



The morpho-phonology of noun class prefixes in Bantu languages and the synchronic change in some selected Bantu languages

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This paper seeks to account for the synchronic sound changes observed in joining of noun class prefixes to nouns in Swahili, Lingala, Ciluba, and Zulu. The noun class prefixes of these Bantu languages were compared with the Proto-Bantu noun class-forms to identify sound changes the languages have undergone over time. It was observed that some sound changes did not obey synchronic rules. The aim of this study was to elaborate on diachronic rules, specifically telescopic rules, to explain why some sound changes in Bantu language evolution stand out as exceptions, giving the impression of violating the neo-grammarians' claim about the regularity of sound change. A special focus is placed on the nasal place of articulation assimilation, which in some conditioning environments, is favourable for assimilation, but fails to occur in Swahili. The findings of this paper provide robust evidence for why the nasal phoneme of some noun classes does not assimilate in place of articulation with the adjacent neighboring segment, as is usually observed in Bantu languages. This study also attempts to explain why the noun class 9/10 nasal prefixes in Swahili assimilate in place of articulation with the following adjacent stop but not the nasal bilabial prefix of noun class 1 and 3. The findings address the concern of whether the synchronic rule of nasal assimilation in Bantu languages could account for this apparent irregularity.

KEYWORDS: Synchronic rule, telescopic rule, Bantu languages, diachronic rule, Proto-Bantu noun-class prefixes, noun-class, nasal place of articulation assimilation, historical linguistics

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The Bantu expansion in the sub-Saharan region resulted in the diffusion of Bantu languages. The series of physical migrations of the Bantu population across Africa resulted in the settlement of Bantu-speaking linguistic communities in the geographical

areas which extend from western Cameroon across the Central African Republic, the Republic of Congo, the Democratic Republic of Congo, Uganda, northern Kenya and a part of the southern Somalia. It is claimed that Bantu languages originated from southwest Adamawa (Blench, n. d., p. 147). Understanding the changes which have taken place in Bantu languages will shed light on “the reconstruction of the broader ethnolinguistic history of the region” (Blench, n.d., p.147).

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Bell (1972) investigated the reflexes of the proto-Bantu noun class prefixes of class 1, 3, 4, 6, and 18 --- mu-, mi-, and ma- ----- by comparing them in 84 Bantu languages. He used the intragenetic comparison approach by Greenberg (1969). The claim of his hypotheses predicted that syllabic nasals arise from sequences of m+ rounded high vowel, rather than m+ unrounded high vowel. The findings of Bell's study confirmed his hypotheses and provided relevant details of syllabic nasals in Bantu languages.

The current study also applied the intragenetic comparison (see Greenberg, 1969), comparing several languages in the Bantu family. The geographical distribution of these languages were restricted to sub-Saharan region of Africa, specifically in North-West, North-East, central and south regions of sub-Saharan Africa. Existing literature claims that syllabic nasals result from the sequence of a nasal + a vowel of which the nasal syllabifies after the deletion of the vowel. Hyman and Ngunga (1997), investigating the Ciyao language, claimed that the nasal from *mu- is typically syllabic, while the nasal from *NC loses its syllabicity. Hyman (2005) further argued that nasal syllabification in Bantu is restricted to phonetic configuration of non-morphemic-internal nasal-oral consonant (NC-) sequences (p.43). It is observed that the prefix vowel has been lost in many Bantu languages resulting in the syllabification of the prefix nasal or non-syllabification of the prefix nasal (Bell, 1969). The reflexes of this diachronic derivation (nasal syllabification versus non-nasal syllabification) raise some challenging questions which need to be answered. For example, the issue of why, in the same phonetic environment (deletion of the vowel), some nasals syllabify while others do not. The non-syllabicity of a nasal after the vowel is syncopated is counterintuitive and I predict that only diachronic rules can account for its apparent irregularity.

It is worthwhile defining and contrasting diachronic rules to synchronic rules at this point in order to shed light on the understanding of the concepts in the paper. Diachronic rules are those which capture and symbolically represent linguistic changes as they have affected language development through time. An instance of a diachronic rule would be the case of a telescopic rule. Telescopic rules consist of displaying and depicting the intermediary changes a linguistic item has gone through as a result of previous rule(s) applied between the initial form of the linguistic item and its current form. For instance, considering the equation A-B-C-D of which A and D are observable on the surface and in which D is the initial form of the linguistic item prior to any change and A its current form after a series of

rules/changes B-C have applied sometime in the past. The telescopic rule stretches the equation A-D to A-B-C-D in order to display and understand the intermediary changes that have taken place to shed light on how the linguistic item has changed from D to A. It is the stretching of the rules that uncover a series of changes a linguistic item has gone through which confers this rule the characteristic of a telescope. Synchronic rules, in contrast, capture and symbolically represent linguistic changes as they have occurred at a single period in time (Campbell, 1998).

The analysis of the present study is based on the fragmentation of the morpho-phonological forms, as Bantu languages are agglutinative. I focus on the system of grammatical agreement, as dictated by respective noun classes. I identify the noun class prefixes in each language and contrast it to the proto-Bantu noun class form in order to identify changes that occurred. Telescopic rules are applied and interpreted in order to depict the development of sound changes and to account for the synchronic rules which prevail across the selected Bantu languages.

I hypothesize that the singular noun class prefix made up of a nasal plus a high vowel is always reduced to a syllabic nasal as the high vowel which is the nucleus of the prefix syllable is syncopated.

The research questions I will answer are:

- Why do single nasal phonemes of some noun classes not assimilate in the place of articulation with the adjacent neighboring segment, as is always observed in Bantu languages?
- Why do the noun class 9/10 nasal prefixes in Swahili assimilate in place of articulation with the following adjacent stop but not the bilabial nasal prefix of noun class 1?
- Could the synchronic rule of nasal assimilation in Bantu languages account for this apparent irregularity?

While the focus of this study is on the nasal sounds and the synchronic nasal place of articulation assimilation in the selected Bantu languages, attention is also paid to some other synchronic sound changes observed in the targeted Bantu languages.

The Proto-Bantu noun-class prefix system

Several reconstructions of the Proto-Bantu noun-class prefixes have been suggested in the literature. Those forms agree in the semantic system of the

categorization of the Bantu noun classes and they reconstruct those classes in 25 classes. Likewise, those noun class prefixes are organized within a similar syllable structure system in which the syllable is always built around either a high or low vowel which acts as the nucleus of the syllable plus an onset segment which is made up of either a nasal or a stop. Only in rare cases is a lateral suggested as the onset.

I consider in this study three reconstructions of the Proto-Bantu noun-class prefixes by Guthrie (1967), Welmers (1973), and Meeussen (1967). The three reconstructions present more similarities of nominal class prefixes in Bantu languages than ever. Meeussen (1967) differs from Welmers (1973) in the onsets of the noun class prefix in class 2, 8, and 14 whereby the former reconstructs the voiced bilabial stop /b-/ as the onset of the noun class prefix syllable, while Welmers (1973) reconstructs it with a voiced labio-dental fricative /v-/. One other major difference which separates Meeussen from Welmers is the reconstruction of the nucleus of the monosyllabic noun class prefix syllable. While Meeussen reconstructs the nucleus with a high back vowel */-u-/ in class 1, 3, 11, 13, 14, 15, and 18, as in respectively *mu-, *mu-, *du-, tu-, *bu-, *ku-, *ku-, and *mu-, Welmers, however, reconstructs the nucleus with the middle counterpart, that is, a middle back vowel */-o-/ in the respective classes. Another difference between Meeussen and Welmers resides in their reconstruction of the front vowel as the nucleus of the noun class prefix syllable. In 4, 5, and 7 Meeussen reconstructs the nucleus with a high front vowel */-i-/ , while Welmers reconstructs it with a middle counterpart */-e-/; such are the cases as in *mi- as opposed to *me-, -i- as opposed to le-, and ki- as opposed to ke-. Meeussen's class 9 and 10 substantially differ from Welmers' classes 9 and 10 in the fact that in the former system of nomenclature both classes are reconstructed with the alveolar nasal /n-/ standing thus away from the CV pattern of the monosyllabic structure of the noun class prefix in the Proto-Bantu system. Also, Meeussen's reconstruction does not specify whether this single morpheme prefix is syllabic once it is appended to a noun. Welmers, however, reconstructs this class 9 with an alveolar nasal plus a front middle vowel /-e-/ as in the form *ne-. He also provides an alternative reconstruction of the class 10 with *ne- and *li-. This reconstruction is plausible and robust to my understanding as it conforms to the principle of majority as all the noun-class prefixes in Proto-Bantu are of CV structure.

In this study I have adopted Meeussen's reconstruction with an adaptation in class 9 whereby

the prefix is adapted to *ni- rather than the original *n- which he presented and class 10 is adapted with a *li- as it was reconstructed by Welmers.

Noun class prefixes

The following table specifies the class and morphological marking of several prefixes in Proto-Bantu. The class prefix in the Proto-Bantu form is first entered followed by examples from each language. The intention was to provide cognates as examples in each class; however this was achieved only in cases where cognates were possible to be provided. Examples were provided to account for the synchronic changes observed in the language. Proto-forms were provided in order to figure out the telescopic rule which without the diachronic information it would be impossible to account for. This is the case with the nasal assimilation in Swahili.

Phonological analysis of Swahili and comparison with Proto-Bantu

Our analysis starts with the sound changes which are related to nasal prefixes in Swahili (Table 1). The choice of Swahili is motivated by the plausibility of evidence it offers in its synchronic state. The analysis starts by isolating a noun class prefix form in Swahili, discusses its phonological interaction with the neighboring segment and then compares it to the Proto-Bantu form to explain the possible changes it has gone through, before any attempt to account for the synchronic rule.

The first Proto-Bantu noun class prefix form was *mu- which has become m- in Swahili as in 1a. The noun class 1 prefix in Swahili has undergone syncope as the high back vowel -u- has been deleted in front of a consonant, as in the case mentioned above. However, the same high back vowel was maintained in a word stem beginning in a vowel but underwent a change to become a semi-vowel -w- as in 1b.

Example (1a)

Proto-Bantu	Swahili Cl.1	Example	Meaning
*mu-	m-	m-tu	"a person"
(1b) *mu-	mw-	mw-ana	"a child"

In (1a), the diachronic rule of this sound change can be written as:

*-u- > Ø/___C

(1b) could be stated as:

*-u- > w/___v

Table 1. Noun class prefix forms in Proto-Bantu and selected Bantu languages

Class	Proto-Bantu	Swahili	Lingala	Ciluba	Zulu
1	*mu-	m - mtu, mwana,	mu- mo- mutu, mwana	mu- muntu, mwana	Umu- umuntu
2	*ba-	wa- watu, wana	ba- Batu, bana	ba- Bantu, baana	aba- abantu
3	*mu-	m- mti, mkila	mu- mo- mukila, munoko	mu- mukila, muchi	Umu- Umuthi, umsila
4	*mi-	mi- miti, mikila	mi- mikila, minoko	mi- mikila, michi	imi- imithi
5	*(d)i-	Ji-/Ø Jicho, jino	li- lisu, lino, litoyi	Ji- Jisu, jinu, jitama	ili- iliso
6	*ma-	ma- macho, meno	ma- misu, mino, matoyi	ma- mesu, menu, matama	ama-
7	*ki-	ki- ch- kiti, chakula	e- ebonga, etabe	Ch- Chamu, chibota	isi- isihlalo
8	*bi-	vi- vy- viti, vyakula	bi- bibonga, bitabe	bi- biamu, bibota	izi-
9	*n-	n- ny- ngombe, nyoka	n- ny- ngombe, nyoka	n- ny- ngombe, nyoka	in- im- inyoka
10	*n-	n- ny- ngombe, nyoka	n- ny- ngombe, nyoka	n- ny- ngombe, nyoka	izin-, izim- inyoka
11	*du-	u- ukuta, nyakati	lo- lolemo	lu- luendu,	
12	*ka-		ka- ka	ka- kantu, kaana	
13	*tu-		tu-	tu- tw- tuntu, twaana	
14	*bu-	u- uhuru, wema	bo- boboto, bondeko	bu- buloji, bualu	
15	*ku	ku- kw- kulala, kwenda	ko- kolala	ku- kw- kulala, kwamba	uku- ukulala
16	*pa-	pa- hapa		pa- pambelu	
17	*ku-	ku- huku		ku- kumbelu	
18	*mu-	mu- humu		mu- mumbelu	

Considering classes 3 and 4 in the Proto-bantu form, the former underwent the same changes as the one which is attested in class 1. However, its counterpart which is a plural form did not undergo any change despite the fact that it also has a high front vowel as the nucleus of the syllable, as illustrated in example (2a & b) respectively.

Example (2a)

Proto-Bantu	Swahili cl. 3	Example	Meaning
*mu-	m-	m-ti	“a tree”

(2b)

Proto-Bantu	Swahili cl. 4	Example	Meaning
*mi-	mi-	mi-ti	“trees”

Likewise, the Proto-Bantu noun class 6 prefix did not undergo any change in Swahili because: firstly, it is the plural form of the class 5; secondly, the nucleus vowel of the prefix is not a high vowel, and so it does not change. The example (3) illustrates the constant of this prefix in Swahili.

Example (3)

Considering the synchronic rule of nasal assimilation in Swahili in which a nasal sound assimilates in place of articulation with the adjacent following stop as in *m-toto*, the question is why in this case the bilabial nasal sound does not take the place of articulation of the following stop to become an alveolar nasal sound *n*? The synchronic rules of nasal place of articulation have failed to account for this irregularity. Only the diachronic rule is able to offer a plausible explanation to this apparent irregularity. In fact, first I posit that a nasal place of articulation assimilation in Bantu languages is sensitive to syllable boundaries; that is, a nasal sound will not assimilate in the place of articulation with a stop which belongs to another syllable. As an illustration, considering the example (1a), the noun class 1 prefix was originally made up of a bilabial nasal sound *m-* as the onset plus the nucleus vowel – *u-* which was deleted resulting in the syllabification of the nasal. As nasal sounds are sensitive to syllable boundary, the bilabial nasal sound *m-* could not assimilate in place of articulation with the following stop *t*. Therefore, we have a syllabic *m-* as the initial syllable in the word *m-tu* marking the class noun of the word without being homorganic with the following alveolar stop.

Likewise, considering the noun class 3 prefix *m-* in (4), the bilabial nasal *m-* does not assimilate in place of articulation with the following alveolar stop *d* as illustrated in the following example.

Example (4)

Proto-Bantu	Swahili cl. 4	Example	Meaning
*mi-	m-	m-ti	“tree”

In (4), the bilabial nasal sound *m-* does not assimilate in place of articulation with the following adjacent alveolar stop *t* because the latter is the onset of the following syllable. The bilabial prefix is a syllabic one which has resulted from the syncope of the nucleus vowel from that noun class prefix. Therefore, the syllable boundary prohibits the assimilation of the bilabial with the following alveolar. As a result, the two segments are not realized as homorganic sounds as that could be observed in usual cases.

Let us contrast this case with example (5) in which the synchronic rule of place of articulation nasal assimilation is observed.

Example (5)

Mbali /^mbali/

In (5), the bilabial nasal */m-/* has assimilated in place of articulation with the adjacent neighboring bilabial voiced stop */b/* resulting in a homorganic articulation. The assimilation was possible only because both the assimilated segment and the conditioning one belong to the same syllable. However, the place of articulation assimilation in (4) was blocked by the syllable boundary. Otherwise, the assimilation would have produced the form *nti* in which the nasal and the oral alveolar would be homorganic.

The diachronic rule accounting for this sound change could be stated as:

*mu-/*mi- (sing) > m- / # ____ C

This rule explains the syllabicity of the bilabial nasal noun class 1 prefix in Swahili. As nasal sounds are sensitive to syllable boundary in Bantu languages as I posited it, the latter could not assimilate with the onset of the adjacent syllable.

Considering class 9 and 10 in the Proto-Bantu noun class prefixes, the forms in class 9 and 10 are *n-* in Swahili. These classes present some cases which create an irregularity as the case is compared with the illustrations which are discussed in the case of class 1. In fact, the alveolar nasal noun class 9 and 10 prefixes assimilate in place of articulation with the adjacent neighboring onset of the following syllable as in (6) creating thus an irregularity in terms of our observation in this study. We need to apply the telescopic rule in order to account for this apparent exception.

Example (6)

Proto-Bantu	Swahili cl. 9	Example	Meaning
*n-	n-	ŋgo ^m be ~ ŋo ^m be	“cow”

In (6), the alveolar nasal noun class 9 prefix assimilates in place of articulation with the adjacent neighboring voiced velar */g/* to become a nasal

Proto-Bantu	Swahili cl. 6	Example	Meaning
*ma-	ma-	ma-cho	“eyes”

velar sound */ŋ/* and then the conditioning segment deletes. As a result we have */ŋo^mbe/*, in which the nasal alveolar has taken the place of articulation of

the following velar. This assimilation raises a number of questions which need to be systematically answered: why is it that in the case of the bilabial nasal in class 1 the place of articulation assimilation was not possible yet it is possible in the case of class 9? Is the alveolar nasal prefix of class noun 9 syllabic or not? Does it share the syllable with the following onset of the noun stem once it is appended to the stem? Is it sensitive to syllable boundary as what was observed in class 1? Once more, the synchronic rule will not be able to account for this situation.

I thus posit that the Proto-Bantu noun class 9 prefix was a monosyllabic made up of the alveolar nasal *n- acting as the onset of the syllable followed by the high front vowel *-i- acting as the nucleus of the syllable. It is class 10 which has only the alveolar nasal *n- as the Proto-Bantu prefix form. In positing so, I just agree with Welmers reconstruction of class 9 in which he had *ne- as the reconstructed form of the class; I readjust it adopting the high front vowel *i as the nucleus. This reconstruction was also suggested by a number of Bantuists. I keep the form in class 10 as it was reconstructed by Meeussen with the single morpheme *n-.

Looking at class 9 with consideration to example (7), the place of articulation assimilation in *ndizi* “plantain” is justified by analogical extension with class 10. In fact, *ndizi* in class 9 resulted from the deletion of the nucleus vowel resulting in a syllabic nasal *n-*, but with analogical extension with class 10 in which the prefix was *n-* and did not undergo any syncope *n-* was not syllabic. Therefore, it was always appended to the onset of the following syllable allowing thus the place of articulation assimilation with the following adjacent neighboring consonant. As people were co-articulating the nasal with the onset of the following syllable in class 10, by analogical extension they also started co-articulating the syllabic nasal prefix of class 9 with the onset of the following syllable resulting in a place of articulation assimilation that is observed in the modern form of Swahili.

Example (7)

Proto-Bantu	Swahili cl. 9	Example	Meaning
*ni-	n-	<i>ndizi</i>	“plantain”

The analogy was also extended from class 9 to class 10 when the noun class 9 prefix *ni-* had to be appended to a noun stem starting with a vowel as in (10). Whenever the class 9 prefix was attached to a stem beginning with a vowel, the alveolar nasal *n-* plus the nucleus *-i-* of the prefix changed to *n-* as in the following example.

We may capture this sound change by the telescopic rule which reads as follows in class 9:

*ni- > ŋ > n > N/___C

This rule interprets that the Proto-Bantu *ni- changed to become a syllabic alveolar-nasal *ŋ-* after the high front vowel which was acting as the nucleus of the prefix syllable syncopated. Then by analogical extension with class 10, the syllabic alveolar-nasal *ŋ-* was reanalyzed as a non-syllabic nasal *n-* which by losing the syllabic feature the syllable boundary was also lost and this loss of syllable boundary exposed the alveolar-nasal *n-* to place of articulation assimilation. Therefore, the nasal *n-* could take and share the place of articulation of the adjacent neighboring stop which was the onset of the following syllable. As a result, rather than having the form such as *ŋ-dizi* in which the prefix is an alveolar syllabic nasal sound, the nasal *N* assimilates to the place of articulation of the following onset /d/ producing the homorganic sound /^hd-/ as seen in /ⁿdizi/. Likewise, the nasal *N* assimilates in place of articulation with the adjacent neighboring velar sound *-g-* which is the onset of the initial syllable of the noun stem *-go^mbe*, resulting in a velar nasal which is co-articulated with the following velar stop *g* as illustrated in (8). Moreover, the alveolar-nasal prefix of noun class 9 changed to become a bilabial nasal sound *m-* after it has been assimilated in place of articulation with the adjacent neighboring bilabial stop *-b-* in (9) as the latter was the onset of the initial syllable which was in direct contact with the prefix.

Example (8)

Proto-Bantu	Swahili cl. 9	Example	Meaning
*ni-	ŋ-	ŋ ⁺ -go ^m be > N-go ^m be > ŋgo ^m be > ŋo ^m be	“cow”

Example (9)

Proto-Bantu	Swahili cl. 9	Example	Meaning
*ni-	ŋ-	ŋ ⁺ -boga > N-boga > ^m boga	“Vegetables”

In (8) and (9), the telescopic rule has shown the development of sound change in Swahili up to its present state as it is captured by the synchronic rule.

Example (10)

Proto-Bantu	Swahili cl. 9	Example	Meaning
*ni-	n-	Nyoka/ noka/	“snake”

The same form is now used by analogical extension from class 9 into class 10 in which the

prefix does not have any front high vowel as nucleus. As a result the singular and plural forms are neutralized by this similarity. It is only clear when the subject prefix is attached to the verb stem: *i-* for the singular and *zi-* for the plural case.

The high back nucleus vowel **-u-* of noun class 1 and 15 prefix in Proto-Bantu changed in Swahili into *-w-* when the noun stem to which the prefix was attached started in a vowel. This sound change was regular across different noun class prefixes which contained that vowel. Example (11) illustrates the issue.

Example (11a)

Proto-Bantu	Swahili cl. 1	Example	Meaning
*mu-	mw-	mw-ana	“child”
(11b) *ku-	kw-	kw-enda	“to go”

In class 2, the Proto-Bantu noun class prefix **ba-* underwent a change also. The voiced bilabial stop *b*, the onset of the prefix syllable changed to become a voiced bilabial approximant *w-* as illustrated in (12).

Example (12)

Proto-Bantu	Swahili cl. 2	Example	Meaning
*ba-	wa-	wa-tu	“people”

Diachronic rule: **b > w*

In (12), the bilabial voiced **b* becomes a voiced bilabial approximant *w*.

A number of onset prefix syllables have undergone changes. The voiced alveolar stop **d* in class 5 underwent change to become the affricate *dʒ*; while the alternative monosyllabic prefix **i-* was deleted resulting in zero prefix in some noun class 5 words. Both cases are respectively illustrated in (13a) and (13b). The noun class 7 prefix **ki-* changed to *ch-* before a noun stem which starts in a vowel (see 14a); the Proto-noun class 8 prefix **bi-* changed into *vi-* before a consonant, while the nucleus of the same Proto prefix syllable in **bi-* changed to become *-y-* in front of a vowel as illustrated respectively in (14b) and (14c).

Example (13a)

Proto-Bantu	Swahili cl. 5	Example	Meaning
*di-	ji- /dʒ/-	jicho / dʒiʃo/	“eye”

Diachronic rule: **di > ji*

Example (13b)

Proto-Bantu	Swahili cl. 5	Example	Meaning
*i-	∅	tunda	“fruit”

Diachronic rule: **i > ∅*

Example (14a)

Proto-Bantu	Swahili cl. 7	Example	Meaning
*ki-	ch- /ɟ/	chakula /ɟakula/	“food”

Diachronic rule: **ki- > ch-*

Example (14b)

Proto-Bantu	Swahili cl. 8	Example	Meaning
*bi-	vi-	viti	“chairs”

Diachronic rule: **bi > vi*

Example (14c)

Proto-Bantu	Swahili cl. 8	Example	Meaning
*bi-	vy-	vyuo	“colleges”

Diachronic rule: **bi > vy-/_V*

The Proto-Bantu noun class 11 prefix also underwent a change. The voiced alveolar stop **d* was deleted on the onset of the monosyllabic prefix when followed by a high back rounded vowel *u* as in (15).

Example (15)

Proto-Bantu	Swahili cl. 11	Example	Meaning
*du-	u-	ukuta	“wall”

Diachronic rule: **du- > u-*

In classes 13, the onset bilabial stop **b-* deleted resulting in a monosyllabic prefix which is only made up of the high back rounded nucleus vowel *u-* as illustrated in (16a).

Example (16a)

Proto-Bantu	Swahili cl. 14	Example	Meaning
*bu-	u-	uhuru	“freedom”

Then, the prefix vowel *u-* of noun class 14 changed in front of a vowel to become the semi-vowel *w-* as in (16b).

Example (16b)

Proto-Bantu	Swahili cl. 14	Example	Meaning
*bu-	u- > w-/_V	wema	“goodness”

Ordering rules in class 14

**bu- > u-*

And then, *u- > w-/_V*

The bilabial voiced stop **b-* was deleted resulting in the high back rounded vowel *u-* as the prefix of class 14. Finally, the *u-* split to produce *w-* in front of a vowel but *u-* in front of a consonant as illustrated in (16a) and (16b).

Phonological analysis of Lingala and comparison with Proto-Bantu

The proto-Bantu prefix vowel **u* of class 1 in **mu-* changed to become the semi-vowel *w-* when it occurred before a vowel as in (17) while the prefix vowel **u* of class 3 **mu-* and 11 **du-* split to *o* and *u* as illustrated in respectively (18a) and (18b).

Example (17)

Proto-Bantu	Lingala cl. 1	Example	Meaning
*mu	u- > w- /__V	mwana	“child”

The alveolar stop prefix consonant **d* of class 11 in **du-* and class 5 **di-* changed to become the alveolar lateral *l* in respectively (18b) and (19).

Example (18a)

Proto-Bantu	Lingala cl. 5	Example	Meaning
mu----	u- > u/o	munoko/ monoko	“mouth”

Example (18b)

Proto-Bantu	Lingala cl.11	Example	Meaning
*du	do- > lo-	lolemo	“Tongue”
	du- > lu-	lulemu	« Tongue »

Example (19)

Proto-Bantu	Lingala cl. 5	Example	Meaning
*di-	li	lisu	“eye”

Class 7 underwent a chain of changes. The proto-Bantu prefix **ki-* changed in which the high front vowel **i-* lowered to become *e-* and then the initial velar stop **k* syncopated resulting in a monosyllabic prefix which was made up of the nucleus *e-* in (20).

Example (20)

Proto-Bantu	Lingala cl. 7	Example	Meaning
*ki-	e-	ebonga	“stool”

Classes 14 and 15 underwent changes also. The prefix vowel **u* was lowered to become *o* in both classes 14 and 15 as illustrated in respectively (21a) and (21b).

Example (21a)

Proto-Bantu	Lingala cl. 14	Example	Meaning
*bu	bo-	boboto	“peace”

(21b)

Proto-Bantu	Lingala cl. 15	Example	Meaning
*ku	ko	kolala	“to sleep”

Class 15 marks the infinitive.

Phonological analysis of Ciluba and comparison with Proto-Bantu

Ciluba has partially undergone the same change as Swahili with respect to class 5 and 7. In class 5, the prefix consonant **d* changed to become *j* as in (22), and the noun class consonant prefix **k-*, the voiceless velar stop changed to become the voiceless post-alveolar affricate *tʃ* as in (23).

Example (22)

Proto-Bantu	Ciluba cl.5	Example	Meaning
*di-	ji- /dʒ/	jisu / dʒisu/	“eye”

Example (23)

Proto-Bantu	Ciluba cl. 7	Example	Meaning
*ki-	ch- /tʃ/	chanza / tʃaʒa/	“hand”

The alveolar stop prefix consonant **d* in class 11 underwent change to become an alveolar lateral *l* as in (24).

Example (24)

Proto-Bantu	Ciluba cl.11	Example	Meaning
*du	lu-	luendu ~lʷendu	« voyage, trip »

Finally, the proto prefix vowel **u-* in class 13 changed to *w-* in front of a vowel, and then the conditioning vowel lengthened as in (25).

Example (25)

Proto-Bantu	Ciluba cl. 14	Example	Meaning
*tu	tw	tʷ	a:na kids

Diachronic rule: *tu > tw-/_V
 And then, v > v:

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In class 1, an archi-vowel was inserted in prefix initial position and then the said vowel underwent umlaut with the proto prefix vowel resulting in a disyllabic prefix of which the inserted vowel makes the initial monosyllable made up of only the nucleus as in (26).

Example (26)

Proto-Bantu	Zulu cl. 1	Example	Meaning
*mu-	umu	umu*tu	“person”

In (26), the diachronic rule which captures this change reads as:

Diachronic rule: Ø > V/#__mu-
 And then, V > u-/#__mu

This change is also observed in *abantu* and *imithi*, to name but a few.

In class 5, the alveolar stop *d in *di- changed to become an alveolar lateral l, and then an archi-vowel was inserted in prefix initial position. Finally, the inserted vowel underwent umlaut with the proto prefix vowel.

Example (27)

Proto-Bantu	Zulu cl. 5	Example	Meaning
*di--	li- > Vli- > ili-	iliso	“eye”

Diachronic rule: *di- > li- > Vli- > ili-

In class 7, there was a chain of sound change of which the voiceless velar stop proto prefix *ki- changed to voiceless post-alveolar affricate *ch-*, then it changed to voiceless alveolar affricate *tsi-*, then it changed to the voiceless alveolar fricative *si-*, and then there was insertion of an archi-vowel in prefix initial position resulting in *Vsi-* and the inserted vowel underwent umlaut then became *isi-* as in (28).

Example (28)

Proto-Bantu	Zulu cl. 5	Example	Meaning
*ki-	isi-	isihlalo	“chair”

The telescopic rule which accounts for this change reads as follows:

*ki- > ch- > tsi- > si- > Vsi- > isi-

In class 8, the proto prefix *bi- changed to become *vi-* and then *zi-*, then the archi-vowel was inserted resulting in *Vzi-*, then the inserted vowel underwent umlaut resulting in *izi-*. Likewise, in class 9 the proto prefix *ni- had a vowel inserted in prefix initial position resulting in *Vni-* and then the vowel underwent umlaut to become *ini-*, and finally the conditioning vowel which caused umlaut was deleted with the result such as the nasal became part of the following syllable thus assimilated in place of articulation with the onset of the initial syllable of the noun stem. These changes are presented in the following rules.

Telescopic rule in class 8: *bi- > vi- > zi- > Vzi- > izi-

Telescopic rule in class 9: *ni- > Vni- > ini- > in-

In class 10, *n- by analogy at a certain point in the history became *ini-* the pre-final stage of noun class 9 prefix, and then there was insertion of *z-* in prefix initial position to make the difference between the singular and the plural form. Then, as this form did not observe the uniformity of the syllable structure paradigm in which the initial syllable of the disyllabic prefix was a vowel, there was analogical leveling with the syllable of other prefixes resulting in the insertion of an archi-vowel which later umlauted with the prefix vowel. Finally, the conditioning vowel which caused umlaut syncopated.

Telescopic rule: *n- > ini- > zini- > Vzini- > izini- > izin-

Discussion

This study has shown that the proto-Bantu prefix vowel *u- was the most vulnerable and that ninety-eight percent (98%) of vowel changes have affected the high back rounded vowel across the Bantu languages included in our analysis. It was syncopated in class 1 and 3 in Swahili causing the syllabification of the nasal prefix consonant, specifically the bilabial nasal *m-. The proto-Bantu prefix *u- has undergone change to become w- in Swahili, Lingala, and Ciluba class 1; in Swahili and Lingala class 15, and in Lingala class 13. This change was conditioned by the initial vowel of the

noun stem in those respective noun classes. Finally, the high back rounded proto-Bantu prefix vowel *u- was split to u- and o- in Lingala class 1 and 3, and the u- and o- merged into o- in class 11, 14, and 15.

In Zulu, an archi-vowel was epenthesized in every noun class prefix in initial position creating an extra syllable which is made up of only the nucleus. Then, the archi-vowel underwent umlauting with the proto-Bantu prefix vowel. The high front unrounded proto-Bantu prefix vowel *i- was either changed to a glide before a vowel (see class 8 in Swahili) or it affected the onset of the prefix when the noun stem to which the prefix was appended started in a vowel. Therefore, the prefix onset phonological features were changed resulting in completely another segment as in the case of the velar stop *ki- and the alveolar nasal *n- in class 7 and 9 which changed respectively to *ch-* /tʃ/ and *ny-* /ɲ/ in Swahili and Ciluba and across all the selected Bantu languages except Zulu.

The nasal which was syllabified did not assimilate in the place of articulation when the adjacent neighboring consonant was not part of the same syllable (as the nasal). It was observed that the alveolar stop was lateralized across the selected Bantu languages. This change was observed in class 11 in Lingala and Ciluba and in class 5 in Lingala and Zulu.

However, the alveolar stop *d- affricated in Swahili and Ciluba in class 5 to become j- /dʒ/. While the bilabial stop *b- changed to w- or was just deleted in respectively class 2 and 14 in Swahili; and it changed to v- in class 8 in Zulu in which case the bilabial voiced stop *b- fricativized resulting in an alveolar fricative -z-. It was, however, noticed that the low prefix vowel *a- did not undergo any change across languages. Also, the prefix consonant which occurred alongside with it did not undergo changes as in class 6, 12, and 16, except in class 2 in Swahili.

The findings of the study suggest such a genetic evolution of the proto-class to the classes which are synchronically observed in the sister languages as illustrated in **Figure 1**.

Conclusion

This paper investigated sound changes in Swahili, Lingala, Ciluba, and Zulu. It accounted for the apparent irregularity of the nasal prefix consonant's failure to assimilate in place of articulation with the adjacent neighboring onset of the noun stem. The analysis has shown that the place of articulation assimilation of a nasal segment with any oral consonant is sensitive to syllable boundary. I posit it in terms of a law that nasal onset is sensitive to

syllable boundary and it assimilates in place of articulation only if it shares the same syllable with the conditioning segment. Diachronic and telescopic rules have shed light on the understanding of some synchronic state of sound change in the selected Bantu languages.

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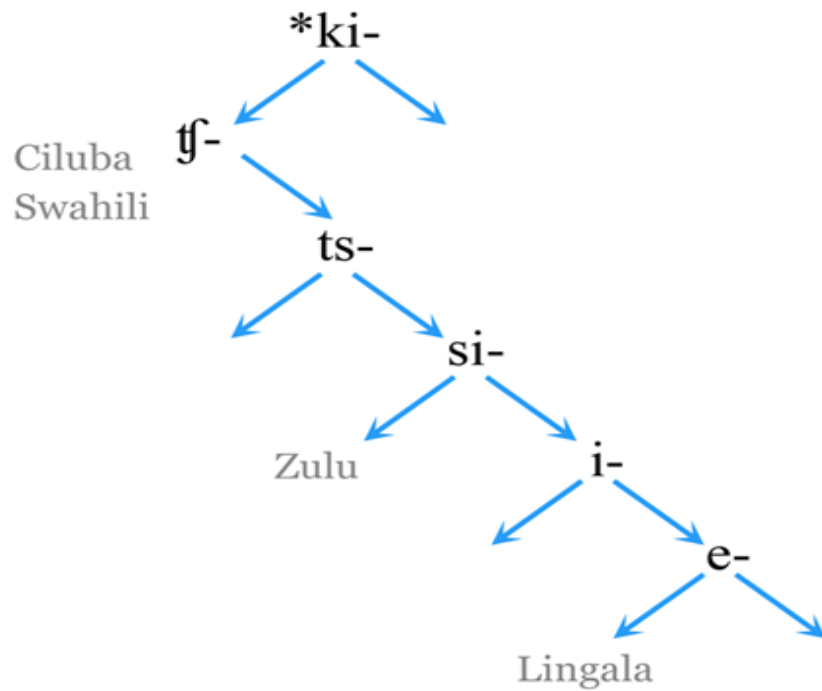


Figure 1. Proto Bantu class 7 development in the selected Bantu languages. The arrows in this figure show how the proto-Bantu class 7 prefix *Ki- has developed across the selected Bantu languages. *Ki- --> tʃ- --> ts- --> si- --> i- --> e-