerful linguistic implication is that suicidal discourse should be organised around the experience and communication of this pain, manifesting in elevated pain vocabulary, pain-related collocational frames, and cognitive constriction — the tunnel-like narrowing of perceived options that produces absolutist language. Series Paper 2's finding that pain/suffering lemmas show the largest effect size in the entire study ($d = 1.27$) and that pain collocates strongly with unbearable ($MI = 9.4$), constant ($MI = 8.2$), and stop ($MI = 7.9$) constitutes corpus-level validation of psychache theory at a scale no previous study has achieved.

3.2 Joiner's Interpersonal Theory of Suicide (2005): The Relational Architecture

of Crisis

Joiner's Interpersonal Theory of Suicide proposes that suicidal desire requires the co-occurrence of thwarted belongingness and perceived burdensomeness, with acquired capability as the additional condition for lethal intent. Each construct generates a specific lexical profile. Thwarted belongingness manifests in social isolation vocabulary — alone, no one, invisible, abandoned — and in the reduction of social solidarity language (we, us, together, belong). Perceived burdensomeness manifests in burden discourse framed in relational terms — I am a burden, my existence is a problem, better without me. Series Paper 1's documentation of burden language in 63% of female and 55% of male notes, and Series Paper 2's elevation of burden to rank 12 in keyness ($G^2=998$) and alone to rank 6 ($G^2=1,288$), provide converging empirical support. The culturally specific manifestation of burdensomeness in Pakistani female notes — framed through izzat and family obligation — extends the IPTS to a culturally inflected register entirely absent from Joiner's original Western formulation.

3.3 Beck's Cognitive Model of Hopelessness (1963; 1974): Temporal Collapse as Linguistic Signal

Beck's negative cognitive triad and his specific theory of hopelessness as a proximal predictor of suicidal behaviour generate the programme's most computationally tractable set of lexical predictions. The collapse of future-oriented language — the statistical disappearance of will, plan, hope, tomorrow, future — is among the most distinctive and reliable discriminators of suicidal discourse. Series Paper 2's demonstration that the T1.3 future temporal reference domain drops from 4.47% in the MCC to 1.89% in the SDC (a 58% reduction) and that future tense forms show a large effect size ($d = -0.64$) instantiates Beck's hopelessness construct with unprecedented corpus-linguistic precision. The insight that automated temporal deixis analysis may serve as a continuous proxy measure for hopelessness — without requiring clinical self-report — is among the most clinically actionable contributions of the PFLSI programme.

3.4 O'Connor's Integrated Motivational-Volitional Model (2011): Process Stages and Phase-Specific Markers

O'Connor's IMV model provides the programme's most developmentally nuanced theoretical framework, distinguishing the pre-motivational, motivational, and volitional phases of suicidal crisis and generating phase-specific lexical predictions. The motivational phase — characterised by defeat and entrapment — should manifest in defeat vocabulary (failed, loser, beaten) and entrapment vocabulary (trapped, stuck, no way out). The volitional phase — the conversion of suicidal desire into action — should manifest in more declarative, decided, forward-resolute language. Series Paper 2's documentation of escape at rank 20 in keyness ($G^2=789$) and Series Paper 1's qualitative observation of a shift from explanatory to declarative discourse in notes approaching closure provide empirical support for both phases. The phase-specific nature of IMV predictions suggests that sequential computational models capable of detecting within-text trajectory shifts will be more powerful than aggregate text-level feature extraction.

3.5 Pennebaker's Linguistic Relativity Theory (2011): Function Words as Psychological Signals

Pennebaker's three decades of LIWC-based research established that function words — particularly pronouns — carry systematic psychological information that is largely inaccessible to conscious strategic management. First-person singular pronoun elevation reflects ruminative self-focus; past-tense dominance reflects depressive temporal orientation; reduced positive affect vocabulary reflects clinical distress. Series Paper 1's documentation of first-person pronoun patterns in both male (69%) and female (78%) notes, and Series Paper 2's large-corpus confirmation of first-person singular elevation ($d = 0.74$) and past-tense dominance ($d = 0.48$), provide converging validation. This framework provides the psycholinguistic rationale for the PFLS pipeline's L2 feature extraction layer, justifying the inclusion of LIWC-category analysis alongside keyness and collocational methods.

3.6 Lakoff and Johnson's Conceptual Metaphor Theory (1980) / Kovecses (2015): Mapping the Language of Darkness

Conceptual Metaphor Theory proposes that abstract experience is structured through concrete source domains, and that the metaphors people use are not rhetorical ornaments but primary cognitive structures. In suicidal discourse, the dominant metaphorical systems — DESPAIR IS DARKNESS, SUFFERING IS ENTRAPMENT, EXISTENCE IS BURDEN — are documented in both series papers. Series Paper 1 records darkness and entrapment metaphors in 58-61% of notes; Series Paper 2 documents pain's collocational frame of permanence, internality, and inescapability (unbearable, constant, numb). Kovecses' (2015) insight that metaphorical source domains are culturally variable is particularly important for the programme: the *izzat*-register metaphors of dishonour as stain, the home as prison, and God's judgment as inescapable condemnation documented in Series Paper 1 are culturally embedded constructions invisible to NLP models trained on Western data, and their computational detection requires culturally specific metaphor lexicons as a research priority for subsequent papers.

3.7 Menon's Narrative-Crisis Model (2024): The Architecture of Self-Dissolution

Menon's Narrative-Crisis Model provides the programme's most discourse-level theoretical framework, proposing that suicide emerges from catastrophic disruption of the self-narrative — the ongoing autobiographical story through which identity, meaning, and temporal continuity are organised. Narrative collapse manifests linguistically in fragmented syntax, temporal foreshortening, progressive self-negation, and the emergence of closure discourse. Series Paper 1 documented these patterns qualitatively across both male and female notes; the shift from structured explanatory prose at the beginning of notes to fragmented declarative utterances at their conclusion is observable across the corpus. This framework motivates the inclusion of sequential modelling architectures (LSTM, transformer-based models capable of detecting within-text trajectory) in the PFLS pipeline's risk stratification layer, on the hypothesis that narrative collapse trajectory is more powerful a predictor than aggregate text-level features alone.

4. Methodology: Synthetic Integration and Framework Development

4.1 Nature of the Present Study

Series Paper 3 is a synthetic and architectural paper. Its methodology is that of systematic theoretical integration, evidence synthesis, and computational system design, rather than primary empirical data collection and analysis. This approach is appropriate at this stage of the programme: Series Papers 1 and 2 have established the empirical foundation; the present paper's task is to transform that foundation into unified theory and deployable architecture.

The theoretical integration methodology follows the principles of systematic interdisciplinary synthesis articulated by Creswell (2013) and Denzin and Lincoln (2018), examining each theoretical framework in terms of its core constructs, empirical predictions, and correspondence to the combined corpus evidence. Where frameworks converge on the same lexical or discourse feature, convergence is taken as evidence for the robustness of that feature's predictive significance. Where frameworks diverge or address distinct dimensions of the phenomenon, the divergence is mapped as complementarity rather than contradiction.

The pipeline architecture design follows established principles of NLP system architecture (Jurafsky & Martin, 2023) and clinical informatics (Gkotsis et al., 2017), adapted to the specific requirements of a multilingual, culturally calibrated, and clinically actionable suicide risk detection system. Ethical framework development draws on established principles of research ethics (Resnik, 2020) and on the specific ethical analysis of language-based suicide surveillance articulated by Ishfaq and Sultan (2026).

4.2 Corpus Evidence Base

The primary corpus evidence synthesised in the present paper comprises the combined datasets of Series Papers 1 and 2. Series Paper 1 (Ishfaq et al., 2025) contributes a N=140 Pakistani suicide note corpus, balanced by gender and format, analysed through Sketch Engine with a ± 5 collocation window, Log Dice association measure, USAS-adapted sentiment module, and Cohen's Kappa inter-rater reliability ($k=0.81$). Series Paper 2 (Ishfaq & Sultan, 2026) contributes a 452,000-token SDC and 449,800-token MCC, processed through spaCy v3.5 with USAS semantic tagging, and analysed through log-likelihood G^2 keyness, USAS domain comparison (chi-square with Bonferroni correction), Mutual Information collocational analysis (± 4 window, $MI > 3.0$ threshold), and t-tests with Welch correction and Cohen's d effect sizes.

Together, these datasets span multiple registers (formal handwritten documents, informal digital social media posts, crisis helpline transcripts, published personal narratives), two cultural-linguistic contexts (South Asian Pakistani and Western English), two genders, and a 25-year temporal range (1998–2026). Their combination constitutes the most methodologically and culturally diverse corpus base yet assembled for psycho-forensic linguistic analysis of suicidal discourse in this programme tradition.

4.3 Ethical Governance

All primary data in Series Papers 1 and 2 were collected under institutional ethics approval (UMT Institutional Review Board; Series Paper 2 IRB Protocol) and fully anonymised prior to analysis. No new primary data are collected in the present paper. The ethical framework articulated in Section 6 of this paper draws on established principles and extends them specifically to the deployment context of the PFLS

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pipeline. Safe messaging guidelines (Niederkrotenthaler et al., 2020) are observed throughout the present paper, and all illustrative references to linguistic content of individual notes are presented in paraphrased or heavily anonymised form.

5. Results: Integrated Evidence, Taxonomy, and Pipeline Architecture

5.1 The Integrated Psycho-Forensic Linguistic Taxonomy

Table 2 presents the integrated psycho-forensic linguistic taxonomy produced by the synthetic analysis of Series Papers 1 and 2, mapping linguistic markers and features to gender distributions (from Series Paper 1), corpus effect sizes (from Series Paper 2), and theoretical anchors (from the seven integrated frameworks). This taxonomy constitutes the PFLSI programme's primary empirical contribution: a theoretically grounded, empirically validated, multi-scale taxonomy of the lexical signature of suicidal crisis.

Table 2: Integrated Psycho-Forensic Linguistic Taxonomy of Suicidal Crisis Markers (Combined S1 + S2 Evidence)

Linguistic Marker / Feature	Female Notes % (S1)	Male Notes % (S1)	SDC Effect Size d (S2)	Theoretical Anchor
First-person singular pronouns (I, me, my)	78%	69%	$d = 0.74^{***}$	Pennebaker (2011); Chung & Pennebaker (2007)
Apologetic language (sorry, forgive, I failed)	74%	38%	—	Speech Act Theory (Austin, 1962; Searle, 1969)
Negative self-descriptors (worthless, burden, disgraced)	63%	55%	$d = 0.98^{***}$ (SDC burden/worthless cluster)	Joiner (2005) IPTS; Narrative-Crisis Model (Menon, 2024)
Hopelessness / futility markers (nothing, never, no future)	65%	71%	$d = 0.83^{***}$ (negation); $d = -0.64^{***}$ (future depletion)	Beck (1963, 1974); Shneidman (1993)
Social isolation / thwarted belongingness (alone, no one, invisible)	44%	59%	$d = 0.74^{***}$ (alone, no one cluster)	Joiner (2005) IPTS; Van Orden et al. (2010)
Pain / suffering	58%	63%	$d = 1.27^{***}$	Shneidman

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vocabulary (pain, hurt, anguish)			(largest effect in S2)	(1993) psychache; Tay (2012)
Death / finality terms (die, end, kill)	52%	67%	$d = 1.08^{***}$	Narrative-Crisis Model; IMV Model (O'Connor, 2011)
Absolutist / negation language (nothing, always, never, completely)	60%	68%	$d = 0.83^{***}$ (negation); $d = 0.58^{***}$ (absolutist)	Al-Mosaiwi & Johnstone (2018); Shneidman (1993)
Darkness / entrapment metaphors (trapped, buried, no way out)	58%	61%	escape: rank 20 in keyness (SDC)	Lakoff & Johnson (1980); Kovecses (2015); Tay (2012)
Future-tense depletion (reduced will, plan, hope, tomorrow)	—	—	$d = -0.64^{***}$; T1.3 domain: 1.89% vs 4.47%	Beck hopelessness construct; Boroditsky (2011)
Relational guilt / izzat honour lexis (honour, shame, izzat, family, duty)	56%	24%	Culturally specific; absent from English SDC	Gee (2014); Vijayakumar (2015); Hussain et al. (2022)

*Note: S1 = Ishfaq, Ahmad & Sultan (2025); S2 = Ishfaq & Sultan (2026). % figures from S1 are proportions of notes containing at least one instance within gender category (n=70 per category). Effect sizes (d) from S2 refer to SDC vs MCC comparisons (N=452,000 vs 449,800 tokens). *** $p < 0.001$. — = not directly measured at that scale.*

5.2 The PFLS Pipeline: Complete Architectural Specification

Table 3 presents the complete seven-layer architectural specification of the Psycho-Forensic Linguistic Surveillance (PFLS) pipeline. The pipeline is designed to transform raw heterogeneous text — from digital social media to digitised handwritten documents — into clinically actionable, explainable, and ethically governed suicide risk stratification outputs. Each layer corresponds to a distinct processing stage, with theoretically grounded feature selection ensuring that the system's outputs are

interpretable in terms of established psychological constructs rather than opaque statistical associations.

Table 3: PFLS Pipeline Architecture — Seven-Layer Big Data NLP Framework

Layer	Stage	Input / Data Streams	NLP / ML Techniques	Output Signal
L1	Multi-Source Ingestion	Social media (Reddit, Twitter/X, Facebook); crisis helpline transcripts; clinical notes; digitised suicide notes (S1 corpus); longitudinal forum data	Tokenisation (spaCy v3.5+); sentence segmentation; POS tagging; NER; Urdu/Punjabi transliteration module	Raw token corpus (multilingual)
L2	Linguistic Feature Extraction	Token corpus from L1	Keyness analysis (G^2 , Log Dice); USAS semantic domain profiling; LIWC pronoun/affect categories; collocational MI ($\pm 4-5$ window); absolutist word list	Feature vectors: pronoun ratios, affect scores, absolutism index, domain proportions
L3	Cultural Calibration Layer	Feature vectors + culturally specific lexica (izzat, tanha, zindagi; honour/shame domains)	Urdu/Punjabi sub-model (XLM-RoBERTa fine-tuned); metaphor detection module; code-switching normaliser	Culturally enriched feature set
L4	Sentiment and Affect Modelling	Enriched feature set from L3	Transformer-based polarity detection; psychache pain-index scoring (Shneidman construct operationalisation); temporal depletion index (future/past ratio)	Affect score, polarity, pain index, temporal collapse index

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L5	Risk Stratification	All feature vectors (L2–L4) + demographic metadata	Ensemble classifiers: BERT fine-tuned on SDC + S1 corpus; LSTM (sequential narrative collapse detection); Random Forest (feature importance); Gradient Boosting	Risk tier: Low / Moderate / High / Critical + confidence interval
L6	Explainability and Audit	Risk tier + underlying feature weights	SHAP (SHapley Additive exPlanations); LIME for local interpretability; linguistic feature attribution report	Clinician-readable alert with feature rationale
L7	Alert, Referral and Governance	Risk tier + explainability report + ethical flags	Rule-based escalation engine; human-in-the-loop override; audit log; GDPR / PDPA compliance module	Clinician alert; digital referral; regulatory audit record

Note: PFLS = Psycho-Forensic Linguistic Surveillance. USAS = UCREL Semantic Analysis System. LIWC = Linguistic Inquiry and Word Count. SHAP = SHapley Additive exPlanations. LIME = Local Interpretable Model-Agnostic Explanations. GDPR = General Data Protection Regulation. PDPA = Personal Data Protection Act (Pakistan).

5.3 Theoretical Convergence Mapping

Table 4 presents the systematic convergence mapping of the seven integrated theoretical frameworks, demonstrating how each framework's core constructs and lexical predictions are confirmed by the combined corpus evidence of Series Papers 1 and 2.

Table 4: Convergence of Seven Theoretical Frameworks with Combined Corpus Evidence (S1 + S2)

Psychological Theory	Core Construct	Lexical Prediction	Corpus Confirmation (S1/S2)
Shneidman (1993) — Psychache Theory	Unbearable psychological pain as necessary and sufficient cause of	Elevated pain, anguish, suffering, torment; cognitive constriction;	S2: pain $d=1.27$; hurt $d\approx 1.1$; absolutist words $d=0.58$; nothing/never ranked 4–5 in keyness

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	suicide	absolutism	
Joiner (2005) — IPTS	Thwarted belongingness + perceived burdensomeness + acquired capability	alone, no one, burden, worthless; reduced we/us/together	S1: burden 63% female / 55% male; S2: burden rank 12 ($G^2=998.4$); alone rank 6; social solidarity depleted
Beck (1963; 1974) — Cognitive Model / Hopelessness	Negative cognitive triad; hopelessness as proximal predictor	worthless, useless, failure; future-tense depletion; hopeless	S2: future tense $d=-0.64$; T1.3 domain 1.89% vs 4.47%; hopeless rank 16 ($G^2=898.6$)
O'Connor (2011) — IMV Model	Defeat, entrapment → suicidal motivation; volitional phase → planning	trapped, stuck, no way out, escape; phase-shift from modal to declarative	S2: escape rank 20 ($G^2=789.3$); tired of existing ($MI=7.2$); shift to declarative noted in S1 male notes
Pennebaker (2011) — Linguistic Relativity	Function words encode psychological state; I-usage reflects self-focus	Elevated I/me/my; past-tense dominance; reduced positive affect words	S1: 78% female / 69% male first-person notes; S2: $d=0.74$ (1st-person singular); past ratio $d=0.48$
Lakoff & Johnson (1980) / Kovecses (2015) — CMT	Conceptual metaphors structure abstract suffering via concrete source domains	Darkness, entrapment, drowning, burial metaphors; pain = unbearable weight	S1: darkness metaphors 58–61%; S2: PAIN collocates unbearable ($MI=9.4$), constant ($MI=8.2$), stop ($MI=7.9$)
Menon (2024) — Narrative-Crisis Model	Suicidal crisis = catastrophic collapse of self-narrative coherence	Fragmented syntax; future-tense disappearance; progressive self-negation; closure discourse	S1: narrative fragmentation documented qualitatively in both genders; closure acts (forgive me, take care of...) at high frequency

Note: S1 = Ishfaq et al. (2025); S2 = Ishfaq & Sultan (2026). MI = Mutual Information score (collocational analysis). G^2 = log-likelihood keyness statistic. d = Cohen's d effect size.

5.4 Cumulative Statistical Evidence: Cross-Study Summary

Table 5 presents the cumulative statistical evidence from both series papers in a unified summary, enabling cross-study comparison and providing the comprehensive empirical

basis for the pipeline's feature weighting decisions.

Table 5: Cumulative Statistical Evidence Across PFLSI Series Papers 1 and 2

Variable / Comparison	Statistic	Value	p	Source and Interpretation
Self-worth expressions: gender difference (S1)	$\chi^2(1)$	5.86	0.016*	Ishfaq et al. (2025): higher in female notes; Cramer's V = medium effect
Professional failure: gender difference (S1)	$\chi^2(1)$	7.14	0.008**	Ishfaq et al. (2025): higher in male notes; consistent with IPTS burdensomeness construct
Apologetic language: gender difference (S1)	$\chi^2(1)$	18.43	<0.001***	Ishfaq et al. (2025): strongly higher in female notes; linked to izzat and relational guilt
Pain / suffering lemmas: SDC vs MCC (S2)	t-test	d = 1.27	<0.001***	Ishfaq & Sultan (2026): largest effect in study; confirms psychache theory at corpus scale
Death-related lemmas: SDC vs MCC (S2)	t-test	d = 1.08	<0.001***	Ishfaq & Sultan (2026): large effect; aligns with Narrative-Crisis Model closure discourse
First-person singular pronouns: SDC vs MCC (S2)	t-test	d = 0.74	<0.001***	Ishfaq & Sultan (2026): confirms Pennebaker (2011) self-focus hypothesis at large-corpus scale
Future-tense depletion: SDC vs MCC (S2)	t-test	d = -0.64	<0.001***	Ishfaq & Sultan (2026): temporal collapse confirms Beck hopelessness construct; T1.3 domain 1.89% vs 4.47%
Absolutist words: SDC vs MCC (S2)	t-test	d = 0.58	<0.001***	Ishfaq & Sultan (2026): confirms Al-Mosaiwi & Johnstone (2018); cognitive constriction as lexical signal
Hopelessness (format: digital vs. handwritten,	$\chi^2(1)$	1.02	0.312 ns	Ishfaq et al. (2025): no significant format

S1)				difference; emotional intensity format-invariant
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* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$; ns = not significant. S1 = Ishfaq et al. (2025); S2 = Ishfaq & Sultan (2026). Effect sizes: Cramer's V for chi-square; Cohen's d for t-tests.

6. Discussion

6.1 Theoretical Unification: Toward a Psycho-Forensic Linguistic Model of Suicidal Crisis

The convergence mapping in Table 4 demonstrates that the seven integrated frameworks are not merely parallel accounts of the same phenomenon but genuinely complementary analytical lenses that together provide explanatory coverage unavailable to any single framework in isolation. Shneidman's psychache theory accounts for the pain organisation of suicidal discourse; Joiner's IPTS accounts for the relational structure of burdensomeness and belonging; Beck's cognitive model accounts for temporal collapse; O'Connor's IMV model provides a developmental-phase account of lexical trajectory; Pennebaker's framework provides the computational operationalisation of psychological state through function-word analysis; Conceptual Metaphor Theory accounts for the systematic metaphorical encoding of abstract suffering; and the Narrative-Crisis Model accounts for the discourse-level self-dissolution trajectory.

The most theoretically productive convergence is between Joiner's IPTS and the culturally specific findings of Series Paper 1. The universal constructs of thwarted belongingness and perceived burdensomeness manifest, in the Pakistani context, through culturally inflected registers that extend the theory's explanatory reach to South Asian Muslim societies: burdensomeness appears not only as economic inadequacy (male notes) but as sexual and reproductive inadequacy, dishonour, and threat to family izzat (female notes); thwarted belongingness appears not only as social isolation but as the specific experience of communal rejection structured by honour-bound social norms. This culturally specific extension of the IPTS is the programme's most important theoretical contribution to the broader suicide research literature.

6.2 The Tired of Existing Problem: Indirect Lexical Routes as the Frontier Challenge

The most practically consequential finding of Series Paper 2 — the collocation tired of existing as paradigm case of indirect suicidal displacement — defines what this paper terms the tired of existing problem: the class of indirect, semantically displaced lexical expressions of suicidal intent that circumvent direct death-reference while encoding the desire for cessation. This problem is the central challenge for computational detection systems, and its solution requires moving beyond keyword-matching to contextual and collocational feature extraction.

The PFLS pipeline addresses the tired of existing problem at multiple levels. Layer L2's Mutual Information collocational analysis, applying the methodology of Series Paper 2, is specifically designed to detect the semantic prosodies and associative meaning frames that characterise indirect expressions. Layer L3's metaphor detection module, targeting DESPAIR IS DARKNESS and EXISTENCE IS BURDEN conceptual

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metaphors, extends the detection scope to figurative indirect routes. Layer L5's transformer-based sequential models, sensitive to within-text trajectory and contextual meaning rather than aggregate feature counts, should capture the contextual markers that distinguish suicidal deployment of common words (alone, tired, end) from non-suicidal uses — the single-word disambiguation problem that Series Paper 2's contrasting collocational profiles of SDC and MCC precisely document.

6.3 Cultural Calibration: The Izzat Problem and the Limits of Western NLP

Series Paper 1's documentation of the izzat honour-shame register as a culturally specific marker of suicidal crisis in Pakistani women's notes establishes what this paper terms the izzat problem: the existence of culturally embedded lexical and semantic registers that encode suicidal crisis in ways that are invisible to NLP systems trained exclusively on Western English-language corpora. The izzat problem is not merely a performance limitation of existing systems but an epistemic injustice: it means that the populations most likely to deploy culturally specific crisis registers are precisely the populations for whom existing detection systems provide the least protection.

The PFLS pipeline's Layer L3 Cultural Calibration module is specifically designed to address the izzat problem. Its Urdu/Punjabi sub-model, fine-tuned on XLM-RoBERTa and incorporating culturally specific lexical resources developed from the Series Paper 1 corpus, aims to detect izzat-register expressions across both Urdu-language and Urdu-English code-switched text. The code-switching normaliser addresses the common Pakistani digital communication pattern of mixing Urdu vocabulary in Roman script with English, a register that standard English NLP pipelines systematically misprocess.

6.4 The Paradigm Shift: Language as Biomarker of Crisis

The cumulative contribution of the PFLSI programme across its three papers constitutes a paradigm shift in suicide prevention research and practice of the kind identified in Series Paper 2's concluding observation: 'Language is not merely a symptom of psychological distress — it is the medium through which distress is constituted, communicated, and, potentially, heard' (Ishfaq & Sultan, 2026, p. 877). This reframing has three dimensions.

Epistemologically, it repositions language from a secondary symptom of psychological states, accessible only through clinical mediation, to a primary evidence stream: one that is produced continuously, spontaneously, and largely without the gatekeeping effects of help-seeking behaviour. The 20-45% of those who die by suicide without prior mental health contact (Luoma et al., 2002) are not, for the most part, silent: they are communicating in digital spaces, in personal writing, and through the indirect registers of crisis discourse documented by the PFLSI programme. The question is whether those communications can be heard.

Methodologically, it integrates the interpretive depth of humanistic linguistics — the ability to understand what cultural honour-codes, metaphorical entrapment constructions, and narrative self-dissolution trajectories mean in the lives of the individuals who produce them — with the computational scale of machine learning, enabling the analysis of text at population-level without sacrificing the cultural and theoretical grounding that gives linguistic analysis its clinical validity.

Practically, it creates the possibility of a proactive, population-level early-warning infrastructure that could detect suicidal crisis before it reaches the clinical encounter —

not to replace clinical judgment but to extend the reach of preventive intervention to the substantial fraction of at-risk individuals who would never voluntarily present to a clinician.

7. Ethical and Governance Framework

7.1 The Core Ethical Tension

The deployment of a population-level linguistic surveillance system for suicide prevention generates an irreducible ethical tension between the public health imperative of preventing premature death and the civil liberties imperative of protecting the privacy and autonomy of individuals in their communicative lives. This tension cannot be dissolved by definitional fiat or technical design choice alone; it must be acknowledged, articulated, and managed through a principled governance framework that is embedded in the system's design from the outset rather than retrofitted after deployment.

7.2 The Ethical Minimalism Principle

Following Ishfaq and Sultan (2026), the present paper adopts an ethical minimalism principle as the primary governance criterion for the PFLS pipeline: no more data should be collected, retained, processed, or acted upon than is strictly necessary to achieve the protective purpose of the system. This principle has four operational implications. First, data minimisation: the pipeline should not retain raw text beyond the processing necessary for feature extraction, and extracted features should be stored only for the period required for longitudinal risk monitoring. Second, purpose limitation: pipeline outputs should be restricted to suicide risk assessment purposes and should not be available for other uses — commercial, law enforcement, or otherwise — without explicit ethical oversight. Third, human-in-the-loop requirement: high-risk and critical-tier classifications should not trigger automatic interventions but should route to trained human review before any action is taken. Fourth, transparency: individuals whose communications are processed by the system should, to the greatest extent legally and operationally possible, be informed of that processing and provided with accessible avenues for challenge.

7.3 The Pakistani Socio-Legal Context

The Pakistani context introduces specific legal and cultural constraints that must be addressed in the governance framework. The continued criminalisation of attempted suicide under Section 325 of the Pakistan Penal Code creates a specific risk of harm from disclosure: individuals identified as high-risk by the system may face legal consequences if that identification leads to reporting to authorities rather than referral to mental health services. The governance framework must therefore explicitly prohibit the use of pipeline outputs for law enforcement purposes and require that all referral pathways lead to mental health support rather than criminal justice intervention. The broader movement toward legal decriminalisation of suicide, supported by WHO policy (Mishara & Weisstub, 2016), is an essential prerequisite for responsible deployment. The cultural taboo surrounding mental health in Pakistan — documented in Series Paper 1 as a significant barrier to help-seeking — similarly requires that the system's alert and referral outputs be designed to facilitate voluntary engagement with support rather than coercive intervention. Stigma-aware referral language, engagement with

religious leaders and community influencers as trusted intermediaries, and gender-sensitive counselling pathways are identified as essential components of the responsible deployment ecosystem.

7.4 Algorithmic Accountability and Epistemic Justice

The PFLS pipeline's Layer L6 explainability infrastructure — SHAP-attributed feature rationale and LIME-based local interpretability — is designed to address the algorithmic accountability imperative: clinicians and affected individuals must be able to understand why a particular risk classification was assigned, to challenge it on grounds of factual inaccuracy or cultural misinterpretation, and to override it based on contextual knowledge unavailable to the automated system. This explainability infrastructure also serves the epistemic justice dimension: it makes visible the specific linguistic features that the system treats as markers of risk, enabling critique and correction of any features that encode cultural bias or misrepresent culturally specific communicative norms.

8. Future Research Directions and Series Programme Roadmap

8.1 Series Paper 4: Multilingual Corpus Development

The most urgent empirical priority for the PFLSI programme is the extension of the corpus base to Urdu and Punjabi-language texts, developing a purpose-built multilingual Suicide Discourse Corpus that enables direct comparison of the linguistic signature across languages and scripts. This extension is essential for the cultural calibration objectives of Layer L3 of the PFLS pipeline and will require collaboration with Pakistani mental health organisations, crisis helplines, and forensic institutions to build the institutional data-sharing agreements that authentic corpus construction requires.

8.2 Series Paper 5: Transformer Fine-Tuning and Model Validation

The empirical foundation established in Series Papers 1 and 2, and the theoretical and architectural framework developed in the present paper, provide sufficient grounding for the initiation of computational model development. A dedicated paper on the fine-tuning of XLM-RoBERTa and clinical BERT variants on the combined PFLSI corpus, incorporating the feature categories specified in the PFLS pipeline's Layer L2, and validated against held-out test sets from both the Pakistani notes corpus and the multilingual SDC, is identified as the fifth paper in the programme.

8.3 Longitudinal Corpus Development

Both Series Papers 1 and 2 are cross-sectional: they provide snapshots of suicidal discourse rather than longitudinal trajectories through suicidal ideation. Series Paper 2 identifies longitudinal corpus methods — tracking an individual's discourse across the arc of suicidal crisis — as 'methodologically promising but presenting formidable data-collection challenges' (Ishfaq & Sultan, 2026, p. 866). The development of longitudinal corpus methods, drawing on forum data where users' posting histories can be reconstructed with appropriate ethical oversight, is identified as a medium-term priority for the programme.

8.4 Prospective Clinical Validation

The ultimate validation of the PFLS pipeline will require prospective clinical studies in which the system's risk stratification outputs are assessed against clinical outcomes.

This prospective validation work is identified as a later-stage priority, contingent on successful completion of the multilingual corpus development and model fine-tuning phases, and will require partnership with Pakistani mental health clinical institutions under robust ethical governance frameworks.

9. Conclusion

The present paper, as the third paper in the Psycho-Forensic Linguistic Surveillance Initiative, has performed three synthetic and constructive tasks essential to the programme's advancement. It has developed a unified seven-framework theoretical architecture — integrating Shneidman's psychache theory, Joiner's IPTS, Beck's cognitive model, O'Connor's IMV model, Pennebaker's Linguistic Relativity Theory, Lakoff and Johnson's Conceptual Metaphor Theory, and Menon's Narrative-Crisis Model — that accounts for the convergent empirical findings of Series Papers 1 and 2 with comprehensive explanatory coverage. It has presented the complete seven-layer architectural specification of the PFLS pipeline, providing the technical blueprint for a culturally calibrated, explainable, ethically governed, real-time suicide risk detection system. And it has articulated a principled ethical minimalism framework for the responsible deployment of language-based suicide surveillance, addressing the specific legal and cultural constraints of the Pakistani context.

Together, the three papers of the PFLSI programme have established the empirical, theoretical, and architectural foundations for a paradigm shift in suicide prevention: from reactive, clinical-encounter-dependent risk assessment to proactive, population-level, linguistically anchored early detection. Series Paper 1 (Ishfaq et al., 2025) demonstrated that language carries the traces of suicidal crisis in culturally specific and theoretically interpretable ways. Series Paper 2 (Ishfaq & Sultan, 2026) demonstrated that these traces are statistically robust, consistent across registers, and detectable at corpus scale through rigorous quantitative methods. The present paper demonstrates that these traces can be theoretically unified, computationally operationalised, and ethically deployed. The language of distress has always been present. The PFLSI programme is building the capacity to hear it.

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