

## **REDUNDANCY RULES IN KISWAHILI**

**Francis Eshun**  
**University of Nairobi**

This paper attempts to describe the sequence structure of vowel segments in Kiswahili. It proposes to establish a distinction between two main types of redundancy rules and their implications for the study of Kiswahili phonology. The paper argues against the application of the concept of long and short vowels to the analysis of Kiswahili. An argument is also advanced for the importance of recognizing two types of epenthesis in Kiswahili: Inter-Language and Intra-Language epenthesis. This analysis is carried out within the framework of Generative Phonology as proposed by Chomsky & Halle (1968).

### **1. Introduction**

Braun (2002) emphasizes the point that redundancy is a well-known phenomenon of phonemes or phonological matrices within the framework of the theory of Distinctive Features. Distinctive features are phonetic properties such as 'voice' and 'nasality', which are classified logically in a number of ways according to the nature of the features concerned. These features fall into a variety of types and are used to establish a distinction between phonemes. Halle & Clements (1983: 6-8) list the entire set of distinctive features required for the theory of Generative Phonology with their articulatory and acoustic characteristics and provide the rationale for the definition of those features. Hyman (1975: 242-244) in an appendix entitled 'SPE Distinctive Feature Matrix for Consonants', provides an entire list of all possible phonetic consonants together with a list of all the features required to describe each consonant.

The term 'redundancy' in this theory means that the specification (either + or - ) of certain features of a phoneme is predictable given the specifications of certain other features of the same phoneme and/or of neighboring phonemes or a set of phonemes. It must be emphasized that within the theory of Distinctive Features, not all the features required to distinguish a segment are truly distinctive. That is, certain features are predictable from the absence or presence of other features and those features that are predictable are the ones considered as redundant. For

example, a consonant marked as [+nasal] implies that the consonant is redundantly [+ voice, -continuant]. This statement makes the claim that there are no nasal consonants in Kiswahili that are voiceless fricatives. In other words, the features [voice] and [fricative] can be implied from the single feature [+nasal] and therefore need not be stated for nasal consonants. These restrictions on feature specifications are usually expressed by 'redundancy rules'.

Among the redundancy rules, usually two main types are distinguished:

- a) those which express a restriction valid for each phoneme of a language, independently of possible neighbouring phonemes. These are referred to in the literature as 'Morpheme Structure Conditions' (MSCs)
- b) those expressing restrictions on the admissible phoneme sequences of the language. These will be referred to as 'Sequence Structure Conditions' (SSCs);

The above classification is a modification of Stanley's classification (See Stanley 1967: 393-436). Stanley originally classified both (a) and (b) above as Morpheme Structure Conditions, where the conditions of (a) were stated under 'Segment Structure Conditions' and those of (b) under 'Sequence Structure Conditions'. I believe my analysis, following Braun (2002), is more elegant because it establishes the difference between the redundancies contained in a single segment and those contained in a sequence of segments. For the purpose of this paper, the type of redundancy in (a) above will be referred to as Redundancy Type 1 while that in (b) will be referred to as Redundancy Type 2.

## **2. Morpheme Structure Conditions (RedundancyType 1)**

Redundancy rules are stated in the form of If - Then Conditions (I - T Conditions). According to Schachter & Fromkin (1968: 41),

An I-T condition requires two parts, which are somewhat similar to the two parts of a transformational rule in the syntactic component. One must state the structural description of the

dictionary matrix to which the condition applies ( 'If' ) and the structural change which takes place ( the 'Then' ).

I have stated earlier that not all the features in a distinctive features matrix are truly distinctive. The effect of Redundancy Type 1 on the Distinctive Features Matrix for Kiswahili vowels is illustrated in Table 1:

**Table 1: Fully Specified Distinctive Features Matrix for Kiswahili Vowels**

	i	ɛ	ɔ	u	a
High	+	-	-	+	-
Back	-	-	+	+	-
Low	-	-	-	-	+

As shown above, three features are required to distinguish all the surface vowels in Kiswahili. The features are High, Back and Low. According to Eshun (1993, 2002), once each segment can be distinguished using the above features, no new features are required to describe the above vowels. Any extra features like tense or lax are therefore not applicable.

The above table is labeled 'fully specified' because each slot in the matrix is marked with either a [+] or a [-] for each of the three features. We can extract the redundancies in the matrix using Redundancy Type 1 as follows:

MSC 1

$$\begin{array}{c} \textit{If:} \quad [+high] \\ \downarrow \\ \textit{Then:} \quad [-low] \end{array}$$

This statement states that no vowel can be both high and low. All high vowels in Kiswahili are redundantly non-low. Therefore the feature [low] need not be stated for high vowels in Kiswahili.

MSC 2

$$\begin{array}{c} \textit{If} : \left[ +\textit{low} \right] \\ \downarrow \\ \textit{Then} : \left[ \begin{array}{c} -\textit{high} \\ -\textit{back} \end{array} \right] \end{array}$$

This statement states that there are no high, or back, low vowels in Kiswahili. The low vowel in Kiswahili is redundantly non-high and non-back. Therefore the features ‘back’ and ‘high’ need not be stated for Kiswahili vowels because they are predictable and therefore redundant.

MSC 3

$$\begin{array}{c} \textit{If} : \left[ \begin{array}{c} +\textit{high} \\ +\textit{back} \end{array} \right] \\ \downarrow \\ \textit{Then} : \left[ -\textit{low} \right] \end{array}$$

This statement states that the high back vowel [u] is redundantly non-low, therefore the feature [low] need not be stated for the vowel [u] because it is redundant.

In the light of the above three redundancies, our distinctive features matrix for Kiswahili vowels will now appear as follows:

*Table 2: Minimally specified distinctive features matrix for Kiswahili vowels*

	i	ɛ	ɔ	u	a
High	+	-	-	+	
Back	-	-	+	+	
Low		-			+

If we look at the above matrix, we can understand that not all the original features used to describe the Kiswahili vowels were truly distinctive. The blank boxes denote the features that are redundant and are therefore not required to distinguish the relevant vowels. For example, three features were required to distinguish the vowel [a] from the rest. After applying Redundancy Type 1, only one feature [+low] is now required to distinguish [a] from the rest. Redundancy Type 1 as illustrated above in Table 2 is the same concept referred to in the literature as the ‘Underspecification Theory’. Schaeffer (2002) explains Underspecification as follows:

In a specific phonemic system (or **inventory**) the universal set of features might not be needed to define the structure that makes up a certain segment, all other **redundant** features (or **blank specifications**) being filled in by **default rules**. It is then assumed that the segment is underspecified, i.e. not specified for features not needed in its definition.

This definition of Underspecification states the same condition as my Redundancy Type 1. Let us now turn to the second type of redundancy referred to as Redundancy Type

### 3. Sequence Structure Conditions (Redundancy Type 2)

Sequence Structure Conditions refer to the conditions that govern the distribution of phonemes in a language. The assumption is that the sequence of consecutive vowel or consonant segments in a language is not random but predictable and governed by rules. Related to the study of the distribution of phonemes is 'phonotactics'. Phonotactics is the study of the permitted or non-permitted arrangement or sequence of segments in a given language. Spencer (1991) defines phonotactic constraints as syntagmatic restrictions on (surface) phonological representations, in other words, constraints on what ('horizontal') combinations of sounds are permitted by the language. Like Morpheme Structure Conditions (Redundancy Type 1), Sequence Structure Conditions are also expressed as If -Then Conditions.

We can begin with Kiswahili vowels to determine which combinations or sequences of vowels are permitted and which are not. A combination of a permitted sequence of segments is called a cluster. A vowel cluster is a sequence of vowels in the base form of the word that meets the following conditions:

- a) the sequence must have no affixation, that is no prefix, suffix or infix
- b) the sequence must not have undergone any morphological process.

Kiswahili permits a maximum of three vowels in a cluster. Consider the following examples:

(1)

/raia/	-	'citizenry'
/nuia/	-	'intend'
/zua/	-	'prevent'
/zoea/	-	'be accustomed to'
/doea/	-	'parasitic'
/loea/	-	'settle'

In the above examples, we see cases of three-vowel clusters in the base forms of words. It is worthy of mention here that although three-vowel clusters are permitted in Kiswahili, they are the exception rather than the rule. The most common vowel clusters are two vowel clusters. Two vowel clusters in Kiswahili may be divided into two groups:  $V_1V_1$  and  $V_1V_2$  sequences.

$V_1V_1$  sequences consist of a sequence of similar vowels while  $V_1V_2$  sequences consist of a sequence of two different vowels. Kiswahili has five vowels in its phonemic inventory and each of the five can be realized as  $V_1V_1$  clusters:

(2) Examples of  $V_1V_1$  clusters are:

/ii/	/tii/	‘obey’
	/bidii/	‘effort’
/uu/	/kuu/	‘big’
	/dʒuu/	‘above’
/ee/	/pekee/	‘alone’
	/mzee/	‘elder’
/oo/	/koo/	‘throat’
	/tʃoo/	‘toilet’
/aa/	/kaa/	‘sit’
	/zaa/	‘give birth’

(3) Examples of  $V_1V_2$  clusters are:

/ia/	/nia/	‘urge’
/oa/	/toa/	‘give’
/ua/	/pua/	‘nose’
/ai/	/hai/	‘alive’
/ui/	/tui/	‘milk’
/ea/	/tetea/	‘argue for’
/eu/	/neupe/	‘white’
/uo/	/nguo/	‘cloth’
/oi/	/kikoi/	‘type of clothing’

There are other combinations of  $V_1V_2$  clusters but the above examples will be used as a representative sample.

What are the implications for analysing the two types of vowel clusters found in Kiswahili? One crucial point that needs to be emphasized here is that such analysis shows that Kiswahili has no ‘long’ vowels, ‘short’ vowels or ‘diphthongs’. It may have any of the combination of  $V_1V_1$  or  $V_1V_2$  clusters

described above, but such clusters cannot be considered as long vowels. Attributing the feature ‘long’ to Kiswahili vowels distorts the idea of sequence structure for vowels. The idea of long vowels is a term borrowed from the phonological analysis of English, which establishes a contrast between long vowels and short vowels. In English where such long and short vowel contrasts are encountered, both vowels are represented in the distinctive features matrix. In Kiswahili, like most African languages, vowel length is not contrastive. That is, all vowels have the same length so they are neither short nor long. The concept of long vowels is used only in opposition to short vowels. So, where this opposition does not exist, the term should not be applicable to the description of that language.

Let us now return to the discussion of three-vowel clusters. As can be seen in the examples in (1), Kiswahili permits a maximum vowel-cluster of three. We can attempt to state a sequence structure condition for a three-vowel cluster in Kiswahili as follows:

SSC 1

$$\begin{array}{l}
 \textit{If:} \quad [V] \quad [V] \quad [V] \\
 \quad \quad \quad \quad \quad \downarrow \quad \downarrow \\
 \textit{Then:} \quad \quad \quad [-low] \quad [+low]
 \end{array}$$

The above condition states that in any three-vowel cluster in Kiswahili, the second vowel has to be non-low, while the last vowel has to be a low vowel.

Our focus on three vowel clusters brings to mind what happens when there is a possible violation of this condition. We must also bear in mind the crucial fact that although Kiswahili permits a maximum vowel cluster of three, this cluster is unique to only the base forms of words and cannot be re-created. That is, no phonological process can result in the creation of a three-vowel cluster. In other words, although a phonological process might result in the creation of a sequence of three vowels, based on my previous definition of vowel clusters, a three-vowel sequence does not necessarily equate to a three-vowel cluster. As will be demonstrated below, three-vowel clusters may exist in Kiswahili in underlying forms, but never in surface forms.



The question here is, what happens then when this three-vowel cluster condition is seemingly violated? To answer this question, we need to talk about a phonological process called ‘epenthesis’.

#### 4. Epenthesis

Epenthesis is a phonological process whereby a segment is inserted into a word. When the segment is inserted at the beginning of a word, the process is called ‘prothesis’ and when the insertion is at the end of a word, the process is known as ‘paragoge’. Burton (2003) defines epenthesis as ‘the addition of a letter, sound, or syllable to the middle of a word’ and gives the following as examples:

Addition of a medial letter:

When ‘sherbet’ is pronounced ‘sherbert’

Addition of a medial syllable:

When ‘realtor’ is pronounced ‘realator’

I have but with a cursorary eye O’erglanc’d the articles.

-Shakespeare, Henry V 5.2.77

Epenthesis may be used for different purposes. As seen in the above definition, it may sometimes be employed in order to accommodate meter in verse or to facilitate easier articulation of a word’s sound. It can, of course, be accidental, and a vice of speech. For the purpose of this paper, epenthesis will be categorized into two types:

- a) Epenthesis due to borrowing from another language, which in this paper will be referred to as Inter-Language Epenthesis, and
- b) Epenthesis that is not due to borrowing but which is a mechanism employed by a language to ensure that its sequence structure is not violated. This type will be referred to as Intra-Language Epenthesis.

The most common type of epenthesis is the one resulting from borrowing from another language. Whenever a new word is borrowed, it has to conform to the phonological structure of the target language. Unpermitted consonant clusters in the new language are easily made to conform by

inserting a vowel to break the cluster. For example, the word for English /baɪsɪkl/ contains an unfamiliar cluster \*/kl/ in Kiswahili, so an epenthetic /e/ is employed to derive /baisikeli/.

Intra-language epenthesis is an interesting phenomenon where a language literally ‘cleans itself up’ to ensure that its sequence structure is not violated. For illustration, let us look at what is generally called the Swahili verbal extension. Consider the following data:

(4)

<u>Underlying Form</u>	<u>Gloss</u>
/soma/	‘read’
/taka/	‘like’
/sema/	‘speak’
/pata/	‘get’
/hama/	‘move’

(5)

/kaa/	‘sit’
/toa/	‘give’
/fua/	‘wash’
/lia/	‘cry’
/ua/	‘kill’

Examples in (4) contain base forms without vowel clusters while those in (5) contain base forms with two-vowel clusters. As a rule, the Kiswahili verbal extension is formed by inserting another vowel before the final vowel as follows: If the initial vowel in the stem is a mid-vowel [e, o], the vowel inserted for the extension is [e]; if the initial vowel in the stem is either high or low, that is [i, u, a], the vowel inserted for the extension is [i]. We can now give the underlying forms for the data in (5).

(6)

<u>Underlying Form</u>	<u>Gloss</u>	<u>Extension</u>	<u>Gloss</u>
/soma/	‘read’	/somea/	‘read for’

/taka/	‘like’	/takia/	‘wish for’
/sema/	‘speak’	/semea/	‘speak for’
/pata/	‘get’	/patia/	‘give to’
/hama/	‘move’	/hamia/	‘move to’

(7)

/kaa/	‘sit’	/kaia/	‘sit’
/toa/	‘give’	/toea/	‘give to’
/fua/	‘wash’	/fuia/	‘wash for’
/lia/	‘cry’	/liia/	‘cry for’
/ua/	‘kill’	/uia/	‘kill for’

If we look closely at the above examples, we observe that, by inserting the relevant vowel to make the extension, we run into a peculiar problem: the data in (6) is fine but that in (7) results in a cluster of three vowels. As already stated, this is a violation of the sequence structure conditions for Kiswahili vowels because three vowel clusters are only allowed in the base forms of words and cannot be the product of any phonological process. In order to ensure that its sequence structure is not violated, Kiswahili employs the use of a special type of epenthesis, which I have referred to as Intra-Language epenthesis. By this mechanism, a consonant [l] is inserted to break any cluster of three vowels that is a product of a phonological process. The surface and underlying forms of the extended verbs can now be realized as follows:

(8)

Underlying Form of Extension	Surface Form
/somea/	[somea]
/takia/	[takia]
/semea/	[semea]
/patia/	[patia]
/hamia/	[hamia]

(9)

/kaia/	[kalia]
/toea/	[tolea]
/fuia/	[fulia]
/liia/	[lilia]
/uia/	[ulia]

The concept of Intra-Language epenthesis is demonstrated clearly in the examples in (9). Here, there is an observed difference between the underlying and surface forms by the insertion of the epenthetic [l] in the surface forms. The above environment for verbal extensions is the only one I have observed where the three-vowel sequence cluster condition appears to be threatened. This epenthetic insertion can be formalized as a phonological rule as follows:

P-Rule 1

$$\emptyset \rightarrow C \ / \ V \ \_\_\_\_ \ V \ V$$

$$[+lat]$$

This rule states that whenever any rule in Kiswahili results in a vowel cluster of three, the epenthetic consonant [l] is inserted to break the cluster. Such a rule can be considered as a Structure-Preserving rule in Kiswahili.

## 5. Conclusion

This paper has examined the issue of redundancy in Kiswahili. With some modifications, I have argued for two main types of redundancies: Morpheme Structure Conditions and Sequence Structure Conditions.

The paper identifies redundancy rules as a mechanism that serves to preserve the principle of economy in Generative Phonology, by reducing the number of features required to distinguish segments in any language. I have argued that, since not all features in a features matrix are distinctive, redundancy rules function to eliminate the non-distinctive features in a matrix.

I have advocated the need to recognize two types of vowel clusters in Kiswahili:  $V_1V_1$  and  $V_1V_2$ . I have argued strongly against applying labels such as ‘long’, ‘short’ or ‘diphthong’ to the description of vowels in Kiswahili since they have no phonological basis and are not justified by the features required for the description.

I have dealt with phonotactics and phonotactic constraints for vowels as a scheme for identifying clusters and cluster types and I have established specific criteria for identifying what constitutes clusters. I have shown that two-vowel clusters are the dominant clusters in Kiswahili while three-vowel clusters are rare.

I have also established that two types of epenthesis need to be recognized for Kiswahili: Inter-language and Intra-Language. I have pointed out that while Inter-language epenthesis is very common among languages, Intra-language epenthesis is rare and unique to a small number of languages. I have also shown that, phonologically, the Kiswahili verbal extension provides strong evidence for the case of Intra-language epenthesis. Finally, I have demonstrated that the epenthetic consonant /l/ is used as a Structure-preserving mechanism to accomplish Intra-language epenthesis in Kiswahili.

## References

- Braun, S. 2002. 'Some formal properties of phonological redundancy rules' in *International Conference on Computational Linguistics Coling 1969*: Preprint No. 6. Classification TG 2.1 <http://acl.ldc.upenn.edu/C/C69/>
- Burton, G. O. 2003. 'Silva rhetoricae: the forest of rhetoric', an online guide to the terms of classical and renaissance rhetoric'. Brigham Young University Publications. Brigham Young University. <http://humanities.byu.edu/rhetori/silva.htm>
- Chomsky, N. & M. Halle. 1968. *The Sound Pattern of English*. New York. Harper & Row.
- Eshun, F. B. 2002. 'Vowel systems of Kenyan languages'. Paper presented at a departmental seminar. Department of Linguistics and African Languages, University of Nairobi.
- Eshun, F. B. 1993. *Aspects of Akan Phonology*. Madison: University of Wisconsin Press.
- Halle, M. & G. N. Clements. 1983. *Problem Book in Phonology. A Workbook for Introductory courses in Linguistics and in Modern Phonology*. Cambridge Massachusetts: The MIT Press.
- Hyman, L. M. 1975. *Phonology: Theory and Analysis*. New York: Holt Rinehart and Winston.
- Schachter, P. & V. Fromkin 1968. 'A phonology of Akan: Akwapem, Asante and Fante'. *Working Papers in Phonetics 9*. Los Angeles: University of California.
- Schaeffer, R. 2002 'A concise introduction to Generative Phonology.' Paper presented at the Sprachwissenschaftliches Seminar (Georg-August-Universitaet Goettingen) Available online at: <http://wwwuser.gwdg.de/~rschae1/material/generica/>
- Spencer, A. 1991. *Morphological Theory. An Introduction to Word Structure in Generative Grammar*. Oxford: Blackwell.
- Stanley, R. 1967. 'Redundancy rules in phonology'. *Lingua* 43: 393-436.