

Landscape lexical diversity for readability and safety mitigation on the commuter line bilingual information board

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Abstract. This study examines lexical diversity and readability of bilingual information boards on the Commuter Line Tanah Abang-Rangkasbitung in Indonesia, with a focus on their impact on passenger safety. It is motivated by observed discrepancies in translations, which could compromise clarity and effectiveness of public signage. The primary objective is to analyze lexical diversity and assess the readability of these translations using theoretical frameworks from Nida and Taber (2003), Newmark (1988), and Venuti (2012). The study employs a qualitative descriptive research design with Spradley's Ethnographical Approach, focusing on the Green Ring Route, which encompasses 19 CL stations. Data were collected through direct observation, photographic documentation, and field notes and analyzed using domain, taxonomy, componential, and cultural theme. The findings reveal significant variation in readability levels, influenced by the translation techniques used. High readability was found in translations employing Literal Translation and Established Equivalent techniques, while medium and low readability were associated with Borrowing, Modulation, and Amplification techniques. These findings underscore the need for consistent, culturally relevant translation practices to ensure effective communication and passenger safety. The study concludes by recommending regular usability testing, feedback integration, and use of technology to enhance the accessibility and effectiveness of bilingual signage in public transportation.

1 Introduction

Indonesia's Commuter Line (CL) train service has undergone significant internationalization, as highlighted by the KAI Commuter Customer Service page [1]. This transformation reflects the public's trust in the service's transparency, which is crucial for accommodating the diverse linguistic needs of its passengers. According to the 2023 KAI Commuter Annual Report, Tanah Abang Station recorded 153,270 passengers on December 30, 2023, contributing to 290 million users on the CL Jabodetabek network throughout the year [2]. The strong bilingual branding of the CL system demands fully accurate information presentation, as the accuracy of translations directly influences the readability and safety of these public information boards [3]. An observation conducted on March 5, 2024, on the Tanah Abang-Rangkasbitung route, revealed a translation discrepancy where "*Peta Jaringan KA Perkotaan Jabodetabek dan Sekitarnya*" was reduced to "Jakarta Metropolitan Railway Network Map." This reduction highlights the need for an analysis of landscape lexical diversity to understand how transposition in the target language can impact both the clarity and the safety of the information being conveyed. Previous research has explored various multilingual and multimodal communication aspects within different contexts. Cortés [4] investigated lexical structure, diversity, and readability in business and management settings but did not fully explore the

acceptance of these concepts in translation analysis [4]. Algyani [5] examined translation strategies and quality assessments across industries, yet this study extends the analysis specifically to the commuter line sector. Even-Zohar [6] linked linguistic variation in children's literature to its broader impacts, providing a foundation for similar explorations within translation studies. Pienimäki, Väisänen, and Hiippala [7] discussed the influence of translation on macro-level lexicon quality, suggesting a need for accuracy assessment in bilingual signage. Helm [8] focused on language diversity and technology, particularly how language modelling biases can cause epistemic injustice, which is relevant to the bilingual lexicon context of this study. These previous studies provide a backdrop against which the current research situates, particularly concerning the need for accuracy and readability in bilingual public signage. Despite the strong bilingual branding of Indonesia's CL system, translation discrepancies have been observed, which could lead to potential miscommunication and compromise passenger safety and readability. The reduction of complex Indonesian phrases to oversimplified English translations, as seen in the case of the Tanah Abang-Rangkasbitung route, risks losing essential information. This issue highlights a broader challenge: how translation readability directly impacts the effectiveness of bilingual information boards in ensuring both readability and safety for local and international passengers. Accurate translation [9] is not merely a linguistic concern but a critical component

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in safeguarding passengers and facilitating seamless navigation within the public transportation system.

This study aims to design the lexical structure of each bilingual lexicon on the Tanah Abang-Rangkasbitung Commuter Line information boards, focusing on the landscape diversity pattern and the translation accuracy parameters. The specific objectives are to:

1. Identify the lexical diversity in bilingual information boards.
2. Evaluate the readability of translations.
3. Provide insights and recommendations for improving the effectiveness of bilingual signage in public transportation systems.

The study focuses specifically on the Green Ring Route of the Tanah Abang-Rangkasbitung Commuter Line, covering 19 CL stations. While the findings offer valuable insights, they may not be fully generalizable to other routes or transportation systems beyond Jakarta. Additionally, the study is limited to the analysis of static signage, excluding other forms of communication, such as digital or audio announcements, which also play a significant role in passenger navigation and safety.

2 Method

This study employs a qualitative descriptive research design using Spradley's Ethnographical Approach [10]. It allows for an in-depth exploration of the lexical diversity and translation readability on the bilingual information boards [11] along the Commuter Line (CL) Tanah Abang-Rangkasbitung route. The ethnographical approach is particularly suited to examining the interaction between language, cultural context, and public information systems [12], offering a comprehensive understanding of how these elements impact readability and safety.

The primary data for this study consists of bilingual information and direction signs located on the Green Ring Route of the Tanah Abang-Rangkasbitung Commuter Line. The route encompasses 19 CL stations, each providing a unique set of signs that reflect the broader linguistic landscape of the commuter system. These signs [13], written in Indonesian and English, are the primary source for analyzing lexical diversity and translation readability.

Data collection involved systematically observing and documenting [14] the bilingual signs across the 19 stations on the Tanah Abang-Rangkasbitung route. Photographic records were taken of each sign to ensure readability in subsequent analysis. The observations were conducted to capture the context in which the signs are placed, providing insights into how passengers interact with these signs and how effectively the signs convey necessary information for safe navigation [15]. In addition to visual documentation, field notes were taken to record immediate impressions and any observed issues with readability or potential safety concerns.

The data analysis followed four distinct stages as prescribed by Spradley's Ethnographical Approach [10]. First, Domain analysis [16] stage focused on identifying and classifying the lexical diversity structure within the landscape of the information signs. The analysis

considered the location of stations and carriages, influencing how translation techniques were applied. It helped establish the broad categories of lexical diversity on the signs.

Subsequently, Taxonomy analysis [16] aimed to reduce the data into linguistic coding. This stage involved evaluating the translation accuracy of the signs based on three parameters: accurate (clear), less accurate (less distortion), and inaccurate (full distortion). The analysis provided a detailed linguistic coding framework that captured the degree of translation fidelity.

The next stage was Componential analysis [17]. the domain and taxonomy analyses were integrated vertically and comprehensively. The componential analysis sought to formulate findings by systematically combining the previous analyses, allowing for a nuanced understanding of the relationships between lexical diversity and translation accuracy.

The final stage namely Cultural Theme analysis [17]. It involved analyzing cultural themes to demonstrate the lexical levels of each bilingual lexicon on the information boards. This analysis focused on identifying patterns of landscape diversity and the structural parameters of translation accuracy, ultimately linking these findings to broader cultural and linguistic practices within the commuter line system.

To ensure the validity of the data, triangulation was employed through multiple data collection methods [18], including direct observation, photographic documentation, and field notes. The data were cross-verified against each method to check for consistency and reliability. Peer debriefing was also conducted with linguistic experts to review the coding and classification processes [17], ensuring that the analyses accurately reflected the observed linguistic phenomena. Member checking was also employed, where preliminary findings were discussed with stakeholders in the KAI Commuter system to confirm the relevance and accuracy of the conclusions drawn from the data. This rigorous approach to data validation enhances the credibility of the study's findings and their applicability to the broader context of bilingual information systems in public transportation.

3 Results and discussion

3.1 The lexical diversity in bilingual information boards

In the Commuter Line Tanah Abang-Rangkasbitung context, the interplay between data, safety indicators, source text, and target text is essential for maintaining passenger safety through effective bilingual information boards. The landscape lexical diversity embedded in these translations is a critical component of safety mitigation, as it captures the variety and range of vocabulary required to meet the needs of a multilingual passenger base. The data includes a spectrum of source texts in Indonesian, translated into English, to ensure that information is accessible to all passengers. These translations are carefully aligned with various safety indicators, such as Informational Safety, Warning Safety, Prohibition Safety,

and Emergency Safety, each serving a unique purpose in guiding and safeguarding passengers. For instance, the translation of *Toilet Difabel* as *Difables' Restroom* reflects an effort to maintain inclusivity within Informational Safety signage, ensuring that facilities are clearly marked and understood by all passengers, including those with disabilities.

Further examination reveals how translations tied to Warning and Prohibition Safety indicators function within this landscape of lexical diversity. The phrase *Jaga dan awasi gawai Anda* which translates as *Caution, always watch out your gadget while charging it*, demonstrates the importance of conveying potential hazards to passengers. This type of warning is crucial in preventing accidents or negligence, emphasizing the need for clarity and immediacy in the target text. Similarly, Prohibition Safety signs, such as *Dilarang lewat di sini*, retain the original Indonesian text without translation, which may pose challenges for non-Indonesian speakers. These instances highlight the complex relationship between the source and target texts and how the translation must adapt to ensure that all passengers, regardless of their linguistic background, can understand and adhere to safety instructions.

Emergency Safety signs, such as *Peta Evakuasi*, translated as "Evacuation Signage," further illustrate the role of lexical diversity in safety mitigation. These signs are particularly critical, as they provide instructions that must be quickly and easily understood during emergencies. The translation employs clear, universally recognized terms, ensuring high readability and effective communication under stress. The careful selection of vocabulary in these cases underscores the importance of landscape lexical diversity in crafting translations that convey essential information and enhance the commuter line's overall safety. By aligning data, safety indicators, source text, and target text within this framework, the Commuter Line ensures that its bilingual information boards are reliable for passenger safety in a multilingual environment.

3.2 The readability of translations

Readability in translation is a crucial aspect of ensuring that the target audience can properly comprehend and engage with the translated text. According to Nida and Taber [19], readability is influenced by vocabulary complexity, sentence structure, and the familiarity of terms in the target language. Newmark [20] also emphasizes that readability is tied to the clarity and fluency of the translation, which should aim to be as natural and comprehensible as possible to the target audience. Venuti [21] discusses the concept of domestication in translation, where the text is adapted to fit the cultural and linguistic norms of the target audience, thus enhancing readability.

High readability ensures the message is immediately clear, without re-reading or additional interpretation. Medium readability indicates that the audience may understand the message but may require some effort or re-reading due to less familiar vocabulary or more complex

sentence structures. Low readability occurs when the translation is difficult to understand due to overly complex language, unfamiliar terms, or lack of adaptation to the target audience's linguistic norms.

Table 1. Componential analysis of determining readability levels.

INDICATOR	SOURCE TEXT	TARGET TEXT	TECHNIQUE	READABILITY
Informational Safety	<i>Toilet Difabel</i>	Difables' Restroom	Borrowing	Medium
Informational Safety	<i>Pos Kesehatan</i>	Medical Room	Literal Translation	High
Informational Safety	<i>Ruang Laktasi</i>	Nursing Room	Literal Translation	High
Warning Safety	<i>Jaga dan awasi gawai Anda</i>	Caution, always watch out your gadget while charging it	Modulation	Medium
Informational Safety	<i>KA Lokal</i>	Local Train	Literal Translation	High
Informational Safety	<i>Stasiun Awal/Akhir</i>	Terminus Station	Adaptation	High
Informational Safety	<i>Difabel</i>	Physically Handicapped	Modulation	Low
Informational Safety	<i>Ibu Hamil</i>	Pregnant Woman	Modulation	High
Informational Safety	<i>Lanjut Usia</i>	Elderly Passengers	Adaptation	Low
Prohibition Safety	<i>Dilarang lewat di sini</i>	<i>Please don't walk here</i>	Literal Translation	High
Informational Safety	<i>Kereta khusus wanita pada jam sibuk</i>	Women-only car during peak hour	Established Equivalent	High
Emergency Safety	<i>Peta Evakuasi</i>	Evacuation Signage	Established Equivalent	High
Informational Safety	<i>Pelayanan Disabilitas</i>	Pasager with Disabilities Services	Amplification	Low

In examining the readability of translations on the Commuter Line Tanah Abang-Rangkasbitung's bilingual information boards, it is essential to consider the influence of translation techniques and the corresponding safety indicators associated with each message. The theoretical frameworks provided by Nida and Taber [19], Newmark [20], and Venuti [21] offer a structured approach to categorizing the readability of these translations into three levels. The table below illustrates how different translation techniques impact the readability of translated texts in relation to their safety indicators.

To formulate discussion, researchers have demonstrated the findings following the Table 1 as follows:

a) High Readability

- 1) *Pos Kesehatan* is translated to *Medical Room* exemplifies high readability by employing Literal Translation, which preserves the original meaning with simple and familiar terms in English. According to Nida and Taber, this approach ensures that the target audience can easily understand and process the information, making it highly effective for informational safety signage.
- 2) *Ruang Laktasi* is translated to *Nursing Room* here maintains clarity and accessibility, ensuring that the message is readily understood by all passengers. Newmark's theory of readability supports this approach, as the translation aligns well with the linguistic norms of the target language.
- 3) *KA Lokal* is translated to *Local Train*; in this case, the use of Literal Translation results in a direct and easily comprehensible translation. The simplicity of the terms ensures high readability, which is critical for ensuring that passengers can quickly identify the nature of the train service.
- 4) *Stasiun Awal/Akhir* is translated to *Terminus Station* applies Adaptation technique to adjust the original text and to fit the cultural and linguistic context of the target audience. This technique, supported by Venuti's domestication theory, enhances readability by using a term ("Terminus Station") familiar and specific to English-speaking passengers.
- 5) *Kereta khusus wanita pada jam sibuk* is translated to *Women-only car during peak hour* employs an Established Equivalent, ensuring that the phrase is culturally appropriate and easily understood. Using a recognized and standardized term contributes to high readability, aligning with Newmark's emphasis on clarity and naturalness in translation.
- 6) *Peta Evakuasi* is translated to *Evacuation Signage*; as an Emergency Safety sign, the translation's high readability is crucial. The Established Equivalent technique ensures that the message is clear and instantly recognizable, essential in emergencies where quick comprehension is necessary.
- 7) *Dilarang lewat di sini* is translated to *Please don't walk here* constructs the translation shifts from a direct prohibition in Indonesian to a polite request in English. Despite the change in tone, the message remains clear and easily understood, contributing to high readability.
- 8) *Ibu Hamil* is translated to *Pregnant Woman* modulates slightly changes the perspective, it

retains high readability by using familiar and straightforward language easily understood by the target audience.

b) Medium Readability

- 1) *Toilet Difabel* is translated to *Difables' Restroom* borrows retains the culturally specific term *Difabel*, which is slightly adapted into English as *Difables*. Although this approach maintains cultural relevance, it introduces a term that may not be immediately familiar to English speakers, resulting in medium readability as some passengers may require additional context to understand the term.
- 2) *Jaga dan awasi gawai Anda* is translated to *Caution, always watch out your gadget while charging* it constructed Modulation technique shifts the structure and phrasing to better fit English norms, but the complexity of the sentence reduces readability to a medium level. Passengers might need to re-read the text to fully grasp the safety warning, which could impact the immediacy of the message.

c) Low Readability

- 1) *Difabel* is translated to *Physically Handicapped* formulated The Modulation technique here results in low readability due to the use of outdated terminology. "Physically Handicapped" is less commonly used in contemporary English, where terms like *Disabled* or *Person with Disabilities* are preferred. It could lead to confusion or a lack of understanding among passengers.
- 2) *Lanjut Usia* is translated to *Elderly Passengers*, experienced the Adaptation technique that adjusts the translation to fit the cultural context, the phrase *Elderly Passengers* may still lack clarity for some readers, especially if it is not immediately clear how this information applies. The resulting readability is low, as the message may not be as accessible or actionable.
- 3) *Pelayanan Disabilitas* is translated to *Passenger with Disabilities Services* employed the Amplification that expands the translation to provide more detail, but it results in low readability in this case. The longer phrase *Passenger with Disabilities Services* might be less direct and harder to process quickly. The mistake in using the singular *Passenger* instead of the plural *Passengers* may confuse readers, as it does not clearly refer to all individuals needing these services. Additionally, the phrase is overly complex and could be simplified for clarity, enhancing readability and ensuring the message is easily understood.

Abang-Rangkasbitung, requires a multi-faceted approach that addresses translation accuracy, readability, and cultural relevance. The following insights and recommendations are derived from analyzing current translation practices and their impact on passenger safety and communication clarity.

High readability ensures passengers can quickly understand and act upon the information presented.

3.3 Insights and recommendations for improving the effectiveness of bilingual signage in public transportation systems

Improving the effectiveness of bilingual signage in public transportation systems, such as the Commuter Line Tanah

Translations should prioritize using simple, familiar vocabulary and sentence structures that align with the linguistic norms of the target audience. For instance, translations like *Pos Kesehatan* to *Medical Room* and *KA Lokal* to *Local Train* exemplify the effectiveness of Literal Translation in maintaining clarity and accessibility. To enhance readability, it is recommended that future translations continue to use straightforward language, avoiding overly complex or technical terms unless necessary.

Cultural and linguistic relevance is critical to ensure translations resonate with the target audience. The use of Adaptation and Established Equivalent techniques, as seen in the translation of *Stasiun Awal/Akhir* to *Terminus Station* and *Kereta khusus wanita pada jam sibuk* to *Women-only car during peak hour*, demonstrates the importance of tailoring translations to fit the cultural context of the target audience. To further improve effectiveness, translators should be encouraged to consider cultural nuances and preferences when selecting terms, ensuring that the translated text is accurate, culturally appropriate, and familiar to passengers.

Low readability and translation discrepancies should be promptly addressed and corrected, such as using outdated or unclear terminology. For example, translating *Difabel* to *Physically Handicapped* reflects the need to update terminology to align with contemporary language norms. Additionally, the error in translating *Pelayanan Disabilitas* to *Passenger with Disabilities Services* underscores the importance of careful proofreading and revision to avoid mistakes that can confuse or mislead passengers. It is recommended that a review process be implemented for all translations involving both linguistic experts and native speakers to ensure that the final product is accurate, clear, and free of errors.

Consistency in translation practices is key to maintaining a uniform level of readability and comprehension across all signage. It involves standardizing translation techniques and ensuring that similar types of information are translated using the same approach. For instance, all informational safety signs should ideally employ Literal Translation or Established Equivalent techniques to maintain clarity and prevent variations that could confuse passengers. A standardized glossary of terms and phrases could be developed and regularly updated to guide translators and ensure consistency across the transportation network.

To ensure that bilingual signage remains effective over time, it is crucial to conduct regular usability testing with diverse groups of passengers, including non-native speakers and individuals with varying literacy levels. Feedback from these groups can provide valuable insights into the effectiveness of translations and identify areas where improvements are needed. Based on this feedback, translations can be revised and updated to meet the needs of all passengers better. Additionally, ongoing training for translators on best practices and emerging trends in translation can help maintain high standards of readability and cultural relevance.

Technology can significantly enhance the accessibility and effectiveness of bilingual signage. For example, integrating QR codes or NFC tags on signage

can provide passengers with access to translations in multiple languages, detailed instructions, or even audio descriptions, which can be particularly beneficial for visually impaired passengers. This approach not only enhances the inclusivity of the transportation system but also ensures that all passengers, regardless of their language proficiency or disability, can access essential information.

4 Conclusion

1. The importance of lexical diversity and readability in ensuring passenger safety underscores that lexical diversity in bilingual information boards is crucial for meeting the needs of a multilingual passenger base. Effective translations that align with the cultural and linguistic context, such as those employing Literal Translation and Established Equivalent techniques, ensure high readability and contribute significantly to passenger safety. Clear and accessible translations enable passengers to quickly comprehend and act upon critical information, particularly in safety-related situations.
2. Consistency and cultural relevance in translation practices are key to maintaining the effectiveness of bilingual signage in public transportation systems. Standardizing translation techniques across all signage and ensuring that terms are culturally appropriate and familiar to the target audience are essential steps. Addressing discrepancies and outdated terminology and implementing a rigorous review process involving linguistic experts can prevent misunderstandings and enhance communication clarity.
3. To continuously improve the effectiveness of bilingual signage, transportation systems should conduct regular usability testing and gather feedback from diverse passenger groups. This feedback should inform ongoing translation revisions, ensuring they remain relevant and clear. Additionally, leveraging technology, such as QR codes and NFC tags, can enhance accessibility by providing multilingual translations and audio descriptions, making the transportation system more inclusive and effective for all passengers.

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