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PHONOLOGICAL DESCRIPTION AND ORTHOGRAPHIC CHALLENGES IN DEVELOPING A LOLOAN MALAY ORTHOGRAPHY

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Abstract
Loloan Malay, a minority language spoken in Bali, lacks a standardized orthographic system, resulting in inconsistent spelling practices. This study provides a phonological description of Loloan Malay and examines orthographic challenges arising from phonological variation and language contact, with the aim of proposing a practical orthographic framework combining both phonemic and morphophonemic principles informed by community preferences. The preferences are based on elicited lexical data from twelve native speakers representing different age and gender groups, complemented by follow-up consultations through informal interviews with seven members of the community. Audio and video recordings were transcribed and phonemic analysis was conducted to distinguish phonemic contrasts from allophonic variation before mapping phonological patterns to graphemic representations following Seifart's (2006) framework for orthography development. The findings indicate that phonological variation, particularly allophonic variation in the vowel system, creates challenges for consistent graphemic representation. For example, the high front lax vowel /ɪ/, an allophone of /i/, is variably represented, which results in ambiguity such as *sambil* 'while' and *sambel* 'while' or 'chili'. The proposed framework addresses these ambiguities and prioritizes pronunciation transparency. This study contributes to efforts toward more consistent writing practices for Loloan Malay, with implications for literacy development and pedagogical applications.

Keywords: Loloan Malay, orthographic challenge, orthography development, phonology

Introduction

Loloan Malay, also known as Balinese Malay (ISO 639-3 code mhp), is one of the indigenous languages of Indonesia spoken in the west of Bali (see Figure 1). While Ethnologue (Eberhard et al., 2025) labels it as Balinese Malay, the term Loloan Malay is more widely used by speakers and researchers, reflecting its

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association with Loloan Village in Jembrana Regency. Locally, it is also referred to as *Bahasa Kampong* 'village language'.

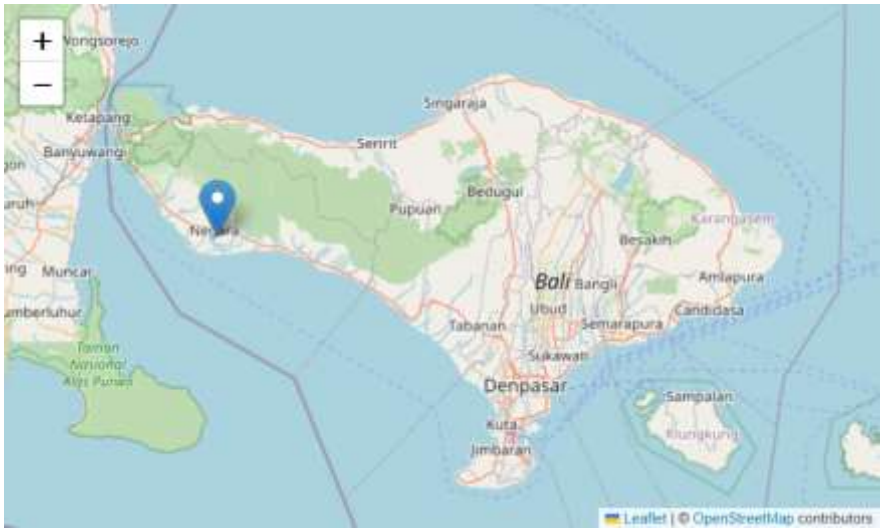


Figure 1. East Loloan village as research location (source: OpenStreetMap)

Indonesia is home to over 700 local languages (Eberhard et al., 2025), many of which lack standardized writing systems (Valentino, 2020). As a result, they remain largely confined to oral use, including Loloan Malay (Putra, 2025; Sinaga, 2025; Sosiowati et al., 2025). Previous studies have described its lexical and linguistic features (Sosiowati et al., 2017, 2025; Sumarsono, 1993), but no systematic effort has been made to develop a phonologically grounded orthography. Consequently, current writing practices are inconsistent and reflect unstable relationships between sounds and symbols.

This issue is especially evident in vowel representation. For instance, *sambil* 'while' may also be written as *sambel*, reflecting variation in the realization of /i/ as [i] or [ɪ] under Indonesian and Balinese influence. Such variation leads to ambiguity, as identical spellings may correspond to different lexical items, and interpretation often relies on contextual inference (Seifart, 2006). This highlights the difficulty of establishing clear sound-symbol correspondences without a standardized system.

Research on Loloan Malay has focused mainly on sociolinguistic vitality and lexical domains rather than structure or orthography. Sumarsono (1993) described its phonemic inventory and grammar. This study remains relevant today, yet it has rarely been extended toward orthographic discussion. Later studies examined language use, with Sosiowati et al. (2019) identifying lexical attrition and Dhanawaty et al. (2020) noting stable use in family settings. Recent work explores cultural contexts. Sosiowati et al. (2025) documented vocabulary in practices such as *Burdah* and *Ngelenggang*, while other studies highlight contact influence from Balinese and Indonesian (Putra et al., 2015; Suparwa, 2010). Despite this, the relationship between phonology and orthography remains underexplored, particularly how phonological variation affects writing.

Orthography development in minority languages, such as Malay creoles, involves balancing tension between linguistic principles and sociolinguistic factors,

such as community preferences and domination of national language (Decker, 2014; Lüpke, 2011; Seifart, 2006). This tension is particularly relevant for Malay varieties in Indonesia, where multilingualism and language contact influence both pronunciation and spelling conventions (Suparwa, 2008). Not only contact from national language, neighboring language like Balinese and foreign language like Arabic further increase the tension since these languages affect how the language is spoken and written. The key challenge lies in deciding how to represent phonological and allophonic variation and in addressing the question of whether orthography should prioritize phonemic simplicity or represent perceptually salient variation. This study demonstrates how this tension is resolved.

Despite these challenges, no study to date has systematically examined how the phonological structure of Loloan Malay interacts with orthographic representation, nor how community preferences can be integrated into orthography design. This study addresses these gaps by investigating the following research questions:

1. What is the current phonemic inventory of Loloan Malay?
2. Which phonological features give rise to challenges in orthographic representation?
3. What type of orthographic framework can adequately represent these features while remaining acceptable to the speech community?

By answering these questions, this study aims to propose a practical orthographic framework that integrates phonemic analysis with sociolinguistic considerations. Establishing such an orthography has important implications for language documentation, education, and cultural sustainability. A consistent writing system enables the development of dictionaries, teaching materials, and digital resources, thereby supporting literacy and facilitating the inclusion of Loloan Malay in educational and public domains (Decker, 2014). More broadly, this effort contributes to the preservation of Indonesia's linguistic diversity by transforming Loloan Malay from an exclusively oral medium into a written and teachable language.

Theoretical Underpinnings

Loloan Malay orthography design principles

This study believes orthography development as a process in which linguistic representation, literacy practices, and community preferences interact. Orthography is not merely a system for transcribing spoken language production, but a social and cultural representation of a language (Coulmas, 2002; Jones & Mooney, 2017). In language documentation context, decisions concerning what orthography to represent a community is shaped not only by phonological analysis, but also by considerations of acceptability, identity, and existing practicality (Seifart, 2006; Lüpke, 2011; 2014). Building on these principles, this study treats Loloan Malay orthography development as an interaction between phonological adequacy, usability, and sociolinguistic acceptability.

Phonological adequacy

Orthography depends on phonological structure. Phonemes are contrastive Cahillunits, while allophones are predictable variants (Anderson, 2021). However, sound-symbol relationships are often complex. A phoneme may have multiple

spellings, or a grapheme may represent multiple sounds, as seen in English and Indonesian. These mismatches create challenges. Underrepresentation leads to ambiguity, while overrepresentation increases complexity (Cahill, 2014).

Loloan Malay orthographic development should be grounded in an adequate analysis of its phonological system. Being able to map the phoneme inventory, including phonetic variations, of Loloan Malay helped in deciding the orthography. However, an orthography does not necessarily need to represent every phonetic realization of a phoneme. This principle guided the identification of Loloan Malay phoneme inventory, the distinction among allophonic variation, and decision in graphemic representation.

Usability

Orthography is a system of written symbols representing language structure (Coulmas, 2002; Seifart, 2006). Three approaches are commonly identified: phonemic, phonetic, and practical. Phonemic orthography represents only contrastive sounds to ensure simplicity. For example, Indonesian uses <i> consistently for /i/ (Wijana, 2003). Phonetic orthography represents detailed variation, as in IPA, but is impractical for everyday use. Practical orthography balances accuracy and usability, integrating linguistic analysis with community preferences (James, 1928; Lüpke, 2011; Seifart, 2006).

Orthography development requires balancing accuracy and usability. Smalley (1964) proposes criteria such as representation of speech, ease of learning, and reproduction. Later work emphasizes trade-offs between simplicity and precision (Cahill, 2014) and alignment with existing literacy practices (Lüpke, 2011; Seifart, 2006).

Usability in orthography concerns about how an orthography can be learned, read, written, and applied consistently by users. Building on this concept, this study adopts practical approach in developing Loloan Malay orthography. During the development, Loloan Malay community asked to make the orthography transparent, which means the writing reflects the pronunciation. This request was driven from how the community wants its identity to be present in the orthography. Baird and Klamer (2006) stress functional load, symbol economy, and community acceptance. Not all distinctions need representation, and excessive complexity should be avoided. Overall, a practical approach combining phonological and sociolinguistic considerations is preferred. This framework guides the development of a linguistically grounded and socially acceptable orthography for Loloan Malay.

The design challenge is therefore to establish representations that are sufficiently systematic and transparent without introducing unnecessary complexity; hence, learnability is ensured. For Loloan Malay, this principle was applied particularly to vowel representation, diacritic selection, and the treatment of consonantal distinctions.

Sociolinguistic acceptability and its impact toward vitality

An orthography is ultimately used by a speech community and therefore cannot be evaluated solely according to linguistic criteria. Orthography may reflect language contact, literacy practices, cultural identity, and users' attitudes toward particular forms (Coulmas, 2002; Jones & Mooney, 2017). Orthographic choices are consequently socially meaningful as they shape how speakers see their own

language represented in writing and by extension, how much ownership they feel over that representation. Developing an orthography is therefore not solely the task of linguists but a shared undertaking with the community, since it is ultimately their language being written. In community-based language documentation, speakers' preferences should accordingly be built into the development process itself rather than sought only as approval of a linguist-designed system (Baird & Klamer, 2006).

Studies show that orthography development is closely linked to successful language maintenance and transmission; hence, future desired use in various fields, one of them as in pedagogy, can be achieved. A writing system enables languages to extend beyond oral use into domains such as education, administration, and digital communication, increasing their functional range and sociocultural visibility (Coulmas, 2002; Jones & Mooney, 2017). Studies show that orthography development is closely linked to successful language maintenance and transmission.For example, standardized Swahili orthography supports education across East Africa (Robinson, 2022). In Southeast Asia, Surigaonon orthography enables mother-tongue education (Liwanag, 2017), while documentation of Obo Manobo and Kinamiging Manobo highlights the role of writing in preserving linguistic knowledge (Gasing & Al-Saggaf, 2025). In Indonesia, Sundanese and Balinese orthographies support use in formal and informal domains (Kurniawati et al., 2021; Widiatmika et al., 2023).

Without orthography, languages face significant challenges. The absence of a writing system limits teaching materials and excludes languages from formal education, as seen in Loloan Malay. This reduces structured learning and weakens intergenerational transmission (Casanova, 2022; Domede, 2023; Jones & Mooney, 2017). Thus, orthography development is essential for sustainability.

The proposed system therefore seeks to preserve Loloan Malay-specific linguistic features while remaining compatible with literacy conventions the community already knows. Acceptability in this sense does more than secure a workable orthography; it fosters the comfort and confidence speakers need to actively maintain and use their language, positioning the community as agents in sustaining Loloan Malay.

Method

Research design

This study is based on fieldwork conducted between 2024 and 2025 as part of a broader documentation project on Loloan Malay, a minority Malay variety spoken in western Bali. Earlier stages of the project focused on the collection of lexical data and oral traditions (Sosiowati et al., 2025). The present study extends this work by providing a phonological analysis of Loloan Malay and examining orthographic challenges arising from variation in existing writing practices.

Participants

Twelve native speakers of Loloan Malay participated in the study. Participants were selected using purposive sampling to capture variation across age and gender. The sample consisted of three age groups, teenagers (10-18), adults (19-59), and seniors (60+), with four participants in each group, evenly distributed by sex. Informed consent was obtained prior to data collection. Written consent form was prepared by the research team and participants were informed about the

purpose and procedure of the research as well as the possibility of future use of resulting materials from this research by other parties for research and academic purposes. In addition, the consent form specified participant rights. They could request to withdraw from the research, to retract the research output, and to obtain a copy of the data collected. These rights ensured that the community still has the agency of its language. Each participant signed and dated the consent form.

Sociolinguistic factors were also considered due to their influence on phonological variation and orthographic preferences. Participants varied in educational background (secondary to undergraduate), though no consistent relationship was found between education and phonological patterns, as individuals with similar backgrounds exhibited different writing practices.

All participants demonstrated functional literacy and were able to read and write Loloan Malay to varying degrees, reflecting everyday usage rather than standardized conventions. They were multilingual, with fluency in both Loloan Malay and Indonesian. Due to the community's Islamic background, participants were also exposed to Arabic, particularly through Qur'anic recitation, and some older speakers were familiar with Arab Pegon (Aziz et al., 2022). Additionally, participants had passive exposure to Balinese as a neighboring language, although it was not actively used in daily communication (Sosiowati et al., 2025).

Participants were long-term residents of the Loloan community with limited migration, supporting the assumption that observed patterns reflect local usage rather than external influence. The sample size aligns with qualitative phonological research, where the goal is to identify recurring patterns rather than achieve statistical generalization. Data collection continued until saturation was reached, with no new patterns of variation emerging across participants. Collectively, the twelve speakers captured the range of allophonic variation present in the community.

Data collection

Data were collected during a field visit in September 2025 using two complementary methods: lexical elicitation and narrative reading. In addition to spoken data, written responses were collected and analyzed as part of the dataset. First, a lexical elicitation task was conducted using thirty Indonesian lexical items selected purposively as provided in supplementary file. These items targeted phonological segments known to pose orthographic challenges, particularly vowel variation (/ə/, /i/, /u/, /e/, /o/) and selected consonants (/t/, /k/). Items were distributed across initial, medial, and final positions to allow comparison across phonological environments. Some items were also chosen to elicit potential ambiguity, such as forms that may result in identical spellings despite distinct meanings.

Participants were asked to (1) translate each item into Loloan Malay, (2) write it as they normally would, and (3) produce spoken forms, which were recorded using audio and video equipment. Written responses were especially important, as they reflect existing orthographic practices. Variation in spelling across participants provided direct evidence of inconsistencies in grapheme–phoneme correspondence, particularly in vowel representation.

Second, participants read a short narrative text in Loloan Malay. This task captured pronunciation in connected speech and allowed observation of

phonological variation in a more natural context. Several elicited lexical items were embedded in the narrative to enable comparison between isolated and contextualized forms. Unlike laboratory-based studies, no fixed carrier phrases were used. Instead, the combination of controlled elicitation and natural reading enhanced ecological validity and allowed variation to be observed in actual language use.

Phonological analysis

Speech data were transcribed using the International Phonetic Alphabet (IPA). Analysis followed a structuralist framework in which phonemes were identified as contrastive units and allophones as predictable variants conditioned by phonological environment (Anderson, 2021).

Phonemic contrasts were established through minimal and near-minimal pairs where possible, while variation resulting from phonetic conditioning or language contact was treated as allophonic. The analysis considered segment distribution across word positions and across both elicited and narrative contexts to identify consistent patterns.

The resulting phonological description formed the basis for identifying orthographic challenges and mapping phonological units to graphemic representations. While a full phoneme inventory is provided, the analysis focuses primarily on contrasts that create orthographic difficulties, particularly in vowel systems and selected consonantal environments.

Orthography development procedure

Orthography development followed a rule-based approach that maps phonological analysis to graphemic representation, guided by established principles (Baird & Klamer, 2006; Seifart, 2006; Smalley, 1964). The procedure was operationalized through several key rules:

1) Phonemic priority: All phonemic contrasts were consistently represented (e.g., *pegi* ‘go’ vs. *pagi* ‘morning’).
2) Allophonic handling: Predictable variation was not represented unless perceptually salient or ambiguous (e.g., *sambil* vs. *sambel*).
3) Ambiguity avoidance: Distinctions were introduced where identical spellings could obscure meaning (e.g., *kenceng* ‘urinate’ vs. ‘tight’).
4) Grapheme transfer: Indonesian conventions were used where possible with modifications reflecting Loloan Malay phonetics (e.g., pïrïng).
5) Economy and simplicity: Complexity was minimized, with selective use of diacritics (e.g., <ï>, <ü>, <ê>).
6) Functional load: Low-impact distinctions were not obligatorily represented (e.g., [t] vs. [t]).
7) Community preference: Orthographic decisions incorporated feedback from community consultation conducted in November 2025 (see Figure 2).



Figure 2. Consulting the result to Loloan Malay community

Community preference was defined as recurring patterns of acceptance identified through discussions and reading tasks. Participants included the twelve primary informants and seven additional community members, such as local leaders and teachers experienced in producing written materials. Preferences were determined qualitatively based on ease of reading, interpretation, and participant feedback.

The resulting orthography aims to (1) preserve linguistic identity, (2) remain clear and readable, (3) minimize reliance on contextual interpretation, and (4) be community-driven to ensure usability without extensive training.

Analysis presentation

Phonological and orthographic analyses are presented descriptively using slashes / / to indicate phonemic representations, square brackets [ ] to indicate phonetic realizations, and angle brackets < > to indicate orthographic forms. Consonant and vowel inventories are summarized in tables to facilitate systematic comparison.

Findings and Discussion

Findings

The phonological system of Loloan Malay consists of a set of consonant and vowel phonemes that largely correspond to earlier descriptions (Sumarsono, 1993), while also exhibiting additional phonetic variation influenced by language contact. The present analysis distinguishes between core phonemes, which occur across the native lexicon, and marginal phonemes, which are primarily restricted to loanwords.

This section presents the consonant and vowel inventories of Loloan Malay, followed by an analysis of phonological patterns that give rise to orthographic challenges. The data show that consonant phonemes are relatively stable across speakers, whereas vowel realization exhibits significant variation. This asymmetry plays a central role in shaping orthographic inconsistency in the language.

Consonant inventory

The consonant system consists of a core set of phonemes and a small number of marginal phonemes restricted to loanwords. Table 1 presents the core consonant inventory of Loloan Malay, while Table 5 shows the marginal consonantal phonemes that are brought by loan words, organized by place and manner of articulation.

Table 1. Core consonant inventory of Loloan Malay

Place & Manner	Bilabial	Dental	Alveo-lar	Post-alveolar	Palato-alveolar	Palat-al	Velar	Glottal
Plosive	/p/, /b/	/t/		/d/			/k/, /g/	
Nasal	/m/			/n/		/ɲ/	/ŋ/	
Trill				/r/				
Affricate				/d͡ʒ/	/t͡ʃ/			
Fricative			/s/					/h/
Approximant						/j/	/w/	
Lateral Approximant			/l/					

The consonant system of Loloan Malay exhibits limited allophonic variation, most of which is predictable and does not contribute to lexical contrast. Among all core consonants in Loloan Malay, there are three phonemes that have allophonic realization. They are /h/, /k/, and /t/. The realization of these three are observed across multiple speakers.

(1) /h/ → [h] ~ [ħ] ~ [x] (free variation in loanwords)

The phoneme /h/ is consistently realized as [h] in native Malay vocabulary across all positions. In contrast, in loanwords—particularly those of Arabic origin and orthographically represented with —/h/ may be realized as [ħ] or [x] as seen in Table 2. These variants do not exhibit contrastive function and are treated as interchangeable by speakers.

Table 2. Phonetic realization of /h/ in Loloan Malay

Realization	Example
/h/ → [h ~ ħ ~ x]	*akhir 'end'* → *[ahir] ~ [axir]* *makhluk 'creature'* → *[mahlʊʔ] ~ [maħlʊʔ] ~ [maxlʊʔ]*

The variants [ħ] and [x] are associated with Arabic-influenced pronunciations (Soderberg & Olson, 2008), particularly in words that have segment <kh> such as *akhir* 'end'*, makhluk* 'creature', and *khidmah* 'devote', while [h] is more common in Indonesian-influenced forms. This pattern reflects the influence of speakers' multilingual repertoires rather than phonological conditioning within Loloan Malay.

This variation is observed across multiple speakers. Younger speakers produce [h], while adult speakers predominantly produce [x] as they are exposed longer to Arabic through Islamic religious practices. However, its occurrence is limited to a restricted set of loanwords. As such, the variation is considered lexically restricted rather than fully productive.

The alternation between [h], [ħ], and [x] carries low functional load, as it does not result in differences in lexical meaning. Substitution among these variants does not affect intelligibility or word identification. Consequently, this variation is not

relevant for phonemic contrast and does not require distinct representation in the orthography.

(2) /k/ → [ʔ] in syllable-final position

The voiceless velar stop /k/ is realized as a glottal stop [ʔ] in syllable-final position, both before a following consonant and at the end of a word, as shown in Table 3.

Table 3. Phonetic realization of /k/ in Loloan Malay

Realization	Example
/k/ → [ʔ] / _C	*bakwan* 'fritter' → [bakwan] ~ [baʔwan]
/k/ → [ʔ] / _#	*baek* 'good' → [baek] ~ [baeʔ]

This alternation is consistently observed across speakers and occurs in a wide range of lexical items, which indicates that it is a productive phonological process rather than an isolated or speaker-specific variation. Both [k] and [ʔ] realizations may occur, but the glottal stop is strongly associated with syllable-final position (Suparwa, 2008).

The alternation between /k/ and [ʔ] carries low functional load; therefore, no lexical meaning changing is found here. The realization is fully predictable from phonological environment and substitution between [k] and [ʔ] does not lead to ambiguity. Consequently, [ʔ] is analyzed as an allophonic realization of /k/ rather than as a separate phoneme.

(3) /t/ → [t] ~ [ʈ]

The alveolar stop /t/ may be realized as a dental/alveolar [t] or as a retroflex [ʈ] as presented in Table 4. This variation occurs in medial and syllable-final positions, although it is not strictly conditioned by phonological environment.

Table 4. Phonetic realization of /t/ in Loloan Malay

Realization	Example
/t/ → [t ~ ʈ]	*mate* 'eye' → [matə] ~ [maʈə] *laut* 'sea' → [laʊt] ~ [laʊʈ]

This variation is observed across multiple speakers, but its distribution is not fully systematic. Some speakers consistently produce [t], while others alternate between [t] and [ʈ], indicating that the variation is influenced by individual speaker background. The alternation between [t] and [ʈ] has low functional load, which means there is insignificant changes in lexical meaning. No minimal pairs were identified that rely on this distinction and substitution between the two variants does not introduce ambiguity.

The retroflex realization [ʈ] is likely influenced by contact with Balinese, where retroflex consonants are more common, while [t] aligns with Indonesian pronunciation. This suggests that the variation reflects speakers' multilingual repertoires rather than an inherent phonological contrast within Loloan Malay.

Table 5. Marginal consonant inventory of Loloan Malay

Place & Manner	Labio-dental	Alveolar	Post-alveolar	Retroflex
Fricative	/f/	/z/	/ʃ/	
Lateral Approximant				/l̪/

Marginal consonants such as /f/, /z/, /ʃ/, and /l̪/ are primarily restricted to loanwords of Arabic origin, many of which have also been borrowed into Indonesian (Balla, 2023). Although some phonetic variation is observed, such as /f/ realized as [p] and /z/ as [s] or [d͡ʒ], these variants are largely limited to older speakers. Younger speakers tend to produce these consonants consistently in accordance with their source forms.

Importantly, these variations do not constitute a major challenge for orthographic representation. The relevant lexical items are already familiar to the community through established spelling conventions in Indonesian and Arabic, such as *kafir* 'a person who disobeys Islamic teachings' [kafir] and *zuhud* 'modest' [zuhud]. As a result, speakers demonstrate stable orthographic expectations for these forms despite minor phonetic variation.

Consequently, these marginal consonants do not require special treatment in the proposed orthography. Their representation can follow established conventions without introducing ambiguity, as the relationship between grapheme and lexical identity remains clear to the speech community.

Vowel inventory

The vowel system of Loloan Malay consists of six phonemes as presented in Table 6. Unlike the consonant system, vowel realization exhibits systematic variation conditioned by phonological environment and language contact, which constitutes the primary source of orthographic inconsistency.

Table 6. Vowel inventory of Loloan Malay

	Front	Central	Back
Close	i		u
Mid	e	ə	o
Open		a	

The vowel phonemes /a/ and /ə/ show relatively stable realizations across speakers and phonological contexts. However, these two have orthographic problem, which will be explained later, if they are in final position. In contrast, the close vowels /i/ and /u/ each exhibit a lax allophonic variant, [ɪ] and [ʊ] respectively. These lax realizations occur in predictable environments, most commonly in medial position and in word-final syllables when the vowel is flanked by consonants. In such contexts, /i/ is realized as a more centralized [ɪ], and /u/ as a lower and laxer [ʊ]. Alternation between tense and lax realizations does not result in lexical contrast.

(1) */a/ → [a] ~ [ə]*

Table 7 shows that the low vowel /a/ frequently undergoes centralization to [ə], particularly in word-final position. This process is widespread and represents

one of the most prominent patterns of vowel variation in Loloan Malay. A highly regular manifestation of this alternation is observed in words borrowed from Indonesian, where final /a/ is systematically realized as [ə] in Loloan Malay.

Table 7. Phonetic realization of /a/ in Loloan Malay

Realization	Example
/a/ → [ə] / _#	*mata* 'eye' → [mata] ~ [matə] *dimana* 'where' → [dimana] ~ [dimanə]

This variation is consistently observed across speakers and constitutes a highly productive phonological process. The centralization of /a/ to [ə] is not an isolated phenomenon, but is widely attested in other Malay creoles. Several Malay dialects exhibit the same pattern (Arsillah, 2013; Haizhou et al., 2005).

The variation involving [a] and [ə] is generally insignificant given that it does not reliably trigger changes in meaning. However, due to its high frequency and widespread occurrence, this variation plays a significant role in orthographic inconsistency. Forms such as *mata* and *mate* represent the same lexical item but are written differently by speakers depending on pronunciation.

In addition, the overlap between /a/ → [ə] and the independent phoneme /ə/ may create ambiguity in orthographic representation. As a result, although the contrast is not strongly phonemic, it has important implications for orthography design.

(2) */i/ → [i] ~ [ɪ]*

The high front vowel /i/ is realized as a tense [i] in open syllables and as a lax [ɪ] in closed syllables, such as in CVC structure, particularly in word-final position, where the vowel is in between consonants as shown in Table 8. This variation is conditioned by syllable structure rather than lexical contrast.

Table 8. Phonetic realization of /i/ in Loloan Malay

Realization	Example
/i/ → [ɪ] / in closed syllables	*Kencing 'pee'→ [kəntʃ͡ɪŋ] ~ [kəntʃ͡ɪŋ]* *sambil 'while' → [sambil] ~ [sambɪl]*

This variation is widely observed across speakers and constitutes a productive phonological pattern. Most speakers alternate between [i] and [ɪ] depending on syllable structure. In most contexts, the interchange of [i] and [ɪ] is functionally marginal, as these sounds rarely serve to differentiate unique lexical items. However, in certain cases, variation in the realization of /i/ contributes to orthographic ambiguity in the community. For example, forms such as *sambil* 'while' may be written as <sambel>, which is a homograph to chili. In such contexts, the distinction becomes relevant for orthographic representation, even if it is not strictly phonemic.

(3) */u/ → [u] ~ [ʊ]*

The high back vowel /u/ is realized as a tense [u] in open syllables and as a lax [ʊ] in closed syllables, particularly when followed by a coda consonant. This variation is conditioned by syllable structure rather than lexical contrast.

Table 9. Phonetic realization of /u/ in Loloan Malay

Realization	Example
/u/ → [ʊ] / in closed syllables	*laut 'sea'* → *[laut] ~ [laʊt]* *tumbuh 'grow'* → *[tumbu^{h}] ~ [tʊmbʊ^{h}]*

The variation shown in Table 9 is observed across speakers and represents a productive phonological pattern. Most speakers exhibit vowel laxing in closed syllables. This phonetic variation carries negligible communicative weight; substitution between the two variants does not lead to ambiguity. However, similar to the /ɪ/ ~ [ɪ] alternation, variation in the realization of /u/ contributes to orthographic inconsistency when speakers attempt to represent phonetic detail in writing. This makes the distinction relevant for orthographic design despite its low phonemic significance.

(4) */e/ → [e] ~ [ɛ]*

The mid front vowel /e/ may be realized as a more open [ɛ] in vowel sequences as seen in Table 10, particularly in combinations involving a preceding low vowel such as /a/.

Table 10. Phonetic realization of /e/ in Loloan Malay

Realization	Example
/e/ → [ɛ] / [open low vowel]_C	*baek 'good'* → *[baɛk]* *aer 'water'* → *[aɛr]*

This variation is observed across speakers, although its frequency varies depending on individual pronunciation patterns. Some speakers consistently produce [ɛ] in vowel sequences, while others maintain a more tense [e], reflecting variation in phonetic realization. The alternation between [e] and [ɛ] possesses minimal distinctive utility since it does not generate any semantic contrasts. However, this variation may contribute to orthographic inconsistency in sequences such as <air> and <aer>, where speakers may interpret or represent the vowel quality differently.

(5) */o/ → [o] ~ [ɔ]*

Table 11 presents that the mid back vowel /o/ may be realized as a more open [ɔ] in both native vocabulary and loanwords. This variation is frequently observed in closed syllables. This alternation also occurs in Arabic loanwords, such as in *rosul* 'messenger of revelation' which can be pronounced as [rosul] ~ [rɔsul].

Table 11. Phonetic realization of /o/ in Loloan Malay

Realization	Example
/o/ → [ɔ] / in closed syllables	*Bonteng 'pregnant'→ [bontɪŋ] ~ [bɔntɪŋ]* *Jaoh 'far'→ [d͡ʒaoh] ~ [d͡ʒaɔh]*

This variation is observed across speakers. Some speakers consistently produce [o], while others exhibit alternation between [o] and [ɔ], particularly in closed syllables. Compared to other vowel alternations, this pattern is moderately

productive but shows greater variability in its application. The alternation between [o] and [ɔ] carries low functional load.

The phonological system of Loloan Malay is characterized by an asymmetry between a stable consonant inventory and a highly variable vowel system with important implications for orthography. Consonantal variation is limited, largely predictable, and carries low functional load. Consonantal alternation does not contribute to lexical contrast, which makes them orthographically non-essential. In contrast, vowel variation is highly productive across speakers, while carries low functional load. However, the alternation has high orthographic relevance due to its frequency in generating inconsistent spellings, which represent inter-speaker variations, in current practice. This study finds that orthographic challenges in Loloan Malay arise not from an unstable phoneme inventory, but from the interaction between productive phonetic variation, low functional load, and social preferences for representing sounds.

Orthographic challenges

This subsection discusses challenges in mapping the phonemic system of Loloan Malay, including predictable allophonic variation, onto a practical orthographic system. Community preferences were incorporated to address these challenges. Feedback was collected from the twelve primary participants involved in phonological elicitation, along with seven additional community members, including teachers and local leaders experienced in writing Loloan Malay.

Participants were presented with a draft orthography based on prior phonological analysis and asked to read, interpret, and evaluate it. Feedback was gathered through guided discussions focusing on readability, ease of interpretation, and perceived naturalness. Rather than relying on numerical measures, preferences were identified through recurring patterns in participant responses, providing a qualitative basis for orthographic decisions.

High front lax vowel

A major challenge concerns the representation of the high front lax vowel /ɪ/, which is an allophone of /i/. Linguistically, it does not require a separate grapheme. However, in current practice, it is inconsistently written using both <i> and <e>, creating ambiguity and reducing readability.

The use of <i> reflects influence from Indonesian, where /ɪ/ and /i/ are both written as <i>. In contrast, the use of <e> appears to stem from local phonetic perception. This inconsistency leads to confusion. For example, *kencing* ‘pee’ and *sambil* ‘while’ may also appear as <kenceng> and <sambel>, which can create ambiguity. The form <sambel>, for instance, may represent /sambɪl/ ‘while’ or /sambəl/ ‘chili’.

An initial proposal was to represent both /i/ and /ɪ/ using <i> following Indonesian conventions and phonemic principles. This option offers advantages in learnability and familiarity, particularly for younger speakers educated in Indonesian. However, community members preferred a visible distinction between the two sounds.

As a result, a revised solution was adopted: /i/ is written as <i>, while /ɪ/ is represented as <ï> using a diaeresis. This approach balances linguistic accuracy

with community preference, reduces ambiguity, and aligns with familiar diacritic usage.

Front and central mid vowels

The mid vowel system presents another challenge, involving /e/, /ə/, and /ɛ/. While /ɛ/ is an allophone of /e/ and does not require separate representation linguistically, the community expressed a preference for distinguishing all three vowels.

Currently, all three vowels are often written as <e>, resulting in underrepresentation and ambiguity. For example, <sedeng> can mean 'currently' [sədəŋ] or 'crazy' [sɛdɛŋ] depending contextual interpretation. Similarly, *gede* 'big' may be read in multiple ways. This writing can trigger [gədə], [gədə], [gedə], or [gede].

A key distinction must therefore be made between /ə/ and /e~ɛ/. Additional complexity arises from the centralization of /a/ to [ə] in word-final position, as seen in forms like <ade>, <bunge>, and <mate>. This further increases ambiguity when <e> is used for multiple vowel qualities.

Previous attempts by the community to represent /ə/ include <é>, <ê>, and <â>. Although <â> has some familiarity, it produces visually unfamiliar forms, such as *peti* 'crate', *petik* 'pick', and *pegang* 'hold', which would need to be written as <pâti>, <pâtik>, and <pâgang>. To address this, the proposed solution adopts <ê> for <ə>, following earlier work and Indonesian orthographic conventions. This maintains familiar word shapes while clearly marking the schwa. For example, *sedeng*, *gede*, and *mate* become <sêdêng>, <gêde>, and <matê>.

For /e/ and /ɛ/, both can theoretically be represented by <e>. However, since the community prefers a distinction, <è> is proposed for /ɛ>, drawing on existing conventions. This solution preserves clarity while accommodating user expectations.

Back vowels

As with the mid and front vowel systems, the principal orthographic challenge among the back vowels concerns the community's request to differentiate /u/ and /ʊ/ as well as /o/ and /ɔ/. Linguistically, separate graphemes are not required because each pair consists of allophonic variants rather than phonemic contrasts. Nevertheless, to accommodate the community's preference for orthographic distinctness, diacritics are proposed as a systematic solution.

Since the lax high front vowel /ɪ/ is represented with the diaeresis <ï>, a parallel treatment is applied to the lax high back vowel /ʊ/. Therefore, /ʊ/ is represented by <ü>. For the open-mid back vowel /ɔ/, the proposal mirrors the representation of /ɛ/, as both vowels share the same height. Accordingly, /ɔ/ is represented by <ò> using the grave diacritic. Reusing the same diacritics, namely diaeresis for lax vowels and grave for open-mid vowels, maintains consistency across the vowel system and prevents unnecessary expansion of orthographic complexity.

Glottal stop

The sounds /ʔ/ and /k/ may both be written as <k> or <'> in current practice, despite the fact that they do not distinguish meaning. In Loloan Malay, /k/ is

regularly realized as /ʔ/ when it occurs in syllable-final position such as in <ba'wan> for [baʔwan] 'fritter' and <baɛ'> for [baɛʔ] 'good'. As this alternation does not create a phonemic contrast, /k/ and /ʔ/ are allophones; hence, they do not require separate orthographic representations.

From a linguistic standpoint, the initial proposal is to represent both sounds with <k>, aligning with the principle that allophones do not merit separate graphemes. This representation is also similar to the convention in Indonesian. However, the community is already familiar with using <'> to represent a glottal stop. For this reason, while <k> is the recommended standard representation, it is reasonably acceptable that the community chooses to retain <'> for /ʔ/ as a distinctive feature of their orthographic identity.

Velar and pharyngeal fricatives

The fricatives /h/, /ħ/, and /x/ occur in complementary distribution and do not contrast meaningfully. Variation is especially evident in Arabic loanwords, where speakers may produce different realizations.

To maintain simplicity and familiarity, the proposed system adopts Indonesian conventions: <h> represents both /h/ and /ħ>, while <kh> represents /x>. This avoids unnecessary distinctions while preserving recognizable forms, such as <makhluk>. Even when speakers produce different pronunciations, the unified spelling remains clear and consistent.

Retroflex

Loloan Malay includes two retroflex sounds: /ʈ/ and /ɭ/, which require different treatments.

The retroflex stop /ʈ/ is an allophone of /t/, influenced by Balinese. Since it does not affect meaning, it does not require separate representation. The grapheme <t> is therefore used for both /t/ and /ʈ>, maintaining simplicity. This decision was accepted by the community.

In contrast, the retroflex lateral /ɭ/ has cultural and lexical significance, particularly in Arabic loanwords such as Allah. Replacing it with /l/ would alter both pronunciation and meaning. For example, <alah> differs semantically from <allah>. Because of this, the spelling <ll> is retained to reflect both phonetic and cultural accuracy. This ensures that important distinctions are preserved in writing.

Final orthography and pedagogical implications

With the agreement of the Loloan Malay community, the finalized orthographic system is presented in Table 12. This system is not only theoretical but already in practical use, particularly in community-supported initiatives such as the development of children's storybooks, demonstrating its usability and acceptance.

The orthography reflects a balance between phonological analysis and community preference. Phonemic contrasts are consistently represented, while predictable allophonic variation is selectively marked using diacritics when speakers consider such distinctions important for readability and pronunciation. At the same time, the system aligns with Indonesian orthographic conventions where appropriate, ensuring familiarity while preserving features that are culturally meaningful to Loloan Malay speakers.

From a pedagogical perspective, the system provides a stable foundation for literacy development. Its consistent sound–symbol mapping supports the creation of teaching materials and facilitates more systematic reading and writing instruction. The representation of vowel distinctions may also help learners connect written forms with locally relevant pronunciation, enhancing phonological awareness.

Furthermore, partial alignment with Indonesian orthography allows for easier transfer of literacy skills in bilingual contexts, reducing learning difficulty. For educators, the system offers a standardized reference that addresses previous inconsistencies in writing practices. Future classroom implementation will be important to evaluate its effectiveness in supporting literacy development and long-term language maintenance.

Table 12. Loloan Malay orthography

Phoneme	Grapheme	Examples
/a/	A a	*Abang*
/i/	I i	*Item*
/ɪ/	Ï ï	*Pïrïng*
/u/	U u	*Kurang*
/ʊ/	Ü ü	*Laüt*
/e/	E e	*Mejê*
/ə/	Ê ê	*Dimanê*
/ɛ/	È è	*Aèr*
/o/	O o	*Sodit*
/ɔ/	Ò ò	*Tarò'*
/b/	B b	*Ban*
/t͡ʃ/	C c	*Cêrè*
/d/	D d	*Duê*
/f/	F f	*Kufur*
/g/	G g	*Gali*
/h/	H h	*Hutan*
/ħ/	H h	*Qosidah*
/d͡ʒ/	J j	*Jêdïng*
/k/	K k	*Katê*
/ʔ/	‘	*Ba'wan*
/x/	Kh kh	*Makhlü'*
/l/	L l	*Lêmbïng*
/ɭ/	L l	*Allah*
/m/	M m	*Matê*
/n/	N n	*Namê*
/ɲ/	Ny ny	*Nyiru*
/ŋ/	Ng ng	*Ngilo*
/p/	P p	*Pêrkarê*
/r/	R r	*Rantang*
/s/	S s	*Sêjati*
/ʃ/	Sy sy	*Syair*
/t/	T t	*Tanggê*
/ʈ/	T t	*Matê*
/w/	W w	*Wajïb*
/j/	Y y	*Yatim*
/z/	Z z	*Mukjizat*

All in all, this orthographic system balances phonological transparency, sociolinguistic identity, and practical usability, providing a sustainable foundation for literacy development and future documentation efforts in Loloan Malay.

Discussion

The findings of this study show that the phonemic inventory of Loloan Malay remains largely consistent with the system described by Sumarsono (1993), with no major expansion of phonemic contrasts. However, the analysis reveals more complex patterns of phonetic variation resulting from sustained language contact. Variations such as retroflex realizations of /t/ and multiple fricative forms are best understood as allophonic or contact-induced variants rather than new phonemes.

These patterns reflect sociolinguistic influences. Participants demonstrate passive competence in Balinese, which is evident in features such as the retroflex [ʈ], corresponding to Balinese articulatory patterns (Firman et al., 2023). The distribution of this feature varies across speakers, suggesting that its use depends on individual exposure. In addition, Arabic influence is present through religious practices. Exposure to Qur'anic recitation contributes to fricative variants such as [ħ] and [x] in Arabic loanwords, although these do not function as independent phonemes.

The study also highlights that developing an orthography for Loloan Malay requires balancing phonological principles with community preferences. Typologically, the proposed system follows an alphabetic, phonographic model (Seifart, 2006), where graphemes correspond to phonological units. However, it departs from strict one-to-one phoneme–grapheme mapping. Although distinctions such as /i/–/ɪ/, /u/–/ʊ/, /e/–/ɛ/, and /o/–/ɔ/ are allophonic, community members preferred that these differences be visibly represented. This reflects Lüpke's (2011) argument that orthographies must balance linguistic adequacy with user expectations. In this case, speaker preference for pronunciation visibility outweighs structural simplicity.

This tendency can be understood through Cahill's (2014) distinction between underrepresentation and overrepresentation. Previously, Loloan Malay orthography suffered from underrepresentation, particularly where <e> represented multiple mid vowels. The proposed system resolves this by distinguishing <ê> for /ə/, <e> for /e/, and <è> for /ɛ/, resulting in controlled overrepresentation. Rather than being problematic, this aligns with community preferences and improves readability. It also reflects the idea that orthographic effectiveness depends not on eliminating imbalance but on managing it in ways users find intuitive.

The resulting system can be characterized as relatively shallow in orthographic depth (Katz & Frost, 1992), as spelling closely reflects pronunciation. Shallow orthographies are generally easier to learn and process (Seifart, 2006), and Reflinda et al. (2024), Wang et al. (2025), and Cerni (2025) suggest that orthographic systems can influence how learners perceive and produce phonological contrasts. This reinforces the importance of designing a system that reflects audible distinctions.

The study further demonstrates that orthography development is a socially negotiated process (Salehuddin et al., 2025). Decisions such as retaining the glottal stop <'> or adopting diacritics reflect both linguistic reasoning and cultural

familiarity. This supports the view that writing systems function as expressions of identity, aligning Loloan Malay with both Arabic and Indonesian influences.

The development process followed a community-based approach, where speakers actively participated in evaluating and shaping the orthography. By facilitating consultations and allowing community negotiation, the development process adhered to Easton's (2003, 2007) community-based model, where other studies like Hemmings et al. (2023), Bow (2013), Rastogi (2015), and Moe (2003) also conducted. The negotiation process is where theory and practice might undergo conflicts as this study showed.

A clear example of this negotiation is the choice of diacritics for marking lax vowels. Although the research team initially proposed the diaeresis based on linguistic convention, the community briefly preferred the macron for visual reasons. After discussion, the diaeresis was ultimately accepted due to its clarity and consistency. This illustrates how theoretical and practical considerations interact in orthography design a linguist only acts as facilitator whose job is to provide supports toward the community to deliver an orthography reflecting their identity (Anderson & Evans, 2024; Bow, 2013; Chelliah et al., 2023; Lublinkhof, 2020).

The study confirms that orthography development tailored to both phonological structure and social context can enhance readability, support literacy, and contribute to long-term language maintenance (Matavire, 2024). For Loloan Malay, a standardized orthography not only improves phonological transparency but also creates opportunities for broader educational use and sustained language vitality.

A consistent writing system provides a practical means of transforming documented linguistic materials into resources that can be used by community members to develop pedagogical materials. For instance, an orthography can support the production of children's storybooks and learning media that can transmit language, knowledge, and social values of the community (Hyslop, 2014; Wise, 2014) . This research has also produced a new version of Loloan Malay bedtime storybook with current developed orthography.

An orthography that is pronunciation-transparent as what this research developed also ensure a more advanced learnability of a language. This kind of orthography facilitates learners to read words based on how they are written (Tamelan et al., 2026). The developed Loloan Malay orthography eases the learnability of Loloan community and external parties who would like to learn the language, either for communication or academic purposes.

A final pedagogical implication of Loloan Malay transparent orthography is teachers of Loloan Malay can explain more clearly about the language to the students; therefore, early literacy success is achievable (Nurhayati et al., 2025) . The teachers now have visual aids from the newly developed orthography, particularly the vowels with diacritics, to teach students how to pronounce words. Furthermore, the teachers can now explain when the sounds change; hence, a more systematic language awareness about phonological structure can be raised among students.

Conclusion

This study demonstrates that a viable orthography for Loloan Malay can be developed by integrating phonological analysis with community preferences. The proposed system preserves linguistically and culturally salient features, reduces ambiguity through consistent vowel distinctions, and maintains transparent sound–symbol correspondence. The community-driven process ensured strong speaker ownership and practical application, as shown by its use in literary production.

This study does not evaluate literacy outcomes or long-term stability. Future research should examine its effectiveness in real contexts, including acquisition and use across domains. Overall, the orthography provides a foundation for language documentation, literacy development, and sustainable transmission of Loloan Malay.

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