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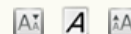
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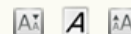
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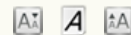
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A Morphological Analysis of the Indonesian Suffixation: A Look at the Different Types of Affixes and Their Semantic Changes

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ABSTRACT

This study delved into the nature of suffixation in Indonesian morphology, analyzing its crucial role in word formation and semantic variations. The present study investigated suffixation patterns, functions, and productivity by scrutinizing a corpus of Indonesian words, i.e., the Indonesian – Leipzig Corpora Collection (ILCC). This exploration used morphosemantics frameworks, two sets of instruments that consisted of verbal construction and noun construction tester, and empirical data to describe suffixation in Indonesian. The results showed that among the various suffixes that shaped the language's grammatical structure, */-kan/* (50.70% with Σ -occurrence: 217,208), */-nya/* (19.53% with Σ -occurrence: 83,648), */-an/* (16% with Σ -occurrence: 68,524), and */-lah/* (7.76% with Σ -occurrence: 33,220) emerged as the most prominent ones. Statistically, the mean value of verb suffixation (5.9) was higher than that of noun suffixation (5.6). Among these, */-kan/* primarily signified causation or transformation of a verb into a transitive verb, while */-nya/* indicated possession, */-an/* transformed verbs into nouns, and */-lah/* added an imperative meaning to the word. In terms of semantic modification and nuances, it has been discovered that suffixes like */-kan/*, */-i/*, and */-an/* change words' semantic structure in complex ways. The suffix */-kan/*, which has a causal or transformational function, modifies the meaning of words by signifying the start of an action. Although */-an/* makes it easier for verbs to become nouns, */-i/* aids in objectification or verbalization. The findings of this study offer implications for the field of Indonesian language description, particularly in the areas of suffixal identification and classification, as well as morphological productivity.

Keywords: affix; corpus-based approach; Indonesian; morphological analysis; semantic changes; suffixation

INTRODUCTION

Indonesian language is renowned for its notable lexical diversity, which can be largely attributed to its intricate morphology mechanisms (Nugraha & Baryadi, 2019; Pasaribu & Nugraha, 2020). One of the most important mechanisms is suffixation, which is crucial in word formation (Booij, 2015; Lieber, 2015b) and semantic elaboration (Cançado & Gonçalves, 2016; Lieber, 2011). In order to create new words and express nuanced ideas in Indonesian, suffixation is an esteemed technique. Word forms can be changed, vocabulary can develop, and language expressiveness can be enhanced by adding suffixes to bare words. Semantic meaning extensions, grammatical

function modifications, word class transformations, and other semantic alterations are all conceivable with suffixes. Suffixes have context-dependent semantic and grammatical characteristics that interact with other components of constructions rather than being inactive. For instance, the suffix */-kan/* might have resultative, applicative, or causative meanings, depending on the form in which it occurs. In the causative construction */membukukan/* ‘to book’, the prefix */-kan/* denotes the agent’s cause of the booking action. In other illustration, */membelikan/* ‘to buy something for someone’ is an example of an applicative construction that uses */-kan/* to expand the action to include the recipient of the purchased.

Furthermore, suffixes are essential in determining the structure and meaning of verbal and noun phrases in the Indonesian language. Suffixes serve as grammatical markers, giving words and phrases more meaning and frequently changing their semantic content and grammatical classification. On the one hand, in verbal constructions, suffixes play a fundamental role in shaping the structure and meaning of verbal constructions, adding layers of grammatical information and semantic distinction to verb forms. These suffixes can modify the verb’s aspect, voice, and directionality and formulate complex verb phrases, enabling reciters to express a wide range of actions, relationships, and intentions. Verbal aspect is a prominent area where suffixes exert their influence. For instance, the suffix */-kan/* in Indonesian indicates the resultative aspect, conveying the outcome or completion of the action. Conversely, the suffix */-lah/* marks the imperative aspect, expressing commands or requests. Another essential function of suffixes is to indicate the grammatical link between the subject and object of the action. In Indonesian, the suffix */-kan/* is frequently used to form causative verbs, indicating that the action is caused or induced by an agent. Suffixes also influence directionality, which is the movement of an action towards or away from a reference point. In Indonesian, the suffix */-kan/* can be used to indicate movement towards the speaker. Voice, indicating the grammatical relationship between the subject and object of the action, is another area where suffixes play a crucial role. The suffix */-kan/* in Indonesian is often used to create causative verbs, emphasizing that the action is caused or induced by an agent. Directionality, the movement of the action towards or away from a reference point, is also affected by suffixes. In Indonesian, the suffix */-kan/* can mark verbs of motion, indicating movement towards the speaker.

On the other hand, suffixes have an indispensable role in determining the structure and meaning of noun formations in the noun constructions. They help to construct and modify nouns, allowing us to communicate a wide range of thoughts and relationships. Suffixes can change verbs into nouns, turning actions into concepts. In Indonesian, the suffix */-an/* converts the verb */makan/* ‘to eat’ into the noun */makanan/* ‘food’. Suffixes can also be used to form adjectives from nouns or verbs, conveying the qualities or attributes associated with those terms. The suffix */-an/* changes the noun */rumah/* ‘house’ to the adjective */rumahan/* ‘homely’, and the verb */buat/* ‘to make’ to the adjective */buatan/* ‘made’. Also, suffixes can show possessive relationships, connecting a possessor to a possessed term. In Indonesian, the suffix */-nya/* indicates possession, as seen in */bukunya/* ‘his/her book’. Lastly, suffixes can be used to produce locative nouns, which denote places or locales related to the activity or thought indicated by the root word. In Indonesian, the suffix */-an/* converts the verb */ujar/* ‘to speak’ into the noun */ujaran/* ‘speech’.

PROBLEM STATEMENT

Previous studies on Indonesian morphology's affixation have expanded our understanding of affixation processes and patterns. In terms of affixation patterns, Chaer (2008) and Kridalaksana (2009) conducted in-depth analyses of Indonesian affixation patterns, emphasizing the affixes' function in word creation. Second, in terms of morphology and semantic shifts, the field of Indonesian morphology has been extensively studied by experts such as Arka & Manning (1998), Isodarus (2023), and Sneddon (1996). These studies have focused on the derivational aspects of the language, particularly the semantic shifts induced by suffixes. Third, in terms of semantic considerations, research conducted by Nugraha (2021, 2022, 2023, 2024a) on the morphosemantic aspects of affixation in Indonesian has brought to light the subtleties inherent in the language's morphological structure by demonstrating the impact of affixes on meaning in various grammatical contexts. Lastly, in terms of corpus-based studies and computational analyses to examine morphological processes in Indonesian, more recent studies have embraced corpus-based and computational methods, as demonstrated by the work of Amalia et al. (2021), Denistia & Baayen (2022), and Muljono et al. (2017). These researchers added actual data to support theoretical frameworks by using quantitative approaches to examine the frequency, distribution, and usage trends of morphemes. In short, Indonesian morphology studies have provided respected evidence about affixation processes' systematic nature and semantic shifts. This information serves as an essential starting point for advance enquiry. Despite the handiness of noteworthy works on the subject, avenues of suffixation in Indonesian morphology still need to be studied.

Even though some studies have been conducted on different aspects of Indonesian morphology, a comprehensive analysis focusing specifically on suffixation still needs to be completed (Schmid, 2015; Stekauer et al., 2012). Therefore, the main objective of this study is to investigate the multilayered nature of suffixation and its influence on the structural composition of the language. I employed a combination of empirical data, linguistic frameworks, and theoretical perspectives to achieve this objective. This study seeks to elucidate the mechanics of suffixation and explore its implications for language usage. Therefore, the research questions are as follows: (1) which affix forms are used in Indonesian suffixation; in the grammatical context of verb and noun construction, what is the frequency distribution of these affixes; and (2) what function do affixes serve in suffixations that change the manner in which Indonesian word formations are grammatically recognized?

LITERATURE REVIEW

The morphology of the Indonesian language is an area of linguistics that numerous theoretical perspectives and frameworks have significantly enriched. Among these, the study of suffixation has played a significant role (cf., Dal & Namer, 2015; Plag, 2020). The first is morphological theory. Morphology is a fundamental aspect of linguistics that explores the structure and formation of words (Bauer, 2019a). Its theoretical underpinnings provide a framework for understanding how morphemes contribute to word formation (Stump & Finkel, 2013). Classical morphological theories, such as structuralism (Motsch, 2015) and generative grammar (Lieber, 2015b) offer insights into the structural aspects of suffixation. Structuralism focuses on the form and distribution of morphemes in language, while generative grammar emphasizes the rules and processes that govern language fabrication.

Second, affixation and word formation. The study of affixation processes, which includes suffixation, is an essential aspect of linguistics. It involves an in-depth exploration of how various affixes combine with roots to create new words and how they alter the meaning of the base word (Štekauer, 2015). This field of study is known as derivational morphology (Kotowski & Plag, 2023; Lieber et al., 2015) and provides a solid foundation for understanding the Indonesian language's productivity, patterns, and semantic shifts induced by suffixation. Third, the semantics of suffixation. Studying suffixes in the Indonesian language and their correlation with semantic nuances is a crucial area of investigation. Through applying semantic theories and frameworks (Haspelmath, 2003), one can gain a deeper understanding of how suffixes modify meaning in the language. These modifications can include changes in aspect, mood, and other semantic dimensions that shape the way the language is used (Aikhenvald & Dixon, 2011; Heusinger et al., 2011).

Lastly, the corpus-based approach. In recent years, significant advancements in the corpus linguistics method have paved the way for empirical investigations into language phenomena (Gries, 2015; Gries & Paquot, 2020). These studies allow for the quantitative analysis of the frequency, distribution, and usage patterns of suffixes in the Indonesian language. The corpus-based approach, however, aids in analyzing the complex linguistic processes involved in suffixation (O'Keeffe & McCarthy, 2022). In summary, this theoretical framework is essential for thoroughly analyzing suffixation within Indonesian morphology.

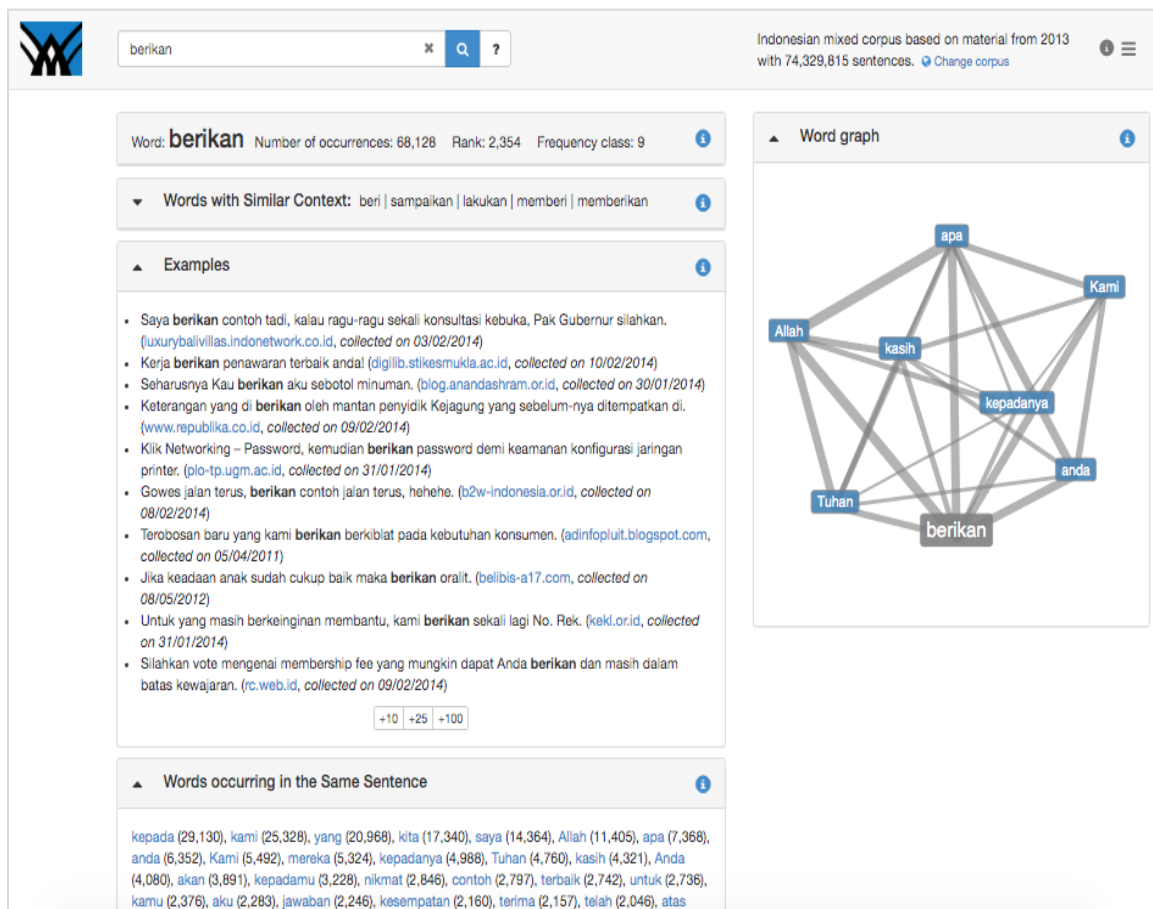


FIGURE 1. The Indonesian – Leipzig Corpora Collection (ILCC)

METHODS

THE CORPUS AND DATA COLLETION

This study used morphology investigation and quantitative examination to analyze suffixation in Indonesian morphology. In the first stage, a corpus selection, data extraction, and data annotation were carried out. A detailed corpus of Indonesian texts covering a wide range of genres and registers was selected, i.e., the Indonesian – Leipzig Corpora Collection (hereafter: ILCC) (website: https://corpora.uni-leipzig.de/en?corpusId=ind_mixed_2013). The ILCC is an Indonesian mixed corpus based on material from 2013. It contains 74,329,815 sentences and 1,206,281,985 tokens (Figure 1). Subsequently, an automated process as illustrated in Figure 2 (this procedure has been done by using the UDPipe, a trainable pipeline for tokenization, tagging, lemmatization and dependency parsing (the package can be accessed via the website: <https://lindat.mff.cuni.cz/services/udpipe/>) and manual annotation extracted words featuring suffixes from the corpus. This process ensured that the extracted data was accurate and reliable and that all relevant words were captured. Each word was annotated with its respective suffix, root, part of speech, and contextual information to facilitate in-depth analysis.

The screenshot displays the UDPipe web interface. At the top, it states the service is freely available for testing and includes a disclaimer about the CC BY-NC-SA license. Below this, there are options to select a model (Indonesian-gsd-ud-2.12-230717 is selected) and actions (Tag and Lemmatize and Parse are checked). An 'Advanced Options' section is visible but collapsed. The 'Input Text' field contains the sentence: "Seharusnya kau berikan aku sebotol minuman." Below the input field is a 'Process Input' button. The 'Output Text' field shows the annotated text in UD-style format, including metadata like generator, model, and license, followed by a list of tokens with their respective morphological and syntactic tags and token ranges.

```
# generator = UDPipe 2, https://lindat.mff.cuni.cz/services/udpipe
# udpipe_model = Indonesian-gsd-ud-2.12-230717
# udpipe_model_licence = CC BY-NC-SA
# newdoc
# newpar
# sent_id = 1
# text = Seharusnya kau berikan aku sebotol minuman.
1 Seharusnya seharusnya AUX D-- _ 3 aux _ TokenRange=0:10
2 kau kau PRON PS2 Number-Sing|Person=2|Polite-Infm|PronType=Prs 3 nsubj _ TokenRange=11:14
3 berikan ri VERB VSA Mood=Ind|Voice=Act 0 root _ TokenRange=15:22
4 aku aku PRON PS1 Number-Sing|Person=1|Polite-Infm|PronType=Prs 5 nsubj _ TokenRange=23:26
5 sebotol sebotol VERB VSA Mood=Ind|Voice=Act 3 xcomp _ TokenRange=27:34
6 minuman minum NOUN NSD Number-Sing 5 obj _ SpaceAfter=No|TokenRange=35:42
7 . . PUNCT Z-- _ 3 punct _ SpaceAfter=No|TokenRange=42:43
```

FIGURE 2. Visualization of Automatic Tokenization and POS-Tagging

DATA ANALYSIS

A quantitative analysis based on morphology and semantics instruments was carried out in the second step. The instruments were the (a) sets of verb categorization and (b) sets of noun categorization; the instruments developed by utilizing the theory of nuclear verbs (Viberg, 1983; Viberg, 2014) and the theory of universal semantic parameters for noun categorization (Aikhenvald, 2006, 2017, 2020). By analyzing the frequency of occurrence and the contexts in which these suffixes were used, the researcher aimed to determine their productivity and distribution across two different linguistic contexts. Then, to gain a deeper understanding of suffixation's role in the language, the study also conducted an in-depth qualitative analysis of the semantic nuances and functional aspects of suffixation. The final stage involved validating findings on Indonesian morphology using quantitative linguistic analysis, utilizing the Kruskal-Wallis test, and cross-referencing them with existing theories to ensure accuracy. Insights from related disciplines, i.e., syntax and semantics, were also considered for a comprehensive understanding.

TABLE 1. Summary of the Occurrences throughout Indonesian Suffixes

Suffixes	Grammatical Context		Σ	(%)	Rank
	Verbal construction	Noun construction			
/-kan/	118,073	99,235	217,208	50.74	1
/-i/	4,664	37	4,701	1.10	7
/-nya/	36,402	47,246	83,648	19.53	2
/-ku/	2,355	983	3,338	0.78	8
/-lah/	32,192	1,028	33,220	7.76	4
/-kah/	6,880	9	6,889	1.61	6
/-mu/	843	610	1,453	0.34	9
/-wan/	0	8,017	8,017	1.87	5
/-wati/	0	22	22	0.01	12
/-wi/	0	0	0	-	-
/-al/	0	0	0	-	-
/-an/	62,428	6,096	68,524	16	3
*-/ken/	13	7	20	0	13
*-/itas/	0	0	0	-	-
*-/onal/	0	0	0	-	-
*-/in/	837	263	1,100	0.26	10
*-/isasi/	0	24	24	0.01	11
TOTAL	264,687	163,577	428,264	100	

Notes:

1. The grammatical context as the experiment's environment has been developed by utilizing two sets of words, i.e., according to the theory of Nuclear Verbs (Viberg, 1983) and the theory of universal semantic parameters for noun categorization (Aikhenvald, 2006).
2. The asterisk symbol (*) indicates the Indonesian language's colloquial suffix and the naturalized suffix (from English).

RESULTS

THE SUFFIXES

In terms of the identification of dominant suffixes, the findings of the corpus analysis conducted on Indonesian morphology showed that a set of suffixes, namely */-kan/* such as in */berikan/* ‘give’, */-nya/* such as in */rakyatnya/* ‘her/his/their people’, */-an/* such as in */buatan/* ‘made’, and */-lah/* such as in */datanglah/* ‘to come-IMPERATIVE’, are the most commonly used ones. These suffixes were observed to be present across different sentences included in the corpus (see Table 1), indicating their widespread usage in the Indonesian language (see Table 2). On the other hand, in terms of the productivity ranking, it has been found that among all the analyzed suffixes, */-kan/* (Σ -occurrence: 217,208) was observed to be the most productive one, followed by */-nya/* (Σ -occurrence: 83,648), */-an/* (Σ -occurrence: 68,524), and */-lah/* (Σ -occurrence: 33,220). These suffixes have shown a higher frequency and versatility in their ability to form new words or modify the meanings of existing ones, either in verbal construction (see Table 3) or noun construction (see Table 4).

TABLE 2. Descriptive Statistics of Suffixation in the Verb and Noun Constructions

N	Verb Suffixation		Noun Suffixation	
	Valid	Missing	Valid	Missing
	10	7	13	4
Mean	5.9		5.6	
Median	0.3		0.02	
Mode	0		0	
Sample Variance	144.1		249.81	
Std. Deviation	12		15.81	
Std. Error	2.9		3.83	
Confidence level (95%)	6.2		8.13	

Moreover, the analysis unveiled the following significant findings. First, the suffix */-kan/*. The suffix */-kan/* emerged as the most frequently used and versatile suffix within the corpus. This suffix’s multifunctional usage spanned across various linguistic contexts, indicating its broad applicability. When used with verbs, consider the example (1), */-kan/* often signifies transformation, causation, and transitivity. Sentence (1) implies causality as it uses the predicate */berikan/* ‘give’ where the subject performs an action for the object or patient. This causative meaning is achieved through the process of suffixation, which transforms */beri/* ‘to give’ into its causative form, */berikan/* ‘give’. Regarding morphosyntax of the sentence, transitivity is added to the root morpheme during affixation, resulting in three arguments: one in the subject and two in the first and oblique objects.

(1) *Seharusnya kau berikan aku sebotol minuman* (ILCC, 2013).

Seharusnya-AUX kau-PRON berikan-VERB aku-PS1 sebotol-NOUN minuman-NOUN
 ‘You should give me a bottle of drink.’

Second, the suffix */-nya/*. In Indonesian, possession or belonging can be conveyed through possessive suffixes. The most commonly used suffix for this purpose is */-nya/*, which indicates that something belongs to or is associated with someone or something else. For example, consider sentence (2), which has the construction */rakyatnya/* ‘his people’. This construction shows the meaning of ownership represented by */the people/* after experiencing suffixation with */-nya/*. Additionally, when referring to possession in the context of the first-person singular, the suffix */-ku/* is used. These suffixes are widely used in Indonesian to express ownership or association with various people, objects, or ideas, especially in the construction of noun.

- (2) *Kepala negara ingin Indonesia menang, seperti juga ratusan juta rakyatnya* (ILCC, 2013).
 Kepala-NOUN negara-NOUN ingin-AUX Indonesia PROPN menang-VERB seperti-ADP juga-ADV ratusan-NOUN juta-NOUN rakyat-NOUN nya-PS3
 ‘The head of state wants Indonesia to win, as do hundreds of millions of his people.’

Third, the suffix */-an/*. Adding the */-an/* suffix is paramount when converting verbs into nouns. Its usage is not limited to nominalization but also denotes collectivity, abstract concepts, or spatial relations. For instance, consider the */buatan/* as an example (3). The verb */buat/* ‘to make’ has been converted into */buatan/* ‘made’ after the suffixation using the */-an/*. The prevalence of this suffix in the language suggests its crucial role in creating innovative vocabulary and broadening the lexicon, i.e., the total occurrence for the verbal construction is 62,428 times and for the noun construction is 6,096 times.

- (3) *Lilin buatan Danang memang terlihat sederhana* (ILCC, 2013).
 lilin-NOUN buatan-NOUN Danang-PROPN memang-ADV terlihat-VERB sederhana-ADJ
 ‘Candles made by Danang do look simple.’

TABLE 3. Suffix Types and Frequency in Verbal Constructions

Suffixes	Reflection of the universal tendencies: nuclear verbs									Σ
	I		II		III	IV	V	VI	VII	
	A	B	C	D	E	F	G	H	I	
<i>/-kan/</i>	2	2,187	68,128	615	2,475	8,887	89	880	34,810	118,073
<i>/-i/</i>	4	4,146	4	5	7	4	14	69	411	4,664
<i>/-nya/</i>	1,726	21,531	32	203	1,579	4,918	440	3,906	2,067	36,402
<i>/-ku/</i>	2	4	86	0	1,912	128	1	132	90	2,355
<i>/-lah/</i>	3,766	8,225	4,879	1,918	5,662	552	5,363	1,809	18	32,192
<i>/-kah/</i>	3	16	7	1	2	0	14	6,727	110	6,880
<i>/-mu/</i>	3	13	22	0	624	127	1	33	20	843
<i>/-wan/</i>	0	0	0	0	0	0	0	0	0	0
<i>/-wati/</i>	0	0	0	0	0	0	0	0	0	0
<i>/-wi/</i>	0	0	0	0	0	0	0	0	0	0
<i>/-al/</i>	0	0	0	0	0	0	0	0	0	0
<i>/-an/</i>	5	58	51	154	60,944	11	11	1,106	88	62,428
<i>*-/ken/</i>	0	0	7	1	0	4	0	0	1	13
<i>*-/itas/</i>	0	0	3	0	0	0	0	0	0	0
<i>*-/onal/</i>	0	0	0	0	0	0	0	0	0	0
<i>*-/in/</i>	3	116	4	116	311	119	97	62	9	837
<i>*-/isasi/</i>	0	0	0	0	0	0	0	0	0	0

Notes:

1. Code for the stem
A: /pergi/ 'to go' D: /ambil/ 'to take' G: /lihat/ 'to see'
B: /datang/ 'to come' E: /buat/ 'to make' H: /tahu/ 'to know'
C: /beri/ 'to give' F: /bicara/ 'to say' I: /ingin/ 'want'
2. Code for the cluster
I: Motion IV: Verbal Communication VII: Desire
II: Possession V: Perception
III: Production VI: Cognition

Lastly, the suffix */-lah/*. The morpheme */-lah/* is commonly used in verbal constructions, especially in the imperative mood. It is typically added to the end of a verb, as in the construction */datanglah/* in a sentence (4), to express a sense of urgency or insistence in the described action. Morphosemantically, this affixation adds an imperative meaning to the word */datang/* 'to come', conveying a command or request for the listener to come to a specific location. In general, */-lah/* is a crucial linguistic tool in Indonesian grammar, enabling speakers to communicate specific nuances and meanings in their speech.

- (4) *Karenanya, datanglah kepada-Nya manakala kesulitan datang mendera* (ILCC, 2013).
Karenanya-SCONJ datanglah-VERB nya-PRON manakala-SCONJ kesulitan-NOUN datang-VERB
mendera-NOUN
'Therefore, come to Him when difficulties come to whip.'

Additionally, the research noted unproductive suffixes in Indonesian verbs and nouns. Four affixes – */-wi/*, */-al/*, */-itas/*, */-onal/* – were found to be not used in either of these contexts of instruments. However, manual searches reveal their presence in the Indonesian language. Suffix */-itas/* as in */rasionalitas/* 'rationality', which is derived from */rasional/*, creating the formation of a noun derived from an adjective. Suffix */-onal/* as in */redaksional/* 'editorial' derived from */redaksi/*, forming an adjective derived from a noun. Besides, the linguistic element */-wi/* is used to create adjectives from nouns, as seen in words like */kimiawi/* 'chemical' from */kimia/*. Similarly, the morpheme */-al/* is another common way to form adjectives from nouns, as seen in words like */praktikal/* 'practical' from */praktik/*. These adjectives often convey a sense of belonging or association with the noun. It is worth noting that */-wi/* and */-al/* have specific grammatical functions and are exclusively used to form adjectives. They are not used to form verbs, which can be a valuable tool for understanding the meaning and function of words within a sentence.

In summary, the Indonesian language heavily relies on suffixes to modify words, transform verbs into nouns, and add specific nuances to the language. The commonly used suffixes in Indonesian morphology are */-kan/*, */-nya/*, */-an/*, and */-lah/*. The */-kan/* suffix indicates the causative aspect of a verb, while the */-nya/* suffix shows the possessive aspect of a noun. The */-lah/* suffix expresses a sense of urgency or insistence in the described action. Finally, the */-an/* suffix is utilized to denote a verb's nominalization or indicate a location or direction. Proper use of these suffixes is essential to conveying the intended meaning accurately in Indonesian.

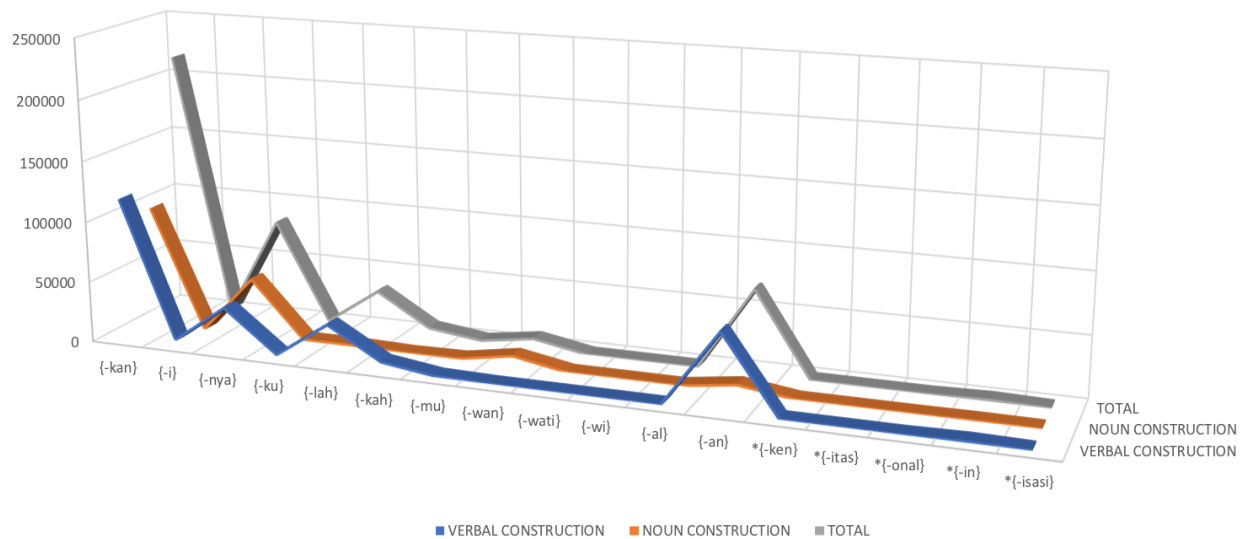


FIGURE 3. Comparison of Suffixation Occurrences in Word Structures

WORD MEANINGS

Suffixes play a decisive function in Indonesian morphology by modifying word meanings and changing their classes. They are an integral part of the language’s grammatical structure and significantly affect the semantic nuances of words. In other words, suffixes play a crucial role in derivational morphology by converting verbs to nouns and vice versa. Thus, they enrich a language’s vocabulary by creating specialized word forms with distinct semantic and grammatical functions. This ability of suffixes to modify and transform words has made them an essential element of the Indonesian language, as they appear in both verbal and noun construction contexts, as depicted in Figure 3.

TABLE 4. Types of Suffixes and Their Frequency in the Usage of Noun Constructions

Suffixes	The parameters of noun classes												Σ		
	I		II		III		IV		V		VI			VII	
	A	B	C	D	E	F	G	H	I	J	K	L			
/-kan/	0	0	0	4	0	0	0	17	36	6	3	99,169	99,235		
/-i/	1	1	0	4	1	2	0	1	21	0	0	6	37		
/-nya/	19,652	484	264	7,386	1,192	3,083	194	478	2,262	615	39	11,597	47,246		
/-ku/	210	18	11	453	40	149	2	5	82	12	0	1	983		
/-lah/	645	4	3	23	67	205	1	2	20	8	0	50	1,028		
/-kah/	5	0	0	0	0	0	0	0	1	1	0	2	9		
/-mu/	193	22	6	303	3	48	4	4	23	2	0	2	610		
/-wan/	0	0	0	7,742	0	0	0	0	0	0	0	275	8,017		
/-wati/	0	0	0	22	0	0	0	0	0	0	0	0	22		
/-wi/	0	0	0	0	0	0	0	0	0	0	0	0	0		
/-al/	0	0	0	0	0	0	0	0	0	0	0	0	0		
/-an/	4	5	26	18	0	0	0	94	102	5,189	3	655	6,096		
*{-ken/	0	0	0	0	0	0	0	0	0	0	0	7	7		
*{-itas/	0	0	0	0	0	0	0	0	0	0	0	0	0		
*{-onal/	0	0	0	0	0	0	0	0	0	0	0	0	0		

*/-in/	0	0	0	0	0	0	0	4	6	1	0	252	263
*/-isasi/	0	0	0	0	0	0	0	0	0	24	0	0	24

Note:

1. Code for the stem

A: /rakyat/ 'the people'	E: /pria/ 'male'	I: /merah/ 'red'
B: /arwah/ 'spirit'	F: /wanita/ 'female'	J: /kuning/ 'yellow'
C: /ratu/ 'princess'	G: /lingkaran/ 'circle'	K: /ajeg/ 'steady'
D: /bangsa/ 'nation'	H: /kotak/ 'square'	L: /guna/ 'function'

2. Code for the cluster

I: Humanness	IV: Shape	VII: Functional Properties
II: Animacy	V: Form	
III: Gender	VI: Consistency	

On the one hand, regarding the semantic modification, the Indonesian language is known for its rich and complex system of suffixes. Qualitative and quantitative analysis of these suffixes has revealed that they introduce a variety of semantic nuances to the language. For example, the suffix */-kan/* often indicates causation or transformation, implying that the verb's action is being done to something or someone else. This suffix is commonly used to create transitive verbs, indicating that a subject is causing something to happen to an object. Therefore, this suffix, when appended to a base form, frequently engenders transitive verbs. By virtue of this affixation, the semantic representation undergoes a critical shift, as the resultant verb denotes an action initiated by the subject that directly impacts upon an object. This process effectively expands the lexicon with nuanced expressions of causation, highlighting the subject's agency and the object's role as the recipient of the action.

On the other hand, concerning word class alteration, one exciting aspect of the Indonesian language is suffixing's role in altering word classes. When a suffix is added to a word, it can completely change its meaning and function within a sentence. For example, adding the suffix */-an/* frequently transforms verbs into nouns, enriching the language with a diverse array of nominal forms. Appended to verb stems, */-an/* frequently engenders a nominalization process, demonstrably expanding the nominal lexicon. This suffixation fosters the creation of a diverse array of nominal forms, each imbued with a distinct semantic nuance. The incorporation of */-an/* not only contributes to the morphological complexity of the Indonesian but also serves as a vital role in the construction of intricate and precise sentence. This addition not only adds to the complexity but also allows for more precise and nuanced sentences. By enabling the derivation of nouns that directly correspond to the action denoted by the verb, */-an/* facilitates the expression of fine-grained semantic distinctions. Thus, in turn, allows for a nuanced portrayal of events and states.

Furthermore, according to the findings of the Kruskal-Wallis test, as detailed in Table 5, it has been observed that the alteration of word meanings is significantly impacted by the process of suffixation. This test has resulted in identifying the precise degree or value of differences among the various suffixes that were listed in the two experiments, both in verbal construction and noun construction.

The test is mainly used to test two groups of hypotheses, namely the verbal construction group and the noun construction group. In the verbal group, the hypothesis formulations are (a) H_0 : There are no significant differences in the realization of verbal construction in the suffixation context, and (b) H_1 : There are significant differences in the realization of verbal construction in the suffixation context. Meanwhile, in the noun group, the hypothesis formulations are (a) H_0 : There are no significant differences in the realization of noun construction in the suffixation context and (b) H_1 : There are significant differences in the realization of noun construction in the

suffixation context. The test statistic for the Kruskal-Wallis test, designated as H, has the following definition:

$$(5) H = \left(\frac{12}{N(N+1)} \sum_{j=1}^k \frac{R_j^2}{n_j} \right) - 3(N+1)$$

where N is the overall sample size, n_j is the sample size in the j^{th} group, R_j is the sum of the ranks in the j^{th} group, and k is the number of comparison groups.

TABLE 5. The Statistically Significant Difference Between the Affixes of Indonesian Suffixation

Grammatical Context	Asymptotic Significance	Accepted Hypothesis
Category 1: Verbal Construction	0.01	There are significant differences in the realization of verbal construction in the suffixation context.
Category 2: Noun Construction	0.01	There are significant differences in the realization of noun construction in the suffixation context.

Notes:

1. The Kruskal-Wallis test has been performed by utilizing the SPSS 27. This test is mainly to support the qualitative analysis on semantic role of affixes in suffixation.
2. The statistical test is a method for comparing differences between multiple independent groups. When the test reveals a significant difference between groups, it implies that one sample group has a higher median value than another. The group difference is statistically significant when the asymptotic significance value is less than 0.05, indicating a low likelihood of obtaining such a result by chance. Therefore, the observed difference is likely due to the independent variable being studied.

In the verbal construction, the */-kan/* in Indonesian is a multipurpose suffix commonly used to indicate causation or transformation in verbs. When added to a verb, it transforms the original verb into a causative verb, indicating that the sentence's subject is causing the action to happen. For example, sentence (6), the verb */bicara/*, which means 'to say', can be transformed into */bicarakan/*, which means 'to make someone say something'. In this case, adding the */-kan/* suffix indicates that the sentence's subject is causing someone else to say something. This suffix can be added to a wide variety of verbs to create new words with different meanings.

(6) *Sung Ra, ada hal yang perlu aku bicarakan denganmu* (ILCC, 2013).

Sung Ra-PROPN ada-VERB hal-NOUN yang-CONJ perlu-VERB aku-PRON bicarakan-VERB denganmu-ADP

'Sung Ra, there's something I need to talk to you about.'

In addition, the structure of Indonesian language features a unique grammatical construction involving suffixes to transform nouns into verbs. One suffix is */-kan/*, critical in this transformation process. Adding to a noun changes the word's meaning from a static concept to an action-oriented one. For example, sentence (7), consider the noun */guna/*, which means 'function'. When the suffix */-kan/* is added to it, it changes to */gunakan/*, which now means 'to function'. This change reflects a shift from a noun representing a state or object to a verb denoting an action. Thus, the suffix */-kan/* is a useful tool for creating dynamic verbs from otherwise static nouns.

(7) *Atau lebih baik lagi, gunakan headphone peredam suara* (ILCC, 2013).

Atau- CON- lebih-ADV baik-ADJ lagi-ADV gunakan-VERB headphone- NOUN peredam-NOUN
suara-NOUN

‘Or better yet, use noise-cancelling headphones.’

Semantic change is a process in language where a word’s meaning changes over time. One such process is called nominalization, which involves turning a verb into a noun. This semantic change can be done by adding the */-an/* suffix to the base verb or other word forms. The resulting noun usually represents a concrete object or concept related to the original action or process. For example, in sentence (8), the verb */buat/*, meaning ‘to make’, can become */buatan/*, which means ‘made’. The */-an/* suffix is often used to show collectivity, abstract concepts, or spatial relations and is frequently associated with food-related nouns.

(8) *Mobil buatan Eropa menyudahi hegemoni Jepang* (ILCC, 2013).

Mobil-NOUN buatan-NOUN Eropa- PROPN menyudahi-VERB hegemoni- NOUN Jepang- PROPN
‘European-made cars ended Japanese hegemony.’

A notable finding has been made about the semantic role of the suffix */-i/* and its ability to change the meaning of words. Although not highly used, */-i/* can indicate the objectification or verbalization of a noun, leading to a change in meaning. The use of the */-i/* suffix in the construction of */merahi/* ‘reddden’, as seen in (9), is particularly noteworthy. In this context, the noun */merah/* has been transformed into */merahi/* by adding the */-i/* suffix. This suffix verbalizes the noun and gives it an imperative meaning, instructing someone to color something red. This demonstrates the impact of the */-i/* suffix in modifying the meaning of words and its potential influence on sentence structure and communication.

(9) *Tolong merahi baris kalimat ini* (ILCC, 2013).

Tolong- PROPN merahi-VERB baris-NOUN kalimat-NOUN ini-DET
‘Please give this line (of sentence) a red color.’

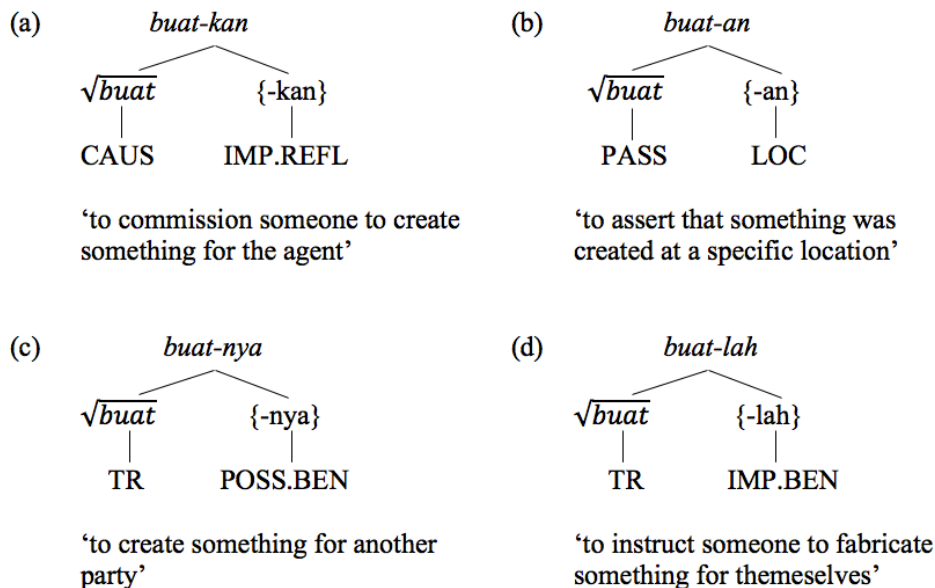
Within the Indonesian morphological landscape, derivational suffixes play a pivotal role in shaping word meaning and grammatical function. These morphemes, appended to root words, orchestrate a semantic and syntactic transformations. A prime example lies in the ability of suffixes like */-kan/* and */-an/* to modulate word class membership. The addition of */-kan/* to verbs, for instance, frequently engenders causative counterparts, while */-an/* acts as a prolific nominalizing agent, deriving nouns from their verbal kin. This process not only expands the lexicon but also injects a nuanced spectrum of meaning. The resultant derived words, imbued with distinct semantic shadings, empower the language to express complex ideas with utmost precision. Furthermore, suffixes like */-nya/* contribute to the expression of definiteness and possession, further enriching the communicative potential of Indonesian. Additionally, */-i/* can introduce instrumentality or directionality, adding a layer of semantic precision to verbs. In essence, these suffixes act as linguistic sculptors, meticulously shaping words to convey a multitude of meanings and contextual subtleties.

DISCUSSION

THE TYPES OF AFFIXES IN INDONESIAN SUFFIXATION

The research findings have shed light on the significant role of specific suffixes in Indonesian morphology. Among the various suffixes that shape the language's structural landscape, */-kan/*, */-nya/*, */-an/*, and */-lah/* emerged as the most prominent ones. The study highlighted the productivity of the */-kan/* suffix, which is used extensively to create new words and modify the semantics of existing ones. The suffixes */-nya/* and */-an/* also play a significant role in word formation and semantic modification, indicating their importance in Indonesian. The multifunctional nature of these suffixes underscores their significance in Indonesian morphology and their contribution to the language's richness and complexity (cf., Fuentes, 2024; Nugraha, 2017). For instance, consider example (10) as follows.

- (10) A morphological cartography of suffixation within the verbal context of lexical item *buat* 'make'.



In terms of the dominance of critical suffixes, according to the study, the most common and adaptable suffixes in Indonesian are */-kan/*, */-nya/*, */-an/*, and */-lah/*. These suffixes became primary linguistic tools that greatly influenced word construction and meaning changes. These suffixes are ubiquitous in a variety of linguistic contexts. According to Ribbens-Klein (2023), as a morphological affix, the suffix is crucial in forming novel words. As Dressler & Ransmayr (2023) claimed, in the context of inflective languages, i.e., Austrian Standard German, suffixes also play a similar role in the process of creating new words. Voeikova (2023) also reported that suffix behavior in the grammatical context tends to be a catalyst for new word formation even in the Russian colloquial language.

Regarding the productivity and functional versatility of the suffixes that were found, */-kan/* was the most productive (see Figure 4 and 5). It was found to be quite versatile when applied to verbs, meaning that it might indicate transitivity, transformation, or causality. Furthermore, the

productive */-an/* and unproductive */-i/* demonstrated their flexibility in nominalization, and verbalization, respectively. These suffixes' versatile nature reflects the vital contributions they have made to Indonesian's linguistic productivity. According to Parshina & Puzynina (2024), productivity, a linguistic concept, can be assessed through finite and infinite approaches, further classified as open and closed paradigms. In closed paradigms, words are formed by adding affixes and suffixes, while in open paradigms, words are used without any such modification. As Gabric (2024) claimed, the closed one is the bordered one, and the open one is the unbordered one.

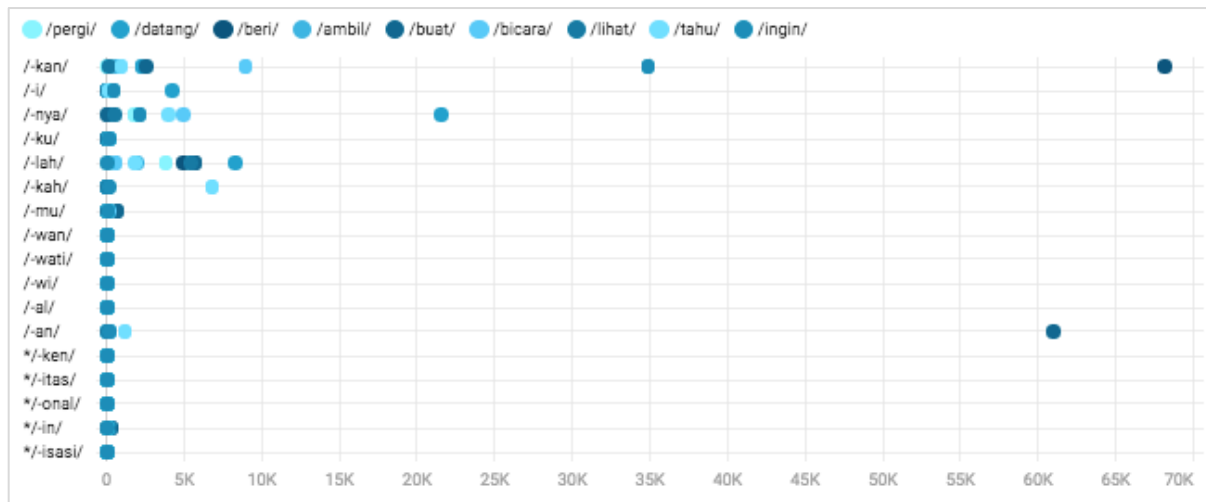


FIGURE 4. Suffixation in the Verbal Constructions

In terms of semantic and lexical expansion, these suffixes introduce semantic alterations that are essential to the expansion of the language's lexicon. The suffix */-kan/*, for example, changes verbs into causative forms or denotes a shift in the action or state. Suffix */-i/* indicates objectification or verbalization, whereas */-an/* makes it easier for verbs to become nouns and adds a variety of nominal forms to the language. According to Bauer (2019b), semantic expansion in morphology is the process of giving words or morphemes that already exist additional meanings. On the other hand, the process of introducing new words to a language is known as lexical expansion. As Fejes (2023) claimed, lexical expansion can occur not only when suffixes from the internal system of the language are used but also from systems outside the language.

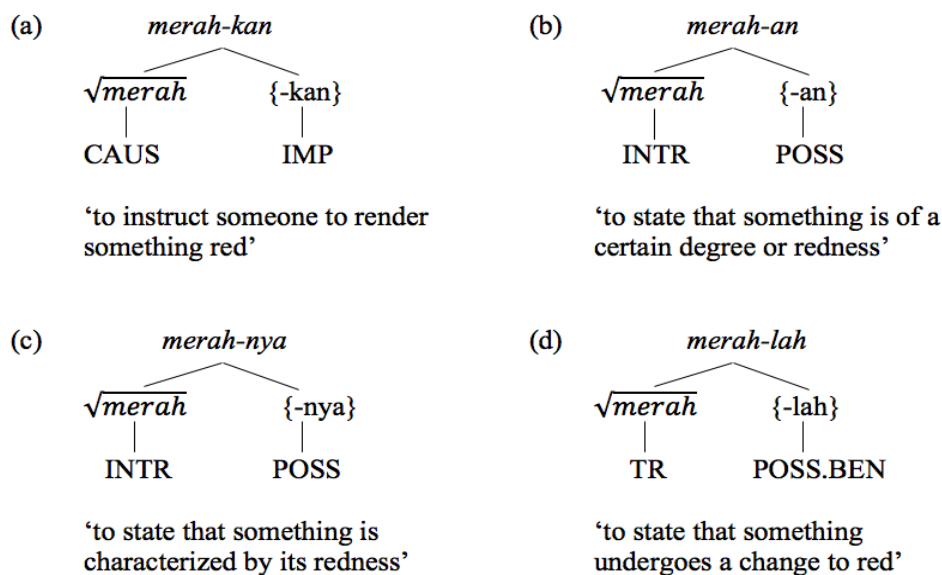
Moreover, using suffixes in language is crucial to grammatical rules. In Indonesia, the frequency and patterns of using suffixes reflect both the grammatical standards and the linguistic occurrences of the language. The language's linguistic structure is shaped by the grammatical effects, which indicates the dynamic interaction between language usage and structural circumstances. As convincingly argued by Lieber (2015a), suffixes contribute to word construction, part-of-speech shifts, grammatical linkages, and effective word creation, which makes them essential to grammatical rules. This aligns with the broader perspective offered by Dressler et al. (2023), who emphasize the universality of suffixes as vital components across all languages. The intricate interplay between suffixes and word forms in Indonesian, as explored in this study, serves as a compelling illustration of their fundamental contribution to grammatical frameworks.

THE SUFFIXES AND THEIR PIVOTAL ROLE

In the Indonesian language, suffixes have been found to play a crucial role in modifying the meanings of words and transforming their grammatical classes. The four most commonly used suffixes in Indonesian are /-kan/, /-nya/, /-an/, and /-lah/. Among these, /-kan/ primarily signifies causation or transformation of a verb into a transitive verb. On the other hand, /-an/ transforms verbs into nouns. These suffixes have remarkable semantic versatility and facilitate the creation of new words by attaching them to the existing roots. Moreover, they allow for the transformation of verbs into nouns and vice versa. Thus, using these suffixes is one of the most significant aspects of Indonesian grammar and its lexical expansion (cf., Nugraha, 2024b; Meinschaefer, 2023).

Studying suffixation in Indonesian morphology has shed light on suffixes' significant influence on word meanings and word classes. This process is a crucial aspect of the language, allowing for a nuanced expression of ideas and concepts. According to Cassio (2023), suffixes are morphological parts that can be fundamental in the context of discourse markers. As Stefanowitsch & Middeke (2023) claimed, the meaning produced through suffixation is a logical consequence of the spectrum of meanings that can emerge from morphological probability distributions. These distributions, shaped by historical precedent and governed by systematic regularities, constrain the possible semantic interpretations that can emerge upon suffixation. The specific suffix employed, in conjunction with the semantic properties of the base form, acts as a selectional mechanism, guiding the interpretative process towards a particular meaning within the spectrum of possibilities. This probabilistic framework underscores the systematic nature of suffixal meaning derivation. The resultant meaning, therefore, is not an arbitrary consequence of affixation, but rather a logical product shaped by the interplay between these morphological forces. As an exemplification, please refer to example (11).

(11) A morphological cartography of suffixation within the nominal context of lexical item *merah* 'red'.



In terms of semantic modification and nuances, it has been discovered that suffixes like */-kan/*, */-i/*, and */-an/* change words' semantic structure in complex ways. The suffix */-kan/*, which has a causal or transformational function, modifies the meaning of words by signifying the start of an action. Although */-an/* makes it easier for verbs to become nouns, */-i/* aids in objectification or verbalization. According to Lieber (2001), suffixation is a very practical approach to generate new words for a variety of reasons. For instance, English words like */treatment/* that indicate the outcome of an action are frequently formed with the suffix */-ment/*. As Nagano (2023) claimed, semantic change occurs naturally in all languages and can happen at any time.

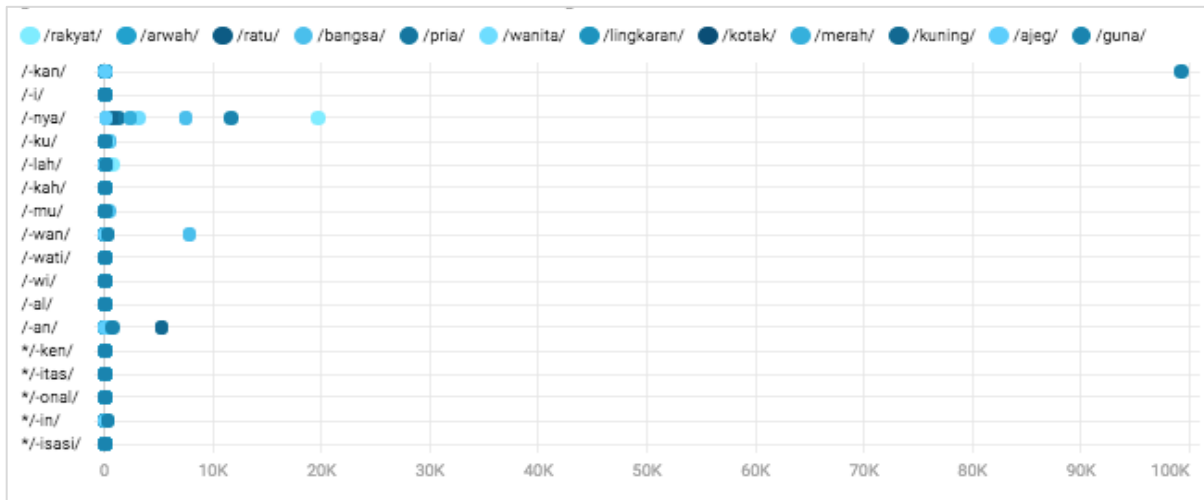


FIGURE 5. Suffixation in the Noun Constructions

In terms of the alteration of word classes, one notable result of suffixation was the modification of word classes. Nouns were easily generated from verbs, expanding the vocabulary of the language. This process made easier by suffixes like */-an/* and */-i/*, allows the language to convey ideas, actions, or entities in a variety of ways, increasing its expressiveness. According to Manova (2011), suffixes can alter a word's grammatical purpose. For instance, an English adjective can become an adverb by adding the suffix */-ly/*, as in the cases of */quickly/* and */sadly/*. As Borer (2017) claimed, suffixation is a relatively simple and efficient way to create new words.

In terms of lexical expansion, suffixes were essential in helping the language acquire more vocabulary since they made it possible to create new words and give them more complex meanings. This suffixation-driven vocabulary expansion adds to the language's adaptability by enabling the articulation of a wide range of thoughts, ideas, and behaviors within Indonesian morphology. According to Bauer et al. (2015), suffixation is a relatively prevalent way to produce new words in English. As Körtvélyessy et al. (2020) claimed, there is a creative tendency in all languages, whether a language is agglutinative or inflectional.

In terms of functional adaptability in communication, suffixes' functional flexibility modifies word meanings and adapts them to different language settings, facilitating accurate communication. This flexibility makes it easier for speakers to communicate effectively by allowing them to express behaviors, conditions, or ideas in subtle ways that are consistent with their intended meaning. According to Luschützky (2015), suffixation is essential for conveying a broad range of attitudes, moods, and stylistic subtleties. As in */sadness/* or other English adjectives, the suffix */-ness/* can be employed to accentuate the adjective. Also, Binder's (2024) insights

regarding the role of affixes in the development of scientific terminology highlight the capacity of suffixation to bridge lexical gaps and facilitate the growth of languages across diverse domains. Suffixes, therefore, serve as crucial building blocks not only for everyday language but also for the expansion of specialized vocabularies across disciplines.

THE IMPLICATIONS OF SUFFIXATION IN PRACTICAL LANGUAGE USE: A PROPOSAL

The current research on Indonesian suffixation provides a foundation for understanding the intricate morphological processes at play in the language. However, expanding the discussion to encompass the practical implications of suffixation could enrich the analysis. Here, I can explore two key areas: language learning and computational linguistics applications. First, language learning. In terms of morphological awareness, understanding suffixation patterns can be crucial for language learners. By analyzing how suffixes alter a word's meaning and grammatical function (e.g., */-kan/* for causative verbs, */-nya/* for possession), learners can move beyond rote memorization and develop a deeper grasp of word formation. This knowledge can empower them to generate new words and comprehend complex sentences with greater ease (cf., Hamada & Yanagawa, 2023; Isono, 2024; Lozinska & Hendriks, 2024; Marra et al., 2020). As to reduce cognitive load, suffixation patterns offer predictability in language. Learners can leverage this regularity to efficiently infer meaning and build vocabulary (cf., Alanazi, 2023; Seixas-Lima et al., 2022). For instance, recognizing the suffix */-an/* as transforming verbs into nouns allows learners to predict the meaning of unfamiliar words like */gubahan/* (lit. composition) from the verb */gubah/* (lit. to compose). Concerning transferability, insights into suffixation in Indonesian can benefit learners acquiring other languages with similar morphological systems. By identifying common patterns across languages (e.g., causative suffixes like */-kan/* in Indonesian and */-rare/* in Japanese) (cf., Aoyagi, 2021; Son & Cole, 2008).

Second, computational linguistics applications. In connection with morphological analysis tools, the present research provide data for developing morphological analysis tools. By identifying the most frequent suffixes and their functions, computational linguists can create tools that automatically segment words into their root and suffix components, aiding tasks like text mining and sentiment analysis (cf., Hwang, 2024; Spring & Johnson, 2022). With reference to machine translation, suffixation poses challenges for machine translation systems. Accurately translating a word requires understanding how its suffixes contribute to meaning and grammatical function (cf., Belete et al., 2024; Polio & Yoon, 2018; Rhee & Khammee, 2024). The research on prominent suffixes like */-kan/* and */-nya/* can inform the development of algorithms that can effectively identify and translate suffixes, leading to more accurate and nuanced translations. Regarding part-of-speech tagging, suffixes offer valuable clues for part-of-speech tagging, a crucial task in natural language processing (cf., Chromá et al., 2024; Harel et al., 2024). The study's findings on how suffixes like */-an/* converts verbs to nouns can be utilized to train algorithms to accurately identify word categories in Indonesian text. By incorporating the understanding of suffixal meaning into these algorithms, one can bridge the gap between computational models and the intricate morphological processes that govern Indonesian grammar. For instance, this study has the potential to enhance automatic sense or meaning disambiguation within morphosemantic phenomena, such as light verb constructions (e.g., Nugraha, 2024c; Nugraha & Vincze, 2024).

Therefore, this morphological analysis of Indonesian suffixation presents a springboard for further exploration. By investigating its implications in language learning and computational linguistics, the study's significance extends beyond language description. For language learners, understanding core suffix functions and their impact on meaning can equip them to tackle word formation and semantic nuances more effectively. Furthermore, incorporating these findings into pedagogical materials can lead to the development of targeted exercises that address specific challenges learners face with suffixation. In the realm of computational linguistics, knowledge of suffixation patterns can improve morphological analysis tools and machine translation accuracy. Additionally, research into part-of-speech tagging can be enhanced by incorporating the insights gleaned from suffixation patterns. Overall, investigating these broader applications paves the way for a more comprehensive understanding of Indonesian suffixation and its influence on both language acquisition and technological advancements.

CONCLUSION

This investigation of suffixation in Indonesian morphology has shed light on the frequency and semantic changes. These results highlight the crucial function that suffixes, particularly */-kan/*, */-nyal*, */-an/*, and */-lah/*, play in determining the structural makeup and semantic subtleties. Notwithstanding the examination, there are several restrictions on this study. It is possible that the corpus utilized does not fully capture the range of linguistic variances seen in all Indonesian areas and social groupings. While the ILCC undoubtedly offers valuable data, it might not fully encompass the Indonesian dialects and sociolects. Languages exhibit geographical and social variations, and the corpus might be skewed towards a specific register. This could potentially limit the generalizability of the findings to the entirety of the Indonesian language. Examining data from diverse sources, including regional newspapers, social media platforms, or dialect-specific corpora, could provide a more comprehensive picture of Indonesian suffixation across different settings. Furthermore, the study's scope may have missed any recent linguistic changes that could have an impact on suffixation usage. The study's focus on a specific corpus raises a question about the potential impact of recent linguistic changes on suffixation usage. Languages are constantly evolving, with new words emerging and existing ones potentially undergoing semantic shifts. The corpus used in this research might not capture the most recent trends, particularly if it does not include data from dynamic sources like social media or contemporary news outlets. Examining the use of suffixes in these evolving contexts reveal if their functions or frequency are undergoing any modifications, offering a more up-to-date picture of Indonesian suffixation.

In order to obtain a more comprehensive understanding of suffix usage within Indonesian morphology, it may be worthwhile to pursue several avenues of inquiry. Firstly, longitudinal studies that monitor language changes and evolving suffixation patterns over time. Secondly, investigating the pragmatic implications of suffix usage in discourse structures could also illuminate the nuanced functions of suffixes in communication. Finally, comparative analyses with other Austronesian languages or languages in the region could reveal cross-linguistic suffixation patterns and typological variations. In conclusion, further research is required to fully grasp the complexity, variances, and changing nature of suffix usage within this miscellaneous linguistic landscape.

ABBREVIATIONS

ADJ: adjective; ADP: ad-position; ADV: adverb; AUX: auxiliary; BEN: benefactive; CAUS: causative; CONJ: conjunction; DET: determiner; IMP: imperative; INT: intransitive; LOC: locative; PASS: passive; POSS: possessive; PRON: pronoun; PROPN: proper-noun; PS1: first person; PS3: third person; REFL: reflexive; SCONJ: subordinating conjunction; TR: transitive

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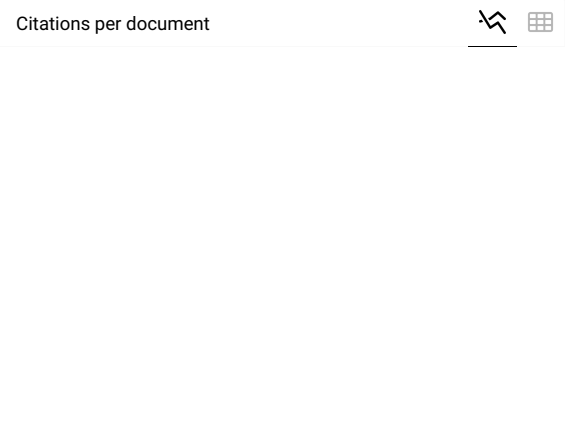
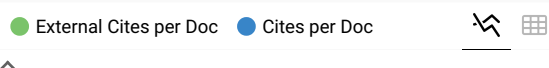
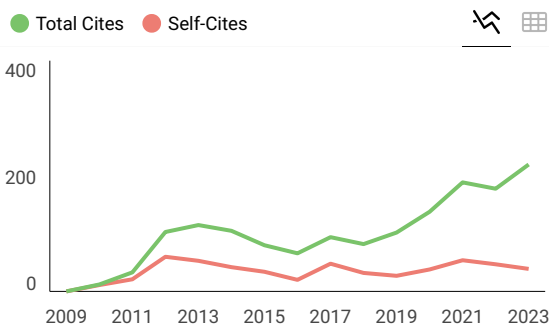
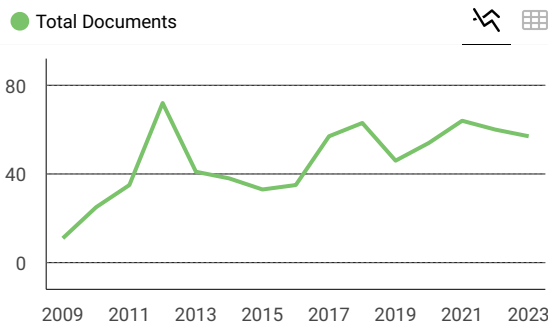
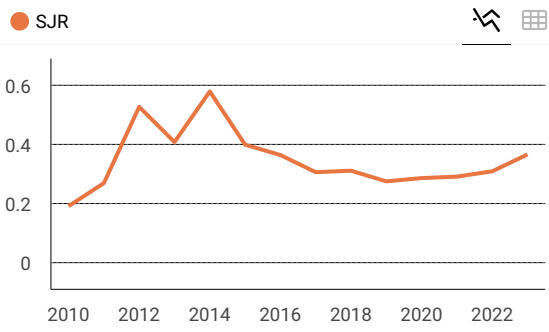
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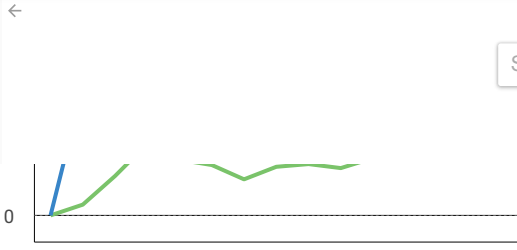
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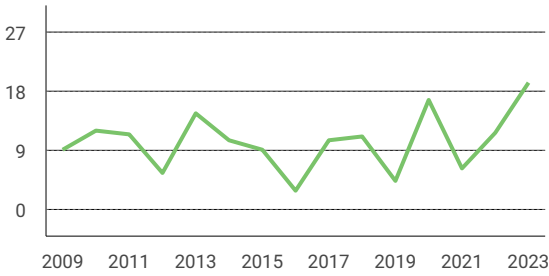
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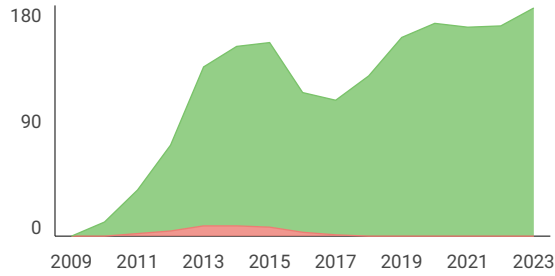
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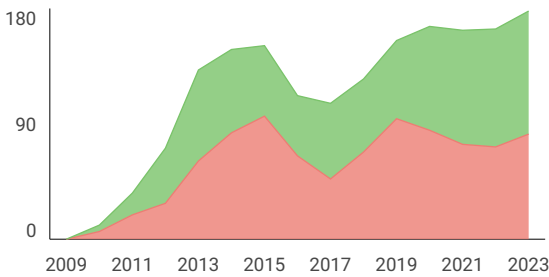
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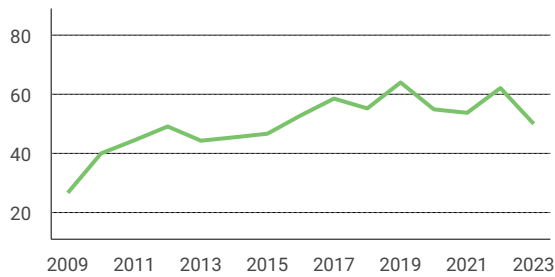
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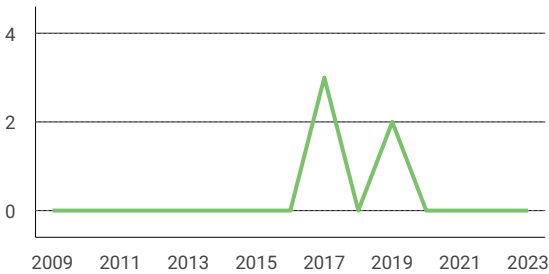
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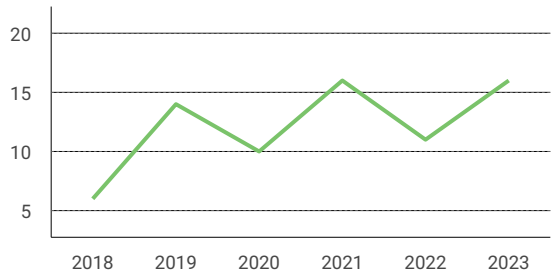
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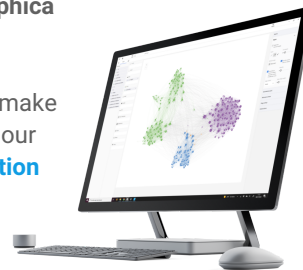
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