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Aspects of the phonology of Sukwa: An optimality theoretic analysis

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COMPULSORY DECLARATION

This work has not been previously submitted in whole, or in part, for the award of any degree. It is my own work. Each significant contribution to, and quotation in, this dissertation from the work, or works, of other people has been attributed, and has been cited and referenced.

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Abstract

Phonological studies of Bantu languages have continued to be an area of investigation for many scholars over the years. These studies have discussed the language's sound patterns, syllable structures, phonological processes and suprasegmental features and have based their analyses on various theories of phonology. This dissertation analyses a Bantu language called Sukwa spoken in Chitipa district in the northern region of Malawi. In Guthrie's classification, it is classified in Zone M while in Maho's classification it is M20. It belongs to a larger language cluster together with Wandya, Lambya and Ndali. Sukwa is among one of the Malawian languages that have received inadequate theoretical and practical research on their structures and use. The focus of the dissertation is on phonological aspects of the language and these include its sound system, its syllable structure and selected phonological processes using Prince and Smolensky's (1993) Optimality theory. We argue that Sukwa is a language that mostly ranks markedness constraints higher than faithfulness ones because of its tendency to strive for lesser complex structures.

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	List of abbreviations
V	vowel
VV	vowel-vowel sequence
C	consonant
CV	consonant vowel sequence
NC	nasal consonant sequence
C-glide	consonant glide sequence
Cw	consonant [-w] sequence
Cj	consonant [-j] sequence
OT	optimality theory
FV	final vowel
Rt	root
sing.	singular
pl.	plural
.	syllable boundary
- (before or after a morpheme)	morpheme boundary
μ	mora

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Contents

Chapter 1: Introduction	7
Chapter 2:Literature review	12
Chapter 3: Sukwa sound system and syllable structure	24
Chapter 4: Phonological processes.....	37
Chapter 5: Summary and Recommendations	59
References.....	63
Appendix 1: Data Elicitation	68

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Chapter 1: Introduction

1. Background

Bantu languages have provided a fertile ground for testing the empirical validity and strength of phonological theories of the past five decades. Several theoretical models have been proposed to account for a wide range of issues in many Bantu languages such as segmental processes and syllable structures (cf. Hyman 1993, 1995, Bickmore 1989, Mudzingwa 2010), reduplication (cf. Downing 2000, 2001 and 2007 and Mtenje 2002), verbal phonology (cf. Ngunga (1997) and Kula (2007)), prosodic features such as tone (cf. Mtenje, 1987, 1999, 2006 a, b Odden, 1998, Bickmore 1989), stress and accent and Miti (2006), Poulos (1990), Ngunga (1997), Bickmore (1989) for overviews of phonologies of particular Bantu languages. Indeed, work on this group of languages has progressed tremendously over the past decades and has contributed significantly to recent theoretical positions in the linguistics literature.

The research in this study focuses on a Bantu language called Sukwa¹ spoken in Chitipa district of northern Malawi and classified by Guthrie (1967) as belonging to Zone M. Maho (2008) classifies it as M20. The study uses Optimality Theory (cf. Prince and Smolensky 1993, 2005, McCarthy and Prince 2005) as the main theoretical framework for the analysis of the phonological aspects of the language. We argue that usually Sukwa strives for non complex phonological features. In its consonant system and syllable structure, markedness constraints are mostly ranked higher in the hierarchy at the expense of faithfulness constraints.

1.1 Research problem

There is a considerable amount of work on the phonology of Bantu languages. However, not much theoretical and practical research has focused on Malawian languages, especially minority languages such as Sukwa. The majority of the studies on Malawian languages, including doctoral theses, have focused on Chewa, (the most widely spoken language of the country). This includes work by Mtenje (1986), (2002) and Moto (1989) on various phonological aspects of the language, Hyman and Mtenje (1999) on tone, Downing and Mtenje (forthcoming a,b) on Prosodic phrasing and Mchombo (2004) on syntax. Other works for example Vail (1970-71) have focused on Citumbuka while others have worked on Ciyao. This research will be one of the emerging studies in Malawi using recent models such as Optimality Theory as the primary theoretical framework.

¹ On recommendation by one of my supervisors, we decided to simply call the language Sukwa and remove the noun prefix *Ci-* as is common practice in other literature.

1.2 Objectives

1.2.1 General Objective: Our overall objective was to examine the phonological structure of Sukwa and more specifically:

- a) To establish the sounds of Sukwa;
- b) To examine the phonemic system of Sukwa;
- c) To analyse the syllable structure of Sukwa;
- d) To determine the main phonological processes in Sukwa;
- e) To present an Optimality Theoretic account of the processes established in (d) above.

1.3 Significance of the study

This study is the first detailed account of the phonology of Sukwa. Studies on the language by Kreshner (2001) have largely focused on the verb system and how it indicates tense, time and aspect. The data and analysis presented here will, therefore, widen the pool from which linguists working on Bantu languages can test the universality of certain claims about these languages and, indeed, African languages in general. The research attempts to make a contribution to the ever-growing literature on African languages.

Furthermore, there is an increasing demand and push in Malawi towards the implementation of a language in education policy that uses local languages as a medium of instruction in the early years of primary school (Standards 1- 4). There are also calls for the use of local languages in the communication of government development strategies especially on issues relating to combating hindrances to sustainable socio-economic growth such as HIV and AIDS, hunger, illiteracy, gender inequalities, environmental degradation and poor governance, among others. Language is, therefore, a crucial tool for achieving national development in a developing country such as Malawi. Indeed, the Centre for Language Studies (CLS) in Malawi in their (2006) report noted with deep concern that the lack of important linguistic information for the country has hampered the formulation of national policies which can accelerate development in the country.

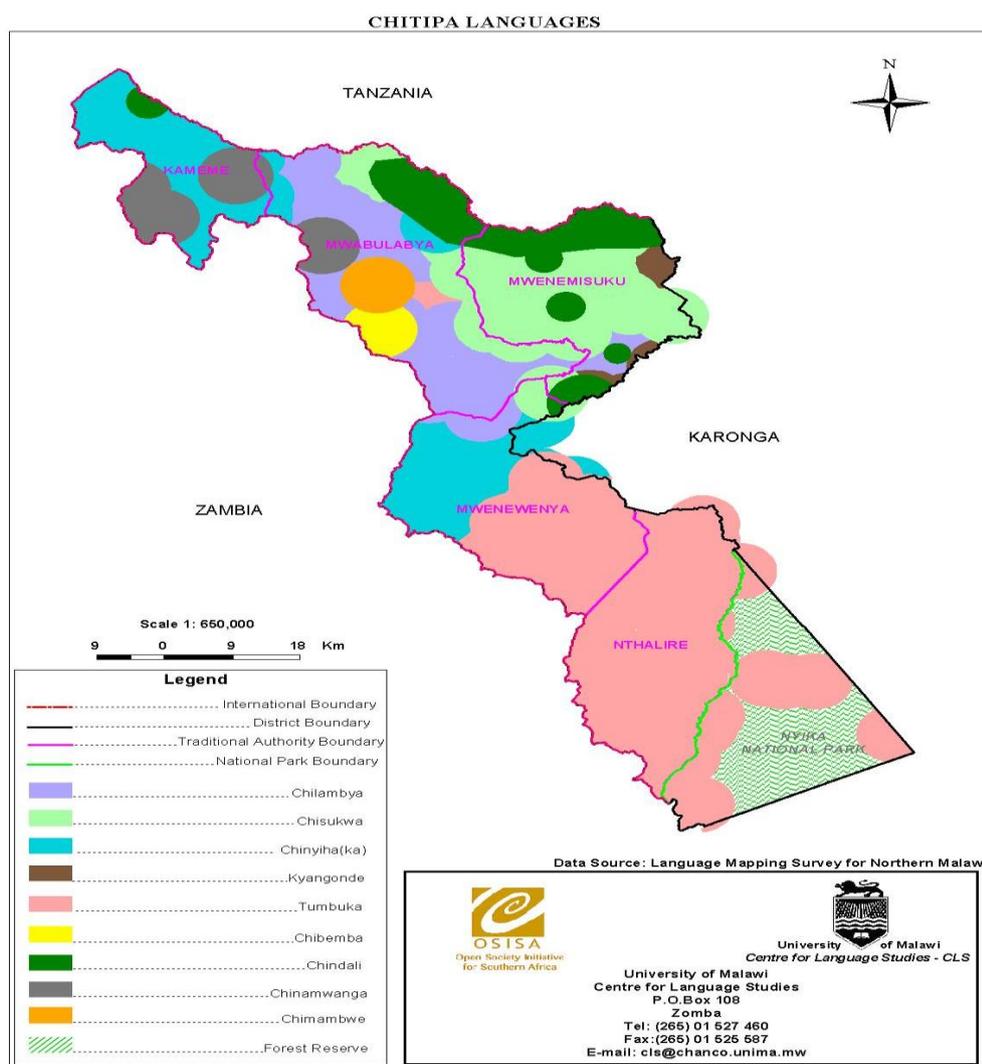
Needless to emphasize the proper formulation and full implementation of these policies can only be effective if there has been theoretical and practical research on the structures and use of the languages to be used for such purposes. In Malawi, most languages (especially the minority languages, including Sukwa) have not yet been fully researched. While phonology per se may not directly meet these goals, the background information to be provided and the descriptive analysis of

the study will be useful to policy makers to make judgments on mutual intelligibility with other varieties and the appropriate orthography to be selected for the language.

1.4 Background of Sukwa and its speakers

As already stated above, Sukwa is a Bantu language spoken in Chitipa district in the northern region of Malawi. Specifically, the language is spoken in the following Traditional Authorities (TAs): Mwambulabya, Mwenewenya and Mwenemisuku. The map in Fig 1. on the next page shows the areas where Sukwa is spoken.

Fig 1. Map of Chitipa indicating languages spoken in the district.



N.B Major languages in Malawi like Yao and Chewa are not widely spoken in Chitipa.

Chitipa is the most linguistically complex district in Malawi. Its people claim that 15 languages are spoken in their district and due to the fear of loss of a variety's socio-political importance, they insist that even the varieties that are mutually intelligible are different languages when, in fact, they are merely dialects of the same language, as established by the CLS (2006) report. The situation is

worsened by the fact that language varieties tend to coincide with ethnic divisions. As a result of this situation, it has generally been claimed by citizens of Chitipa that mutually intelligible varieties such as Sukwa, Ndali, Lambya and Wandya are different languages, although the CLS (2006) places them in one language cluster. In this study, we follow this categorization and treat Sukwa as a variety which belongs to this language group.

According to the 2006 CLS Language Report, Sukwa is spoken mostly in the private domain and is also spoken when people meet in public places such as hospitals, the market and other trading areas. Sukwa is also sometimes used by both pupils and teachers for teaching and learning on a daily basis although this is against government policy, which states that Chichewa should be the only medium of instruction throughout the country.

Furthermore, Sukwa-speakers have been reported in the CLS report to regard their language more highly than those of other groups and to regard the language as a symbol of their identity. The report also indicated that they hope that their language will, one day, be given a chance to flourish just like the major languages Chichewa and Citumbuka. It should be noted that since Chitipa is a highly multilingual area, most Sukwa speakers are also fluent in the other languages spoken in the area especially those within its cluster.

According to the CLS Language Report (2006), there is not much literature in Sukwa except for a hymn and some religious tracts by unstated authors.

1.5 Methodology

1.5.1 Sample

In this study, data was collected from four native speakers of Sukwa (two males and two females).² Two of the respondents (one male and one female) were in their twenties while the other two were between the ages of 45 and 55. The ages and gender were varied in order to try to order to try to capture the current state of affairs of the language in terms of these variables. Furthermore, all respondents come from TA Mwenemisuku. This was done because, as observed in the map, this is an area where Sukwa is widely spoken. It therefore provides a fair representation of the language. The speakers also indicated that they speak other languages such as Ndali, Lambya, Wandya, Tumbuka, Chewa and English.

² I would like to thank Ms M. Sikwese, Ms A. Sikwese, Mr Msukwa and Mr. Msukwa for providing me with data for this thesis. I remain responsible for any errors of fact and interpretation.

It should also be noted that all respondents were interested in having their language documented and were always eager to provide information pertaining to their language. These respondents gave their oral consent (which was captured on a recorder) for the data to be used for research purposes.

1.5.3 Method of data collection

A structured interview was used to solicit data from the respondents. The questionnaire (see appendix) was divided into separate sections varying from nouns concerning kinship terms, food, animals, body parts and plants, etc to phrasal patterns and verbal constructions differing in terms of tense, aspect and verbal extensions.

The informants were then asked to translate the list of words and sentences in the questionnaire from Chewa into Sukwa. This was done in order to examine the sounds, sound system, syllable structures and phonological processes of the language. Since the study has aspects of morphology, it was important to solicit data on the description of the noun class system of the language. This further helped to provide linguistic contexts in which certain phonological processes may apply.

In all cases, the data was collected using a digital recorder and it was later transcribed using the International Phonetic Alphabet (IPA) for ease of phonological analysis.

1.5.4 Method of data analysis

The main theoretical framework used in the analysis of the data is Optimality Theory (Prince and Smolensky 1993). A detailed overview of the theory is presented in Chapter 2. In the application of the theory to the data, language inputs for structures were constructed and candidates were evaluated on constraint hierarchies in order to determine the optimal candidates.

1.6 Limitations of the study

Due to time limitation and financial circumstances beyond the researcher's control, it was not possible to travel and collect data in Chitipa District, which is situated nearly 1,200kms from the researcher's base in Zomba City in the southern part of Malawi. The only available option was to use native speakers of Sukwa who were based in Zomba.

1.7 Organization of the study

The dissertation has five chapters. Chapter 1 is the introduction and includes sections on the objectives of the research, the background of the Sukwa people and their language and the methodology used to elicit the data. The review of previous literature on phonology and the theoretical framework is discussed in Chapter 2. Chapter 3 covers the Phonemic System and Syllable Structure of Sukwa. Chapter 4 analyses the various phonological processes observed in the language. Finally, Chapter 5 provides concluding remarks on all the issues discussed in the previous chapters.

Chapter 2:Literature review

This chapter provides a detailed discussion of the literature concerning different issues in phonology and the framework of Optimality Theory.

2.1 Theoretical framework

2.1.1 Brief overview of Optimality Theory

Optimality Theory (hereafter OT) was developed by Prince and Smolensky (1993). The theory was later extended and discussed in numerous works like Archangeli (1997), Kager (1999), Boersma, Dekkers, Joost, and Van Weijer (2000), McCarthy and Prince (2004), Prince and Smolensky (2004) just to mention a few. The basic principles of OT propose that Universal Grammar contains a set of violable constraints. There are basically two types of constraints namely, faithfulness and markedness constraints which are intrinsically in conflict with each other. Faithfulness constraints are those that preserve lexical contrasts. They require that the output forms be identical to the input forms. Markedness constraints, on the other hand, strive to maintain unmarked types of structures of language. These serve to preserve structural well-formedness criteria.

Two crucial issues have been raised above: firstly, constraints are in conflict and secondly they are violable. Since these two types of constraints are always in conflict, it means that once a markedness constraint is observed, there is a cost with respect to a faithfulness level and vice versa. Grammars of a language regulate the ranking of constraints and it is the different ranking of constraints that accounts for variation in languages. For a given linguistic input, the grammar of a language will generate an infinite number of candidates which are then evaluated over a hierarchy of constraints of that particular language until an optimal candidate is selected. As Kager (1999:12) puts it, 'Optimality is the status of being most harmonic with respect to a set of conflicting constraints'. The optimal candidate is the one which incurs the least violations of constraints, especially the highly-ranked ones. A constraint violation, therefore, does not entail ungrammaticality. In OT, constraints can be violated only if they are meant to satisfy a higher-ranking constraint. This means that languages generally avoid violations of constraints but, the avoidance of a violation of a higher-ranked constraint is preferred to that of a lower-ranked one.

OT proposes that conflicts between constraints are resolved by strict domination as stipulated below:

Domination: the higher-ranked of a pair of conflicting constraints takes precedence over the lower ranked one (Kager 1999:13).

This means that if, for instance, there are two constraints, the most harmonic candidate will be the one that does not violate the higher-ranking constraint even though it may violate the one which ranks lower. However, if a low-ranking constraint is observed at the expense of a high-ranking one,

then the form will not be considered as optimal. In other words, the form will be taken as unacceptable in the language.

2.2 The architecture of OT

2.2.1 The Lexicon or Input

The lexicon contains the vocabulary of language representation. All lexical representation-contrastive properties of morphology, phonology, syntax, semantics (underlying forms) are composed from this vocabulary.

2.2.2 Generator

The Generator (*Gen*) is the function that provides possible output forms. It creates an infinite number of output forms from the input for Evaluation (*Eval*) to assess which form is going to be optimal. *Gen* can therefore add, delete, create and rearrange items. This property is known as *Freedom of analysis*. The function can, however, only do this with linguistic items and representations such as segmental, morphemic and prosodic structures. *Gen* is also responsible for demonstrating correspondences between inputs and outputs.

2.2.3 Constraint

OT also recognizes a property called Constraint (*Con*) which contains the universal set of constraints (markedness and faithfulness) which are claimed to be the endowment of every human being.

2.2.4 Evaluation

Evaluation (*Eval* also known as *H-Eval*) is the central property of grammar in OT. This is because it has the responsibility of assessing or evaluating the output forms created by *Gen* and choosing the most 'harmonic candidate'. *Eval* carries out this function by assessing candidates over a constraint hierarchy of a particular language. Prince and Smolensky (2004:5) argue as follows:

Though *Gen* has a role to play, the burden of explanation falls principally on the function *H-eval*, a construction built from well-formedness constraints, and the account of the interlinguistic differences is entirely tied to the different ways the constraint-system *H-eval* can be put together, given UG.

Evaluation of the optimal candidate is achieved by considering a constraint hierarchy that is transitive. One constraint will rank higher than another and an output form that incurs fewer violations and avoids violations of a higher-ranked constraint wins. According to Prince and Smolensky's (1993:27) property of economy, 'banned options are available only to avoid violations of higher-ranked constraints and can only be banned minimally (the least number of times)'.
Indeed, the theory, as Boersma et al. (2000) note, is better at explaining linguistic phenomena than the more static rule-based theories. It has not only been influential in phonology but, its applicability has also spread to other areas in linguistics such as morphology, syntax,

psycholinguistics, semantics and even sociolinguistics. Boersma et al. (2000) point out that OT is a move away from rule-based models to output-based ones. In earlier systems, for example, Chomsky and Halle's (1968) *Sound Pattern of English*, phonology had a set of ordered rules which displayed "functional unity" (cf. Kisseberth 1970) through a "conspiracy" to produce the same output. The rule-based approach thus derived outputs (in the form of phonetic representations) from abstract underlying representations through the application of these ordered rules.

Optimality Theory also recognizes conspiracies as identified by Kisseberth (1970) but deals with them by postulating that they are the result of 'the interaction of grammatical tendencies which exist within as well as across languages' (Boersma et al. 2000:1). In other words, while rule-based phonologies describe different outputs of conspiracies, they fail to account for the fact that such conspiracies all strive to come up with an optimal output. Optimality Theory, on the other hand, captures such regularities by postulating a single output constraint.

Following the arguments outlined above, one can say that the major strength of OT as a theory is that it allows constraints to be violable, unlike other approaches such as Classical Generative theory of Universal Grammar, where they were not.

Furthermore, through the notion of constraint ranking, OT deals simultaneously with universality and language specificity by arguing that languages have the same constraints but differ only in the way they rank them. This resides in the fact that all constraints are part of universal grammar (hence accounting for the universality of language) but through the same universal constraints, *Eval* can come up with the constraint hierarchies of different languages. This is ably put by Archangeli (1997:7):

Optimality Theory abandons the widely held view that constraints are language-particular statements of phonotactic truth. In its place is the assertion that constraints are essentially universal and of very general formulation, with great potential for disagreement over the wellformedness of the analyses; an individual grammar consists of a ranking of these constraints, which resolves any conflict in favour of the higher ranked constraint. The constraints provided by Universal Grammar are simple and general; interlinguistic differences arise from the permutations of constraint-ranking ...

The other advantage of OT is that it leaves the interaction of constraints to a single device only, namely, constraint ranking, while in Generative Grammar constraint/rule interaction was a product of more than one component. This is because in classical generative phonology there were different levels of representation - the underlying representation (UR) and the surface representation (SR).

Furthermore, inviolable constraints were posited at every level i.e. the input, at rule interaction, morpheme concatenation and the output. This is not the case with OT.

It is on the basis of these arguments that we have chosen OT as the theoretical model to be used in the analysis of aspects of the phonology of Sukwa.

2.3 Basic notation of OT

In this study, we use the following OT notation:

* stands for the violation of a constraint.

! means that the violation of the constraint is fatal.

Columns bordered with breaks indicate that the ranking of the constraints in question is not crucial.

Shaded rows show that the violation of the constraints in the rows is irrelevant since the fatality or the optimality of a candidate has already been made on the basis of earlier constraints.

⇒ shows that the candidate chosen is the optimal one.

>> indicates that a constraint ranks higher than the following one.

2.4 OT and inventories

Pulleyblank (1997) notes that there has not been much work that has described the phonetic inventories of the world languages in an OT analysis. He notes that according to OT, the content of the lexical inputs is unconstrained. The occurrence of a segment on the surface will be determined by the constraint grammar of the language in question. If faithfulness constraints pertaining to a particular feature outrank any prohibitions governing the occurrence of the feature, then the feature becomes part of a language's inventory. If prohibitions against some feature outrank relevant faithfulness constraints, then the feature does not feature in the inventory of that language. Kager (1999) notes that languages which have faithfulness constraints ranked high have larger phonetic inventories while those that rank markedness constraints high have smaller ones.

Pulleyblank (1997), for instance, discusses the occurrence of voiced and voiceless obstruents in languages. There are some languages such as English where voicing in obstruents is contrastive while in others, such as Hawaiian, all obstruents are voiceless. He argues that whether voicing occurs in a language or not is a result of the interaction of the constraints below:

Obs/Voi

An obstruent must be voiceless

Faith [Voice]

When voiced obstruents are attested in the inventory, the following is the constraint ranking:

Faith [Voice]>>Obs/Voi

When voiced obstruents are excluded from the inventory, the constraints are ranked in reverse order as follows:

Obs/Voi>>Faith [Voice]

In discussing allophony, he presents examples from Imbabura Quechua based on Cole (1982), showing that the language does not contrast voicing but where voiced sounds appear only after nasals. These are reproduced below:

1. Stops	Words	Gloss
/p/	wasi uku-pi house interior-in	'inside the house'
/t/	marja-ta maria-ACC	
/k/	marja-ka maria-Topic	

2. Post-nasal voicing

/p/	nam-bi road-in	'in the road'
/t/	nan-da road-Acc	
/k/	nan-ga road-Topic	

This post-nasal voicing is a result of the ranking of constraints presented in the tableau below:

/nan-ta/	ICC [Voice]	Obs/Voi	Faith [Voice]
nan-ta	*!		
⇒ nan-da		*	*

It is important in this language that clusters have identical voicing and with the constraint **Nas/Voi** ranked high, the obstruent takes the voice features of the nasal. This is why the second candidate wins.

Since Sukwa exhibits similar phonetic feature patterns (with voiceless obstruents and post-nasal stop voicing), the use of the constraints given above will prove to be very relevant when explaining this phenomenon.

2.5 OT and syllable structure

OT has contributed tremendously to the explanation of the distribution of syllable structures of the world's languages. Kager (1999) discusses cross-linguistic asymmetries of onsets and codas. He notes that all syllables in the world's languages have onsets. The implicational universal for syllable onsets is as follows: *If a language has syllables that lack an onset, then it also has syllables that have an onset.* This means that there are languages which have both onsetless syllables and syllables that have onsets. Examples of such languages include Japanese, Diola-Fogny, Ponapean and English. For example in English the word *cat* and *an* have onset and onsetless syllables respectively. There are other languages however where onsetless syllables do not occur at all. This results in the languages having all syllables with onsets. Examples of such languages include Temiar, Axininca Campa and Arabic.

Quoting data from Axininca Campa collected and explained by Payne (1981), Ito (1989), McCarthy and Prince (1993b), Kager (1999) illustrates how the language only allows syllables with onsets by inserting a consonant where only a vowel appears in a syllable of a loan word. The examples are presented below:

- a) /no-N-koma-i/ noŋkomati 'he will paddle'
b) /no-N-č^hk-i/ noŋč^hiki 'he will cut'

Crucially, this means that there are no languages that do not have onsets. A language which has onsets is therefore unmarked, judging from typological evidence and the epenthesis data presented above. Kager (1999) explains this as being a result of the well-formedness constraint presented below:

Onset

Syllables must have onsets (Ito 1989 and Prince & Smolensky 1993)

If this constraint is undominated, the language has obligatory onsets.

In addition to the distribution of onsets in the world's languages, Kager (1999) discusses the occurrence of codas. The implicational universal for this phenomenon is as follows:

If a language has closed syllables, then it also has open syllables.

Languages therefore fall into two categories according to whether they allow (these have syllables with codas) or disallow codas (codas do not occur in the syllables). For example, Arabic, Tunica and English allow codas, although the languages may also have syllables that do not have codas. This means that these languages have both coda and codaless syllables. However, languages such as Fijian, Mazateco and Cayuvava do not allow their syllables to have codas at all. Typologically, this suggests that there are no languages that only have codas. Languages disallowing codas may

employ ‘repair strategies’ in order to ensure that languages do not end with such structures. Examples include loan words in Boumaa Fijian where epenthesis is used to make syllables end in a CV or V type (Kager (1999) citing Dixon (1988)). This is illustrated below:

- a) kaloko ‘clock’
- b) aapolo ‘apple’
- c) tʃone ‘John’

Evidence from language typology and instances of the use of epenthesis to avoid the occurrence of codas suggests that codas are marked positions. The following markedness constraint is therefore intended to account for that.

No coda

Syllables are open

When this constraint is undominated, the language in question will have open syllables.

Kager (1999) also explains the complexity of syllable margins across languages — whether languages allow complex onsets and codas or not. Complexity of syllable margins is marked. Typology suggests the following implicational universals concerning complex margins:

Implicational universal for onset complexity

If a language allows complex onsets, then it also allows simple onsets

Implicational universal for coda complexity

If a language allows complex codas, then it also allows simple codas

Crucially, no languages have syllables with complex margins while disallowing syllables with simple margins. This is also seen in the fact that many languages avoid these margins by either vowel epenthesis or deletion. Margin complexity is captured in the following constraints:

***Complex^{ons}**

Onsets are simple

***Complex^{cod}**

Codas are simple

Languages such as Japanese, Yokuts, Finnish and Tunica have simple onsets and therefore have *Complex^{ons} undominated. Similarly, languages such as Japanese, Yokuts, Spanish and Sedang do not allow complex codas, which means that *Complex^{cod} is undominated.

Archangeli (1997) provides an OT analysis of the explanation of syllable structures of various languages. Below we present a tableau of the analysis of Yawelmani and English. She uses the following constraints:

Faith V

All vowels in the input should be present in the output

Faith C

All consonants in the input should be present in the output

Peak

Syllables have one vowel

*Complex

Syllables have at most one consonant at an edge

Yawelmani (based on Archangeli 1997:20)

/logw-hin/	*Complex	Faith C	Peak	Faith V
logw.hin	*!			
log.whin	*!			
log.w.hin			*!	
log.hin		*!		
↪ lo.giw.hin				*

Yawelmani ranks ***Complex** high and this ensures that syllable margins in the language are simple. This is the reason why the first two candidates are ruled out. They violate a high-ranking constraint. The third candidate tries to fix this problem by syllabifying the second consonant in the cluster as a peak. However, it violates **Peak** which is also highly-ranked and requires all syllables to have a vowel. The fourth candidate loses out because it deletes a consonant and therefore violates **Faith C** which is also a high-ranking constraint. The last candidate wins because it only violates the least-ranked constraint **Faith V**.

English (based on Archangeli 1997:23)

/limp.nes/	Faith V	Peak	Faith C	*Complex
↪ limp.nes				*
lim.nes			*!	
lim.pi.nes	*!			
lim.p.nes		*!		

The first candidate wins because it does not incur any constraint violations while all the other candidates lose out because they violate high-ranking constraints.

We use the OT framework summarized above to provide some insight into the syllable structure and phonotactic constraints of Sukwa.

2.6 OT and Phonological processes

One of the major advantages of an OT analysis, as already discussed in section 2.2, is that it accounts for conspiracies in language. Pulleyblank (1997) discusses a conspiracy concerning identity cluster constraints. Pulleyblank (1997:64) argues that these constraints require identical featural properties of sequences of consonants. He provides four examples of Identical Cluster Constraints (ICC) and these are presented below:

Voicing: A sequence of consonants must be identical in *voicing*.

Consider the Zoque example below:

3. Input	Output	
min-pa	minba	‘he comes’

The output shows identity in voicing between the nasal and the stop.

Place: A sequence of consonants must be identical in *place of articulation*

Consider the Youruba example below:

4. Verb root	Progressive form	English gloss
ba	m+ba	‘overtaking’

In the example the nasal and the stop are both bilabial.

Continuancy: A sequence of consonants must be identical in *continuancy*.

Nasality: A sequence of consonants must be identical in *nasality*.

These constraints interact with each other and with faithfulness constraints. An example of such interaction between identity cluster constraints and faithfulness constraints from Yoruba is presented in the tableau below:

(Based on Pulleyblank 1997:69)

/n-kɔ/	ICC [Place]	Faith [Place] Obstruents	Faith [Place] Nasals
nkɔ	*!		
⇒ ŋkɔ			*
ntɔ		*!	

The first output form loses, because by not sharing the same place of articulation, it violates **ICC [Place]**, the constraint that requires identity in terms of place. Although the third candidate shares identity in place, it violates a high-ranking constraint which requires faithfulness of the place features of the input obstruent. Candidate two wins because it only violates the lowest ranking constraint while observing **ICC [Place]** – a high-ranking constraint.

As observed in the tableau above, there is homorganicity in Yoruba because the language satisfies **ICC [Place]**. This is further illustrated in the examples below.

Place of articulation	Verb root	Progressive form	Gloss
5. Velar	gu	ŋ+gu	climbing
6. Alveolar	ta	n+ta	selling
7. Labio-velar	kpa	ŋm+gbɔ	hearing

Kager (1999) discusses the ***NC [-vc]** constraint at length. This is an example of the ICC constraint (the one that requires segments with identical voicing) already referred to above. This markedness constraint prohibits the occurrence of a nasal and a voiceless obstruent in a nasal-consonant cluster. ***NC [-vc]** is stated as follows:

A sequence of a nasal plus a voiceless obstruent is disallowed.

In languages, this constraint interacts with other constraints (mostly faithfulness constraints) and a variety of strategies are employed in order to observe it. Below are examples from languages that conform to this unmarked structure and the strategies they employ:

8. Nasal substitution – Indonesian (based on Refinaldi 2006:4)

(i.e. forms in the second column are outputs of those in the first)

- | | | |
|----------------|---------|------------------|
| a) /məN+pakai/ | məmakai | to wear / to use |
| b) /məN+tari/ | mənari | to pull |
| c) /məN+kirim/ | məŋirim | to send |
| d) /məN+pilih/ | məmilih | to choose |

In this process, in a nasal + obstruent sequence, the latter is deleted but leaves its place of articulation features. In the data above, in (a) the segment /p/ is deleted but its bilabial features are manifested in the second [m] of the output.

9. Post-nasal voicing in Puyu Pungo Quechua (based on Kager 1999:80)

- | | |
|-------------------------------|---------------------------|
| a) i) sinik-pa ‘porcupine’s’ | ii) kam-ba ‘yours’ |
| b) i) wasi-ta ‘in the jungle’ | ii) wakin-da ‘the others’ |

In Puyu Pungo Quechua, once there is an NC sequence, the obstruent has to be voiced. For example the /p/ that appears in (9a) above changes into a voiced segment [b] once it is preceded by the nasal /m/.

10. Denasalization in Mandar (based on Kager 1999:81)

a) /maN-dundu/ mandundu ‘to drink’

b) /maN-tunu/ mattunu ‘to burn’

In this process, the nasal preceding the voiceless obstruent is denasalized. This can be observed in (b). The nasal /N/ in the input has changed into an oral consonant /t/ in the output form. This is because in (10b) the nasal was followed by a voiceless consonant. In (10a) there is no denasalization because a voiced sound [d] follows the nasal.

Kager (1999) notes that the following constraints account for the data above:

***NC [-vc]**

No nasal plus voiceless obstruent sequences

All output forms presented in examples 8, 9 and 10 above are affected by *NC [-vc]. This is because they all occur without the nasal and a voiceless obstruent structure. For instance, the output forms in (9) have nasal and a voiced obstruent sequence.

Linearity-IO

The output reflects the precedence structure of the input, and vice versa

The output forms in 8) violate this constraint. This is because it requires the linear ordering in the input to be the same as the one in the output. In the forms here, there were two segments in the input - nasal plus obstruent but in the output only the nasal segment appears. This is a violation of

Linearity-IO.

Max-IO

(‘No deletion’)

Input segments must have output correspondents

This constraint is obeyed in the Mandar examples, because all the input forms have correspondent output forms even though their features may be different in some instances. For example, in (10b) seven segments appear in the input and seven sounds also appear in the output forms.

Dep-IO

(‘No epenthesis’)

Output segments must have input correspondents

Again the Mandar examples obey this constraint because all the output forms have correspondent input forms. Once more in (10b) there are seven segments in the output and seven segments also appear in the input forms.

Ident-IO (Obs Vce)

(‘No changes in the voicing of obstruents’)

Correspondent obstruents are identical in their specification for voice

The output forms of the Puyu Pungo Quechua data violate this constraint. Consider the forms in (9a) and (9b). The input form for the obstruent following the nasal in (b) was /t/ — a voiceless stop but this sound becomes [d] — a voiced stop in the output. This is a clear violation **Ident-IO (Obs Vce)**

Ident-IO → (nasal)

(No denasalisation)

Any correspondent of an input segment specified as F must be F

Ident-IO → (nasal) is violated by the Mandar examples. This is because in (10b), the nasal is specified with nasal features in the input. However, they appear without the nasality in the output.

The literature discussed in this section examines aspects of phonology within the OT framework. The theory itself is examined and different work within OT is analysed. This whole framework informs the work on Sukwa for this research. In Chapter 3, we start our analysis of Sukwa by examining the sound system and syllable structure of the language.

Chapter 3: Sukwa sound system and syllable structure

In this Chapter, we discuss the sound system of Sukwa as well as its syllable structure³. It draws mainly from Chomsky and Halle's (1968) distinctive feature theory in the examination of the features of segments⁴. This is because OT does not provide a detailed distinctive feature analysis.

3.1 Vowel system

3.1.1 Short vowels

Miti (2006) outlines the common vowels in Bantu languages. He notes that the majority of Bantu languages have either five or seven underlying phonemic vowels. Those that have seven vowels have one of the following two types:

Type 1

/ɪ/, /e/, /ɛ/, /a/, /ɔ/, /o/, /u/

Type 2

/i/, /ɪ/, /e/, /a/, /o/, /u/, /ʊ/

Examples of such languages according to Miti (2006) include Lingala, Mongo and Wongo. Bantu languages which have a five vowel system are also categorized into two and these are presented below:

Type 1

/i/, /e/, /a/, /o/, /u/

Type 2

/i/, /ɛ/, /a/, /ɔ/, /u/

The examples Miti (2006) seem to be phonetic representations of these vowels. He provides the following languages as examples of the five vowel system Swati, Venda, Swahili, Vale. Mudzingwa (2010), Kula (2007) and Bickmore (1989) also mention Shona, Bemba and Lungu as languages with a five vowel system.

Sukwa also has a system of five short vowels. The vowels are presented below.

FRONT

BACK

i

u

e

o

a

³ It should be noted that all examples from the data in this dissertation have not been marked for tone. This is because we only wanted to deal with the segmental phonology of Sukwa. Issues of tone were left out for future research.

⁴ Much as considerable advances have been made on distinctive feature analysis since Chomsky and Halle's SPE framework for example autosegmental representations by Goldsmith (1976) and feature geometry by Clements (1985) and others, we decided to just use the SPE framework for this mini dissertation and use the other frameworks in future analyses.

3.1.2 Long vowels

The language also has some words that have long vowels. We are yet to analyze the environments where these appear. The following words manifest long vowels:

Sukwa	English
1. iljo:si	ash
2. umu:nda	garden

The long vowels are non-contrastive. Most of the long vowels in the language seem to occur in verb constructions and are a result of the concatenation of morphemes. Unfortunately, we do not discuss vowel length in this dissertation. Sukwa, like most other Bantu languages, has no nasalized vowels or diphthongs.

3.2 Consonant system

Sukwa has 15 consonants that spread across six places of articulation and six manners of articulation. A phonemic chart of Sukwa words is presented in Table 1 below:

Table 1

	Bilabials	Labio-dentals	Alveolars	Palatals	Velars	Labio-velars
Plosive	p		t		k	
Nasal	m		n	ɲ	ŋ	
Fricative	β	f	s		ɣ	
Affricate				tʃ		
Approximant				j		w
Lateral			l			

From the table, it can be observed that except for /ɣ/ and /β/, Sukwa only has phonemic voiceless plosives, fricatives and affricates. These do not have voiced counterparts. Consonant voicing, obviously, only occurs in approximants and nasals. Voiced plosives only appear after nasals. Sukwa, therefore appears to be a language with a simple consonant inventory.

Archangeli (1997) and Lombardi (1997) discuss languages that do not have voicing. Following Archangeli's constraints, voicelessness in Sukwa is a result of the interaction of the following constraints:

Faith [Voice]

Segments specified as voiced in the input should also have voicing in the output

Obs/Voi

An obstruent must be voiceless.

The ranking of the constraints is therefore as follows.

Obs/Voi >> Faith [Voice]

The ranking and interaction can be observed in the tableau below:

/ivula/	Obs/Voi	Faith [Voice]
a. ifula ⇒		*
b. ivula	*!	

Candidate (a) wins as the optimal candidate because it satisfies the high-ranking constraint Obs/Voice which requires that obstruents must be voiceless while the violation of the same constraint by candidate (b) is fatal even though it remains faithful to the input. It therefore is not attested in the language.

3.2.1 Aspiration

There are no prominent cases of aspiration in the recorded data. This means that we did not find many cases of aspiration in the data. The only aspirated consonants are the stops /t^h/, /k^h/ and /p^h/. These aspirated sounds only appear as the onset of the final syllable of a word. Consider the examples below:

3. Sukwa word	English gloss
jit ^h u	ours
ʃok ^h a	one
iljot ^h o	fire

However, it should be noted that their unaspirated counterparts can also appear in this environment.

Consider the examples below:

4. Sukwa word	English gloss
ikutu	ear
seka	laugh
imitu	heads
ifupa	bone

The aspirated and the unaspirated stops are therefore in free variation.

3.2.2 Distribution of consonants

This section considers the distribution of consonants in the word and also in the syllable.

Table 2 below shows the distribution of consonants in a word.

Table 2

Distribution of position of consonants in a word

Consonant	Initial		Medial	
	Word	Gloss	Word	Gloss
/p/	puluka	fly	ʃipapilo	uterus
/t/	tata	father	fitatu	three
/k/	kinda	run	mukasi	woman
/m/	mutu	head	amisi	water
/n/	naaŋwa	I have drunk	finama	legs
/ɲ/	ɲumba	house	lupeɲe	bee
/ŋ/	ŋombe	cow	kuŋwa	to drink
/f/	fiwili	two	amafumbi	eggs
/s/	sekulu	grandfather	lusoko	river
/ɣ/	ɣawa	share	aɣa	these
/ʃ/	ʃinama	leg	itʃakulja	food
/β/	βika	give	amaβele	breasts
/j/	juya	say	mujemba	brother
/w/	wuka	go	wawili	two
/l/	luma	bite	ululimi	tongue

Since Sukwa generally has open syllables (cf. discussion in section 3.4), consonants (single or as clusters) do not appear in word-final position.

Table 2 shows that the consonants presented there can appear both word-initially and -medially.

3.3 Consonant clusters

3.3.1 Nasal consonant sequences

Debate in the Bantu literature has, among other things, focused on whether combinations of a nasal and an obstruent should be considered as a cluster or a single unit. Kula (2007) and Downing (to

appear) cite different arguments of these two sides but they both argue for a cluster analysis. The following are some of the arguments which have been presented in support of a unit segment position: Firstly, the nasal and the following stop are always homorganic. Secondly, they have the surface duration of simple segments. Thirdly, they are widely attested in languages that have a strictly CV syllable type and finally, the fact that they are psychologically real to native speakers whose syllabification patterns regard them to be unitary.

Downing (to appear) argues that it is difficult to account for the unit segment analysis because it is unclear whether there is any phonological contrast between intervocalic pre-nasalized stops and NC clusters. Furthermore, there is contradictory evidence on the durational distinction between pre-nasalized stops and NC clusters. She cites Herbert (1975, 1986), Maddieson (1989), Maddieson and Ladefoged (1993) who show that NC sequences have the same duration as singleton segments. Nevertheless, Hubbard (1995a) argues that in some Bantu languages such as Nyambo, Ganda and Sukuma, NC sequences are significantly longer than singleton segments. Studies by Maddieson and Ladefoged (1986 cited in Maddieson and Ladefoged (1993)) and Browman and Goldstein (1986) further show that there is a timing difference between those segments analyzed as NC clusters and those analyzed as pre-nasalized stops. Kula (2007) further argues that the homorganicity argument may not be true for all languages because although the majority of languages have homorganic nasal assimilation, in languages such as Nyanja, it is possible to have both homorganic and non-homorganic NC sequences.

On the issue that Bantu languages strictly have CV structure, Kula (2007:64) notes that

Agreeably, it is easier to formalize NC clusters as unit segments in comparison to ambisyllabic and sequence structures that may require additional motivation, but we cannot seriously argue that one analysis is better than the other merely on grounds of ease of formalization.

She further argues that speakers' intuitions are influenced by surface representation so the intuition argument does not necessarily hold.

Kula (2007) and Downing (to appear) present further arguments for regarding NC sequences in Bantu as NC clusters. The first argument is based on the distribution patterns of these clusters in that these sequences are restricted in the morpheme initial position. Kula cites Bemba to show that while the entire set of consonants occur in word initial position, NC sequences do not. They are rather found in C_2 and C_3 positions. They can only occur in C_1 once they are a result of a morphologically complex structure involving prefixation and that most NC sequences occur between vowels. She further observes that NC sequences do occur word initially in some Bantu languages and they are always split by a morpheme boundary in this position (and are commonly

split by a morpheme boundary in other positions as well). She concludes that it would be strange if NC clusters were analyzed as pre-nasalized stops, because they would not therefore behave in the same manner as their fellow unitary segments.

The second argument is that when nasal + consonant sequences are analyzed as clusters, Meinhof's law of dissimilation can be predicted in these structures. In this process, a voiceless stop becomes voiced when immediately followed by a syllable which has a voiceless stop in it. Kula argues that once nasal consonant sequences are analyzed as clusters this dissimilation process can be predicted. It is observed that there is a blocking effect when there is an NC sequence which can only be accounted for if they are analyzed as clusters and not unitary segments. Downing (to appear) argues against the unitary segment analysis based on pre-NC lengthening. She treats NC sequences as heterosyllabic clusters and that the nasal shares a mora with a preceding long vowel.

It is observed that there is a blocking effect when there is an NC sequence which can only be accounted for if they are analyzed as clusters and not unitary segments. Downing (to appear) argues against the unitary segment analysis based on pre-NC lengthening. She treats NC sequences as heterosyllabic clusters with the nasal sharing a mora with a preceding long vowel. She argues that vowel lengthening before NC does not require the nasal to be resyllabified in onset position because this can be done if the nasal in NC is syllabified as a coda. Downing concludes that NC sequences should be analyzed as clusters because prosodic and segmental affiliations of the nasal are misaligned. The nasal shares properties with a preceding vowel and consonantal properties with a following consonant.

In our discussion of Sukwa, we analyze NC sequences as clusters following the persuasive arguments presented by Kula (2007) and Downing (to appear) and also largely based on the distribution patterns of NC sequences in the language. We immediately turn to this issue below.

Firstly, it should be noted that the NC clusters that occur in the language are that of a homorganic nasal and a voiced stop (recall from the consonant inventory in Table 1 that the language only has voiceless stops). This phenomenon will be explained in detail in Chapter 4. The NC clusters therefore include: /mb/, /nd/, /ɲdʒ/, /ŋg/, /mb^w/, /nd^w/, /ŋg^w/. The following is a brief description of their distribution

Distribution of NC clusters in a word

Table 3

NC	Initial		Medial	
	Word	Gloss	Word	Gloss
mb			imbuno imbusi imbeja ifumbi atiimbite ukumba	nose sheep salt egg they have not sung to dig
nd	ndakuṅwa ndamuwene	I will not drink I have not seen him/her	indond ^{wa} ukweenda umundu atakindite	star to walk person they have not run
ɲɔ			iɲɔzoka	snake
ŋg	ŋgulja	I am eating		

From the table above, it is observed that it is only [mb] that does not occur as the initial sound of the word. The other NC combinations, such as [nd] can occur word- initially and -medially. However, it should be noted that the instances where NC occurs as the first segment are a result of complex morphological combinations cf. *ŋgulja* ‘I am eating’, which comes from:

N- ku- lj -a
1stsg TM eat FV

The phonological processes involved in the derivation of forms like this with change of /k/ to [g] through post-nasal stop voicing is discussed in Chapter 5. This means that NC appears as the initial sound in this special case.

It can also be observed that NC can occur in any consonant position (i.e. C₁, C₂, C₃). However, much as NC appears as C₁, it always appears with/after a morpheme boundary (the pre-prefix). For example the words *imbusi*, *iɲɔzoka*, *indondwa*. The NC sequences ([mb], [ɲɔ], [nd]) in the examples are the first consonants in the words but they are separated by the pre-prefix.

If these occurrences discussed above are compared with those of the phonemic segments presented in Table 1, we observe that they do not exhibit similar patterns. This is because the other consonants do not have restrictions on their occurrence. They therefore can not be treated in the same manner, i.e. as unitary segments.

Crucially, we argue that on the surface, the NC sequences do appear as the initial sound in the word and as C₁ as can be seen in the data. However, their occurrence is not the same as other consonants because firstly the other consonants appear in the initial position even when there is no concatenation of morphemes, unlike the NC sequences.

For the OT analysis, we acknowledge that these clusters appear on the surface as the initial sound. However, overstating this will obviously make a wrong prediction that the sound appears as such in every instance while as we have argued above they do not do so. We will therefore have to posit a high-ranking constraint to avoid these clusters appearing as the initial sound normally, but rather when they are a result of this morpheme juxtapositioning.

Furthermore, the pre-prefix, as will be discussed in Chapter 4, is optional. Speakers can produce a noun with or without it. However, we observe that while speakers can do this with nouns that begin with all the other consonants presented in Table 1, they cannot do so with nouns which begin with an NC sequence. Consider the examples below:

5. Sukwa word	English gloss
a) umaji or maji	mother
utata or tata	father
umutu or mutu	head
ifipapilo or ifipapilo	uterus
b) imbuno	nose
c) inguku	chicken
d) ingalamo	lion

The data in a) show that the appearance of the pre-prefix with the noun is optional. For the b) forms, this is not the case because they always have to be produced with the pre-prefix. The blocking of

the optional removal of the pre-prefix is done because the initial position is a place where the NC sequences can not occur.

Based on the arguments, presented above, we can only analyze NC sequences as clusters.

3.3.2 Consonant glide sequences

Kula (2007) argues that these sequences in Bantu languages occur as a result of gliding. Gliding results in the articulation of high vowels in onset and being articulated as secondary articulation. The consonant and glide are in independent constituents and there is therefore no restriction on what consonants may occur in an onset preceding the glide in nuclear position. Mudzingwa (2010) also regards these sequences as secondary articulation and explains that they involve eliding V₁ (the first vowel in VV sequence) and then passing the whole V place node to the preceding consonant. In Sukwa, almost all consonants can occur with a glide /w/ to form a consonant with secondary articulation except the sound /ɣ/, the nasals /n/ and /ŋ/ and the glides themselves.

Sukwa therefore has the following consonant glide sequences /m^w/, /p^w/, /l^w/, /sw/, /mb^w/, /ŋg^w/, /ŋ^w/, /f^w/, /k^w/, /t^w/, /s^j/, /m^j/, /f^j/, /t^j/, /p^j/⁵

Examples include the following:

Consonant plus /w/

6. Sukwa word	English gloss
umwesi	moon
mujipwa	mother's brother
ukuŋwa	to drink
ukufwa	to die
ukwimilila	to stand up
twatesja	you have seen

Consonant plus /j/

7. Sukwa word	English gloss
mulisja	boy
itisja	call
malafjale	chief
iljo:si	ash

⁵ The consonant glide clusters are not represented in the phonemic system of Sukwa simply because they occur as a result of secondary articulation and are rather derived.

ukupjela

to sweep

Much as there are some words that seem to have underlyingly labialized and palatalized segments, most of the sequences, as Kula (2007) notes, are a result of the gliding of the high vowels /u/ and /i/. These processes will be explained in detail in Chapter 4.

With all the discussion about Sukwa consonants put into perspective, we can now present the feature matrix of Sukwa as follows. (The distinctive features used are largely based on Chomsky and Halle's (1968)) distinctive feature theory in the *Sound Pattern of English*.

Feature Matrix of Sukwa consonants

Note: The ticks stand for unary features that have (+) or(-) values.

	p	t	k	m	n	ɲ	ŋ	β	f	s	ʃ	ʧ	j	w	l
Consonantal	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Syllabic	-	-	-	+/-	-	-	-	-	-	-	-	-	-	-	-
Sonorant	-	-	-	+	+	+	+	+	-	-	-	-	+	+	+
Continuant	-	-	-	-	-	-	-	+	+	+	+	-	+	+	+
Nasal	-	-	-	+	+	+	+	-	-	-	-	-	-	-	-
Lateral	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+
Strident															
Coronal	-	√			√	√				√		√	√		√
Dorsal			√				√				√			√	
Labial	√			√				√	√					√	
Anterior	+	+	-	+	+	-	-	+	+	+	-	-	-		+
High	-	-	+	-	-	+	+	-	-	-	+	+	+	+	-
Low	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Round	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-
Voicing	-	-	-	+	+	+	+	+	-	-	+	-	+	+	+
SpreadGlottis	+	+	+	-	-	-	-	-	-	-	-	-	-	-	-

3.4 Syllable Structure

Syllables in Sukwa are open (i.e. they end in vowels) except in one case, a syllable is closed is when it is a syllabic nasal.

3.4.1 Syllable types

Sukwa has the following syllable types:

V

This consists of a syllable that only has a vowel. Since Sukwa nouns have a pre-prefix with a vowel, most of the syllables under this category involve the pre-prefixes. Nevertheless, there are some syllables which only have a vowel but are not prefixes. This syllable can occur in word-initial position (most frequently) but it can sometimes also occur word-medially. Examples that fall under this syllable type are presented below (the syllables in question are in bold):

7. Sukwa word

a.ku.lja

a.kwe.nda

i.ŋo.mbe

u.ta.ta

ti.u.lje

English gloss

s/he is eating

s/he is walking

cattle

father

you (sing.) will come

CV

This syllable type is the commonest in Sukwa, as in most other Bantu languages, and consists of a consonant and a vowel. The language strives to maintain this syllable type through various phonological processes discussed in Chapters 4. Examples of this syllable type are presented below.

8. Sukwa word

u.lu.li.mi

i.fu.la

mu.ka.si

English gloss

tongue

rain

woman/wife

C type

This syllable type is rare in Sukwa and only occurs with a nasal (always the bilabial nasal) which acts as a syllable peak. Examples of this type of syllable are given below.

9. Sukwa word

m.pu.nga

m.nandi

English gloss

rice

somebody small

NCV (Nasal consonant vowel)

This type of syllable consists of a nasal followed by a voiced stop and a vowel. Consider the examples below:

Sukwa word

i.ŋgu.ku

i.mbu.no

English gloss

chicken

nose

From the examination of Sukwa syllables above, it is clear that the language prefers syllables that do not have complex margins. This causes the language to have open syllables. In the onset

position, Sukwa has simple onsets comprising, mainly, one consonant. The only exceptions are a few consonant clusters such as those involving nasal consonant clusters. (We refer to instances of Cw and Cj as secondary articulation. cf. section 3.3.2)

The Sukwa syllables can be accounted for within OT through the interaction of the following constraints.

***NF**

No nasal plus fricative sequences

***Complex Ons**

Onsets are simple

No coda

Syllables are open

***NC [-vc]**

No nasal plus voiceless obstruent sequences

No hiatus

No VV sequences

Dep-IO

Output segments must have input correspondents

Max-IO

Input segments must have output correspondents

These constraints are ranked as follows:

*NF >> *NC [-vc] >> *Complex ons, No Coda, No Hiatus >> Dep-IO, Max-IO

The ranking of the constraints can be observed in the tableau below:

1. impuno	*NF	*NC [-vc]	*Complex Ons	No Coda	No Hiatus	Dep IO	Max IO
a. impuno		*!	*				
b. imvuno	*!		*				
⇨ c. imbuno			*				
2. kuota	*NF	*NC [-vc]	*Complex Ons	No Coda	No Hiatus	Dep IO	Max IO
a. kuota					*!		
⇨ b. kota							*
3. umama	*NF	*NC [-vc]	*Complex Ons	No Coda	No Hiatus	Dep IO	Max IO

a. umaman				*!		*	
⇒ b. umama							

Such a constraint ranking allows the language to have NC clusters only where the consonants are identical in voicing since this is a high-ranking constraint. This is why form (1c) is optimal. (1b) is fatal because it violates the highest ranking constraint that disallows sequences of a nasal and a fricative. However the NC cluster is the only cluster that is allowed since all other clusters are blocked by the other highly ranked *Complex Ons. VV sequences are also disallowed by the high-ranking of No Hiatus. That is why its violation, which is why form (3b) is chosen over (3a).

In conclusion, in this chapter we have discussed the sound system and syllable structure of Sukwa. We have shown that the language has a simple consonant inventory, mostly short vowels and various syllable types that are all open except for the syllabic nasal.

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Chapter 4: Phonological processes

In this chapter we discuss the phonological processes prevalent in Sukwa. We focus on the processes occurring across the noun class system and in verbal constructions. Note that we divide the occurrence of processes into nouns and verbs. Although there are some phonological processes occurring in the two categories which are the same, the division was done mainly because there are instances where a certain phonological process (glide-formation) does not occur in the expected phonological environment and vowel deletion applies instead. This strange phenomenon is dealt with in 4.5.2.3 where we explain that certain processes take place in one grammatical category and not the other. Hence the division, between the two categories nouns and verbs.

4.0 The Noun Class system

One of the predominant characteristics of Bantu languages is that their nouns fall into different noun or gender classes which generally consist of a singular/plural pairing. In total, Bantu languages have 25 noun classes but the choice of the number of classes used by individual languages varies from language to language. Languages, therefore, have individual systems for the operation of these classes.

Although the criteria upon which the classification of nouns is based are a subject of debate, there are indications that semantic, natural gender and phonological factors are among the issues which contribute to the categorization. The gender classes are therefore usually associated with semantic properties such as animacy, configuration, location, size, plurality or quality (cf. Bresnan & Mchombo 1995).

Typically, a Bantu noun will consist of an optional pre-prefix, or augment, a noun prefix and a stem. The pre-prefixes and prefixes, usually known as noun class markers, mark nouns for number and gender, determining the agreement forms of determiners, modifiers and predicates. The prefixation of a given noun class marker to a stem in Bantu can determine the inflectional agreement properties of the resulting form as well as change its semantic class at the same time. Thus, nominal prefixes have both inflectional and derivational characteristics (cf. Mufwene 1980, Myers 1987, Bresnan & Mchombo 1995 and others for this and various syntactic and phonological analyses of nominal prefixes in Bantu).

4.1 The Sukwa noun

The structure of the noun in Sukwa consists of a pre-prefix (which is optional in some cases), a noun prefix and a noun stem. This is illustrated in the examples below:

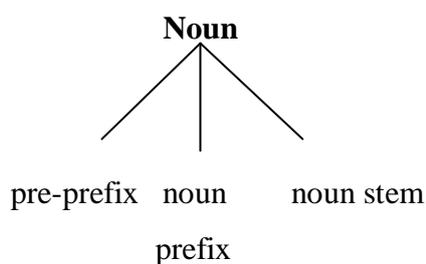
1. Sukwa word

English gloss

i-mi-tu	heads
a-ma-kutu	ears
u-mu-lomo	lip

In the examples, *i-*, *a-*, and *u-* are pre-prefixes of the nouns *imitu*, *amakutu* and *umulomo*, respectively, while *mi-*, *ma-* and *mu-* are the basic noun prefixes and *-tu*, *-kutu*, *-lomo* are the noun stems. Diagrammatically the structure of the Sukwa noun is illustrated below:

Structure of the Sukwa noun



According to Maho (2008), the pre-prefixes in some Bantu languages do not have any semantic function. Sukwa belongs to this group of languages, which is probably why they are optional in this language. However, as we argued in Chapter 3, section 3.3.1, the pre-prefix has a phonological function in that it is obligatory when it is followed by a nasal stop sequence. The locative classes in Sukwa do not have augments. This is nevertheless fairly typical of Bantu languages and this accords with the semantics of these classes.

The data show that there are 16 noun classes in Sukwa and these are presented in the table below:

Table 4

Class	Pre-prefix	Prefix	Examples	English Gloss
1	u-	mu-	umundu umulisja um ^w anakasi	person boy girl
1a	u-	∅-	usekulu umayi utata	grandfather mother father
2	a-	ba-	abandu abalisja	people boys

			abatata	fathers
3	u-	mu-	umutu umojjo um ^w esi umulomo	head heart moon lip
4	i-	mi-	imitu im ^o jo	heads hearts
5	i-	Ø-/li-	ifupa ilino ijiya iβele iluwa	bone tooth lung breast flower
6	a	ma	amafupa amino amajiya amaβele amaluwa	bones teeth lungs breasts flowers
7	i	f	itʃipapilo itʃakul'a itʃinama itʃijuni	uterus food leg bird
8	i	fi	ifipapilo ifakul'a ifinama ifijuni	uteruses food legs birds
9	i	N	imbuno iɲowe isofu ifula	nose hand elephant rain
10	i	N	imbuno	noses

			ijᵛowe isofu ifula indondwa iᵛgwi	hands elephants rains stars pieces of firewood
*11	u	lu	ulutondwa uluk ^{hw} i	star piece of firewood
15	u	ku	ukuᵛa ukutes ^ᵛ a ukulila	to eat to see to cry
16		pa	paᵛumba	at the house
17		ku	kuᵛumba	to the house
18		mu	muᵛumba	in the house

The nouns in Class 11 have their plurals in Class 10.

Having illustrated the noun classes of Sukwa, we now turn our attention to a discussion of the noun prefix. Just like in other Bantu languages, it is basically the prefix that determines the class to which a noun belongs and also informs the number of the noun, i.e. whether it is singular or plural, countable or uncountable. The term ‘neutral’ has been used for nouns that are neither singular nor plural. Examples of the noun prefix in Sukwa are illustrated in the following examples:

	Sukwa word	English gloss
2.	a) i- ᵛi - pungu	shoulder
	b) i- fi - pungu	shoulders
3.	a) u- mu - kolo	daughter
	b) a- ba - kolo	daughters
4.	a) *u- mu - pungu	shoulder
	b) *i- chi - kolo	daughters
	c) *a- ba - pungu	shoulders

The prefixes in bold indicated in (2a) and (3a) show the class of the whole noun, i.e.7 and 1 respectively. They also specify that the nouns are singular. While those in (2b) and (3b) show that the nouns belong to classes 8 and 2, respectively and that the nouns are plural. The forms in 4 are ungrammatical because they bear prefixes that do not belong to the class of the nouns.

It should be noted however that there are certain problems with only using the prefix to determine all those properties. For instance, Class 9 and 10 generally have the same noun prefixes in Bantu. They are nevertheless distinguished by their concords and pronouns. Classes 1 and 3 also have the same prefixes in Bantu and they are also distinguished by their concordance. They can also be differentiated by their plurals but there are many Bantu languages in which Class 1 nouns have plurals in Class 4, for example Sotho and Zulu. There also cases, though rare, where Class 3 nouns have their plurals in Class 2.

Nouns in Sukwa, as in other Bantu languages, also show a concordial system of agreement, where every word associated with a noun of a particular class will bear the agreement marker belonging to that particular noun class. This is illustrated in the examples below:

5. Sukwa word	English gloss
a) i-ŋ-umba j -a-ŋgu	my house
b) i-m-busi j -a-ŋgu	my goat
c) u-mw-ana w -a-ŋgu	my child

In the examples above /i/ in (5a and b) is the agreement marker for class 9 to which the nouns *imbusi* and *ifumba* belong. This is why the possessive pronoun *-a-ŋgu* (with the *a* being the possessive particle) bears this form in the examples (although it undergoes glide-formation processes which will be discussed later). It should also be noted that /u/ is the agreement marker for class 1 though it too undergoes glide-formation as will be explained in section.

There are several phonological processes that operate across these noun classes and they will be presented in the sections which follow.

4.2 Nominal phonology

4.2.1 Assimilation processes

4.2.1.1 Post-nasal stop voicing

As indicated earlier, Sukwa has underlying voiceless stops and fricatives. However, when a stop follows a nasal, it becomes voiced. A nasal and fricative combination is not allowed (cf. comment on this in 3.4 and 4.2.1.2). This can be observed by the fact that all words that have a nasal plus a stop have the stops as voiced. The language therefore, has the phonological process which is widely referred to as post-nasal stop voicing in Bantu (cf. Mtenje 1991 and Ngunga 1997 on Yao and Clements 1985 on Kikuyu among others).

Examples of post-nasal stop voicing in Sukwa are shown below.

6. Sukwa word	English gloss	Sukwa word	English gloss
a) u-lu-tondwa (Class 11)	star	indondwa (Class 10)	stars

- b) u-lu-k^{hw}i (Class 11) piece of firewood iŋg^wi (Class 10) pieces
of firewood

In the examples above, the noun stems /-tondwa/ and /-k^{hw}i/ have the voiceless stops /t/ and /k^h/ when they are singular. When these are combined with the noun prefix for Class 10 which is a nasal, the voiceless stops change into voiced stops [d] and [g].

To show that post-nasal stop voicing is a wide-spread phonological process in Sukwa, we will present more instances of this phenomenon in verbal constructions later.

4.2.1.2 Homorganic nasal assimilation

This is a common process in most Bantu languages. In a nasal consonant sequence, the nasal copies the place of articulation features of the following consonant. The examples in (6) above illustrate this. For instance, the stop /d/ in the Class 10 noun in (6a) is alveolar and the nasal [n] is alveolar too. In (6b), the stop [g] in [iŋg^wi] is velar and the nasal becomes velar too. The nasal is therefore argued to be abstract with no place of articulation value associated to it until it combines with the following consonant. The structures in (6) would therefore be reproduced as follows:

7. Sukwa word	→	English gloss
a) i-N-tondwa	→	indondwa stars
b) i-N-k ^{hw} i	→	iŋg ^w i pieces of firewood

It should be noted that we discussed in Chapter 3 that the nasal consonant clusters that occur in Sukwa always include a nasal and a stop. The combination of a nasal and a fricative is not allowed in the language. This seems to be as a result of the high-ranking of NF which does not allow such a sequence. This is placed above NC in the constraint hierarchy. This is the reason why *isofu* and *ifula* with the fricatives [s] and [f] respectively do not appear with nasals as in other Bantu languages such as Chewa.

4.2.2 Syllable structure processes

Most syllable structure processes are employed by Sukwa to maintain a basic CV structure, which is a very common syllable structure in the language.

Many of the processes operate in order to break hiatus situations (VV sequences). Some of these are discussed below:

4.2.2.1 Secondary articulation

This, as indicated in Chapter 3, occurs when a high vowel is followed by another vowel but is preceded by a consonant. The high vowel V1 is elided but the V place node is passed on to the preceding consonant.

This process is common across the noun classes when noun prefixes with high vowels are juxtaposed with a noun that begins with a vowel. This is observed in two instances. Firstly, the vowel /u/ in prefixes such /mu-/ is elided and attaches itself as secondary articulation and is superimposed on to the nasal consonant /m/ after the deletion process. This is illustrated through the examples in (8b) below.

8a) Sukwa word			English gloss
u-mu-ndu	→	umundu	person
u-mu-tu	→	umutu	head
u-mu-lomo	→	umulomo	lip
b) u-mu-ana	→	um ^w ana	child
u-mu-esi	→	um ^w esi	moon

The second instance of secondary articulation following vowel deletion is in the palatalization of /i/ in CV prefixes. When this vowel is followed by another vowel, it gets palatalized to /j/ as seen in examples (9b) below.

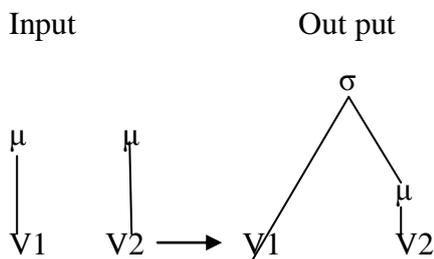
9a) Sukwa word			English gloss
i-fi-papilo	→	ifipapilo	uteruses
i-mi-tu	→	imitu	heads
i-fi-nama fi-thu	→	ifinama fithu	our legs
i-mbusi si-thu	→	imbusi sithu	our goats
b) Sukwa word			English gloss
i-fi-a-kulja	→	if ^j akulja	food
i-mi-ojo	→	im ^j ojo	hearts
i-fi-nama fi-awo	→	ifinama f ^j awo	their legs
i-m-busi si-awo	→	imbusi s ^j awo	their goats

4.2.2.2 Glide-formation

In this process, the high vowels [u] and [i] change into the glides [w] and [j], respectively, when they are followed by another vowel and not preceded by a consonant. While the root node is preserved. This causes the vowel to change into a glide whilst maintaining its place of articulation features. In section 4.5.2.3 below we discuss what seems like a contradiction to this process,

because we find that in a phonological environment where glide-formation was meant to apply, the process did not apply. We explain this using cophologies.

A structure of the glide-formation process is presented below:



In the concordial system, this occurs when an agreement marker that only has a vowel is combined with a morpheme which begins with a vowel. Examples of this are the agreement markers of Classes 1, 3, 4, and 9. These are presented below where the initial vowels in the demonstratives and possessive forms show class agreement.

10a) Sukwa phrase		English gloss
u-mu-ana u-ju (Class 1)	→	um ^w ana uju this child
u-mu-kasi u-ju (Class 1)	→	umukasi uju this woman
i-mi-tu i-ji (Class 4)	→	imitu iji these heads
i-mi-ojo i-ji (Class 4)	→	im ^j ojo iji these hearts
i-N-busi i-ji (Class 9)	→	imbusi iji this goat
i-N-gombe i-ji (Class 9)	→	injombe iji this cow

(Note: Though we do not discuss Meinhof's law in this dissertation, it will be noticed that the segmentation of i-N-gombe in the input has the sound [g] which does not appear in the output. This is a result of Meinhof's law which targets NCVNC sequences. In cases where Meinhof's has applied, a geminate may occur as in Ganda where N-limi → nnimi for tongues, but in languages like Sukwa, its application involves the elision of the oral consonant. Hence the deletion of /g/. It is noted that the process does not apply in all situations in cases where a language clearly has Meinhof's law.

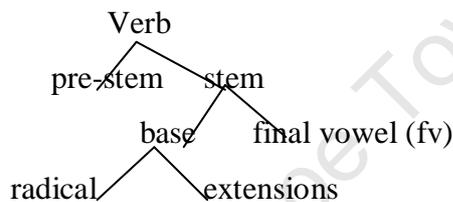
b) Sukwa phrase		English gloss
u-mu-ana u-angu (Class 1)	→	um ^w ana wangu my child
u-mukasi u-angu (Class 1)	→	umukasi wangu my wife
u-mu-tu u-angu (Class 3)	→	umutu wangu my head
i-mi-tu i-ithu (Class 4)	→	imitu jithu our heads
i-mi-jojo i-ithu (Class 4)	→	im ^j ojo jithu our hearts
i-N-busi i-ithu (Class 9)	→	imbusi jithu our sheep

i-N-gombe i-ithu (Class 9) → ijombe jithu our cow

The forms in (10a) retain their agreement markers as vowels [u] or [i] because the following possessive pronouns begin with consonants. However, in (10b), where the possessive forms begin with vowels as in /-anga/ and /-ithu/, the high vowels /u/ and /i/ of the agreement markers become glides /w/ and /j/, respectively.

4.3 The Verb

Bantu phonologists have argued that the Bantu verb is a hierarchically organized structure comprising prefixes (which represent a wide array of linguistic information like negation, tense, aspect, subject and object marking) which are added before a root which is then followed by optional suffixes and an obligatory final inflectional vowel, which is [a] in the majority of cases (cf. Myers 1987, Mchombo 1993, Hyman 2009 and others). We present Hyman's (2009) version of the structure of the Bantu verb below:



According to this diagram, the verb branches into a pre-stem (where all the prefixes are found) and stem. The stem branches into the base and final vowel (which includes [a] or [e]), while the base divides into radical and extensions. Under the branch of extensions we find suffixes such as the causative, applicative, passive and reciprocal.

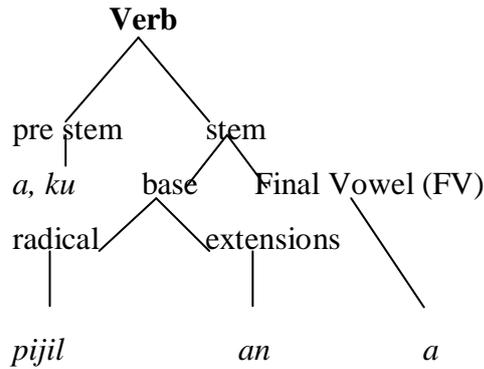
Note: We are yet to find out whether Sukwa has a VCV reflex of the P-B perfective suffix **-ide* and its position in the tree.

In the Sukwa structure below:

a-	-ku-	pijil-	-an	-a
3rd	pres.cont. tense	cook	reciprocal	final
pers pl.	marker		marker	vowel

They are cooking for each other.

The prefixes *a-* and *-ku-* fall under the pre stem, *-pijil-* is under the radical while *-an-* is a suffix that is placed under the extension branch and the final *-a* will come under final vowel. Hyman's tree with Sukwa's /akupijilana/ would therefore be as below:



4.4 Verbal phonology

4.4.1 Assimilation processes

4.4.1.2 Post-nasal stop voicing

This process in which a stop is voiced when it is preceded by a nasal consonant was discussed in 4.3.1 above and also appears in verbal constructions. Consider the examples below (where /u-/ is the second person subject singular marker, /ni-/ is the 1st person singular marker, [ti-] is the future tense marker, [ku-] is the present tense marker, [mu-] is the 2nd person plural marker and [ka] is the distant future tense marker):

11a)	Sukwa word	English gloss
	u-ku-ɸ ⁱ -a	you (sing.) are eating
	u-ku-ŋ ^w -a	you (sing.) are drinking
	u-ku-tes ^j -a	you (sing.) are seeing
	u-ku-kind-a	you (sing.) are running
	ti-mu-kis-e	you (pl.) (distant future)
	ti-mu-ka-ɸ ⁱ -e	you (pl.) will eat (distant future)
	u-k-imb-a	you (sing.) ate (near past)
	u-k-eend-a	you (pl.) walked (near past)

b. Sukwa word	English gloss
ni-ku-is-a ⁶ → ŋg ^w isa	I am coming
ni-ku-ɸ ⁱ -a → ŋgul ⁱ a	I am eating
ni-ku-eend-a → ŋg ^w eenda	I am walking
ni-ku-ŋw-a → ŋguŋ ^w a	I am drinking
ni-ku-tesj-a → ŋgutes ^j a	I am seeing

⁶ There seems to be a phonological process that deletes the /i/ sound from the ni of the first person singular marker. We however did not go into the details of examining this phonological process.

ni-ku-kinda	→	ŋgukinda	I am running
ti-ni-ka-lj-e	→	tiŋga ^l e	I will eat (near future)
ti-ni-ka-kind-e	→	ti-ŋgakinde	I will run (near future)
ni-ka-imb-a	→	ŋgimba	I ate (near past)

In the examples in 11b), [k] of the /ka/ and /ku/ change into voiced /g/ when it is combined with /ni/. We do not discuss this issue in the dissertation but the /i/ in /ni/ is deleted when concatenated with another morpheme.

4.4.1.3 Homorganic nasal assimilation

The process of nasal assimilation, which has also been discussed in the section above, takes place in verbal phonology as well. In the examples of post-nasal stop voicing given in (4.4.1.21) above, one notices that the velar nasal /ŋ/ shares the same place of articulation with the following consonant, in this case /g/. This is due to homorganic nasal assimilation.

4.4.2 Syllable structure processes

4.4.2.1 Secondary articulation

In prefixes, the vowel /u/ changes to /w/ when followed by vowels other than /u/ and when it is preceded by a consonant.

Consider the examples below:

12a. Sukwa word		English gloss
u-ku-lja	→	uku ^l ja to eat
u-ku-kinda	→	ukukinda to run
u-ku-ŋwa	→	ukuŋ ^w a to drink
ti-mu-kinda	→	timukinde you (pl.) will run (near future)
ti-mu-wona	→	timuwone you (pl.) will sleep (near future)
ti-mu-wika	→	timuwike you (pl.) will give (near future)
b. Sukwa word		English gloss
u-ku-imba	→	uk ^w imba to sing
u-ku-enda	→	uk ^w eenda to walk
u-ku-isa	→	uk ^w isa to run
ti-mu-imba	→	tim ^w imbe you (pl.) will sing (near future)
ti-mu-ise	→	tim ^w ise you (pl.) will come (near future)

(In the last two forms, the final vowel in those tenses (near future) changes into /e/)

In 12a, when /u-/ is followed by a consonant, the vowel remains the same. However, in the examples in 12b) where the vowel /u-/ is followed by another vowel, a glide is formed. This is due to the fact that Sukwa does not allow VV sequences.

4.4.2.2 Vowel deletion

When two or more vowels follow each other, all the vowels except the last one, are deleted. Chiona (2005) also notes instances of vowel deletion in Nyika and Ndali. Vowel deletion seems to be in conflict with our explanation above on glide-formation (Section 3.2.2.3). This is because in the phonological environment where glide-formation occurs, vowel deletion also occurs. This phenomenon is discussed later in section 4.5.2.3 by resorting to cophologies. Consider the examples below (where /ti-/ is the future tense marker, /wa-/ is the 3rd person plural prefix, /u-/ is the 2nd person singular marker, /-a-/ is the perfective tense marker, /ni-/ is the 1st person singular marker and /-ka-/ is the distant future marker):

13a. Sukwa word		English gloss
ti-wa-ise	→	tiwise They will come (near future)
ti-wa-imbe	→	tiwimbe They will sing (near future)
u-a-lja	→	alja You (sing) have eaten
u-a-tesja	→	ates ^h a You (sing) have seen
u-a-isa	→	isa You (sing) have come
u-a-imba	→	imba You (sing) have sung
ni-a-lja	→	nal ^h a I have eaten
ni-a-juxa	→	najuxa I have spoken
ni-a-wika	→	nawika I have given
ti-a-ka-ise	→	takise S/he will come
ti-a-ka-imbe	→	takimbe S/he will sing

4.5 OT analysis

In this section, we present an analysis of the phonological processes discussed in the sections above using the framework of Optimality Theory (cf. Archangeli (1997), Kager (1999), McCarthy and Prince (2004) and Prince and Smolensky (2005)). We start with assimilation processes.

4.5.1 Assimilation processes

4.5.1.1 Post-nasal stop voicing

The process where stops are voiced when preceded by a nasal can be accounted for through the interaction of several constraints. These are presented below.

*Complex Onsets

Onsets are simple

*NC [-vc]

No nasal plus voiceless obstruent sequences

IDENT- IO (Obs Vce)

No changes in the voicing of obstruents

Correspondent obstruents are identical in their specification for voice

IDENT-IO → (nasal)

(No denasalization)

Any correspondent of an input segment specified as F must be F

Firstly, it should be noted that since the process prohibits the sequence of a nasal and a voiceless obstruent, it must be the case that the constraint which licenses the sequence nasal plus voiced obstruent is ranked very highly in the constraint hierarchy (cf. Kager 1999 for a similar analysis). This constraint is, actually, in conflict with the faithfulness constraint **Ident-IO (Obs Vce)** which does not allow any changes in the voice features of obstruent segments.

A further point to be noted is that the occurrence of NC clusters indicates that although Sukwa does not allow complex onsets, where a cluster could be considered as such, the only cluster allowed is the NC cluster. Consonant glide sequences of Cj and Cw are in this analysis considered as secondary articulation cf. 3.3.2, 4.2.2.1 and 4.4.2.1. They are therefore not considered as clusters.

The constraint allowing clusters should, therefore, be ranked higher than ***Complex Ons** which does not allow them.

Finally, the occurrence of **Ident-IO** → (nasal) ensures that as a means of obeying the NC constraint, the nasal should not denasalize. This constraint is, thus, ranked higher than **Ident-IO Obs Vc** so that it is only the obstruents that can change to obey NC. The ranking of the constraints is therefore as follows:

*NC [-vc] >> IDENT-IO → (nasal)

The constraint allowing clusters should, therefore, be ranked higher than ***Complex Ons** which does not allow them.

Finally, the occurrence of **Ident-IO** → (nasal) ensures that as a means of obeying the NC constraint, the nasal should not denasalize. This constraint is, thus, ranked higher than **Ident-IO Obs Vc** so that it is only the obstruents that can change to obey NC. The ranking of the constraints is therefore as follows:

*NC [-vc] >> IDENT-IO → (nasal) >> IDENT-IO (Obs Vce) >> *Complex Onset

This ranking is presented in the tableau below:

Tableau 1

1.ni-ku-lja	*NC [-vc]	IDENT → IO (nasal)	IDENT-IO (Obs Vce)	*Complex Onset
a) ⇨ ŋgulja			*	*

b) ŋkulja	*!			*
c) kkulja		*!		*
2. i-N-buno	*NC [-vc]	IDENT → IO (nasal)	IDENT-IO (Obs Vce)	* Complex Onset
a) ɔimbuno				*
b) impuno	*!		*	*
c) ippuno		*!	*	*

The forms (1a) and (2a) are optimal candidates because they only violate ***Complex Onset** which is the lowest ranking constraint. However, (1b) and (2b) violate ***NC [-vc]** by having a voiceless segment after the nasal. Although (1c) and (2c) obey ***NC [-vc]** by denasalizing the nasal, they fatally violate the high-ranking **IDENT** → **IO**, hence they are ruled out.

4.5.1.2 Homorganic nasal assimilation

As Pulleyblank (1997) argues, clusters could be required to identical features whether in terms of place of articulation, continuancy or nasality. For Sukwa, clusters have to be identical in their place of articulation. This does not include C-glide sequences because as discussed in 3.3.2, 4.2.2.1 and 4.4.2.1 as these are cases of secondary articulation. This is the reason why forms like /fj/, /sj/ and /sw/ do not have to be identical in terms of place. The constraints interacting in this process are the following:

ICC (place)

A sequence of consonants must be identical in place of articulation

Ident (place) obs

No changes in place features of obstruents

Ident (place) nasals

No changes in place features of nasals

ICC (place) is the constraint which ensures that consonants in a cluster share the same place of articulation. However, it is only a nasal which can change its place of articulation features. This does not affect C-glide sequences because of the reasons stated above. This, therefore, means that the constraint **Ident (place) nasals** which does not allow changes in the place of articulation features of nasals has to be ranked lower than the constraint that requires faithfulness of place features of obstruents. Consequently, the constraints are ranked in the following manner:

ICC (place) >> Ident (place) obs >> Ident (place) nasals

We present the ranking of these constraints in the tableau below:

Tableau 2

ni-ku-ŋwa	ICC (place)	Ident (place) obs	Ident (place) nasals
a. ɛŋgʊŋwa			*
b. nguŋwa	*!		
c. ntunwa		*!	

By having the nasal and obstruent with the same place of articulation features, candidate a) becomes the optimal candidate, because it only violates **Ident (place) nasals** which is the lowest ranking constraint. Even though candidate b) is faithful to the place features of both the nasal and the obstruent by obeying **Ident (place) obs** and **Ident (place) nasals**, it violates the markedness constraint **ICC (place)** because the segments have different place of articulation features i.e. alveolar for the nasal and velar for the obstruent. Candidate c) violates **Ident (place) obs** by changing the place of articulation of the obstruent from a velar to an alveolar in order to observe **ICC (place)**. This violation, however, is fatal due to the high-ranking of **Ident (place) obs**.

4.5.2 Syllable structure processes

As discussed in section 4.4, syllable structure processes in Sukwa are hiatus-resolution strategies. OT analyses of similar resolution strategies in Bantu languages such as Shona, Ndebele and Tonga have been presented in Mudzingwa (2010), Sabao (2009) and Mkochi (2004), respectively. Bantu languages may strive to break hiatus situations, but the way these sequences are resolved may vary from one language to another and sometimes even within the same language. The ranking of constraints, as is commonly known in Optimality Theory, is different across languages and sometimes within the same language system. The same situation will be observed in Sukwa. Below is a presentation of the constraints that are involved in the operation of the syllable structure processes in Sukwa, all of which are intended to break the hiatus situations discussed above.

4.5.2.1 Glide-formation

This process is as a result of the interaction of the following constraints:

No hiatus

No VV sequences

Max μ

A mora in the input must have a correspondent in the output

Max Rt

Every root node in the input has a correspondent root node in the output

Glide-formation takes place as a hiatus-resolution strategy. Thus, **No hiatus** has to rank very highly. Glide-formation also involves the loss of a mora and this means that **Max μ** is ranked lower than **No hiatus** in order to enable the change of the vowel into a glide. Although the mora is deleted, the root remains intact indicating therefore that **Max Rt** will have to appear above **Max μ** . The constraints are therefore ranked as follows:

No Hiatus >> Max μ >> Max Rt

This ranking is presented in the ranking below:

Tableau 3

u+aŋgu	No hiatus	Max Rt	Max μ
⇒ wangu			*
uŋgu	*!		
uŋgu		*!	
i+aŋgu	No hiatus	Max Rt	Max μ
⇒ jaŋgu			*
iaŋgu	*!		
iŋgu		*!	

Candidates 1a) and 2a) are the optimal candidates because they do not violate the high-ranking **No hiatus** even though they violate **Max μ** . However, candidates 2a) and 2b) have VV sequences and are therefore in violation of **No hiatus** which makes their violation fatal because it is the highest ranking constraint.

4.5.2.2 Secondary articulation

Secondary articulation occurs when glide-formation fails. As indicated earlier, it involves eliding V1 without eliding the place node which then attaches itself to the preceding consonant. Mudzingwa (2010) argues that secondary articulation in Shona is done to avoid the occurrence of clusters. Similarly, in Sukwa, the process also takes place in order to avoid clusters since as argued in Chapter 3, Sukwa does not have clusters except for the NC clusters. If the high vowel was to glide it would create a consonant glide cluster. Secondary articulation for the vowel /u/ therefore is a consequence of the interaction of the following constraints.

No hiatus

***Complex Onset**

Complex onsets are prohibited

Max [labial]

Any labial feature in the input must have a correspondent feature in the output

Max Rt

Every root node in the input has a correspondent node in the output

The ranking of the constraints is as follows and is presented in Tableau 4 below:

No Hiatus, *Complex Onset >> Max [labial] >> Max Rt

Tableau 4

1. u+mu+ana	No Hiatus	*Complex Onset	Max [labial]	Max Rt
a. umwana		*!		
b. \hookrightarrow mwana				*
c. umuana	*!			
2. u+mu+esi	No Hiatus	*Complex Onset	Max [labial]	Max Rt
a. umwesi		*!		
b. \hookrightarrow umwesi				*
c. umuesi	*!			

Glide-formation in the examples 1a) and 2a) in the tableau are blocked by ***Complex Onset**. This is the reason why these candidates are not optimal. Having them as optimal candidates would have forms with consonant-glide clusters which are prohibited in the language. The forms 1c) and 2c), which have vowel sequences, violate the highest ranking constraint **No Hiatus** and their violations are also fatal. Candidates 1b) and 2b) do not violate all high-ranking constraints although they violate **Max Rt**, the lowest ranking constraint. This therefore makes these candidates optimal.

Palatalization

The process of palatalization takes place when the vowel /i/ is followed by another vowel and it is also preceded by a consonant. This process results from the following constraints: **No hiatus**, ***Complex Onset**, **Max Rt** (as presented above) and another constraint, **Max [place]** which states that any place feature in the input must have a correspondent feature in the output.

The ranking of the constraints is given below.

No Hiatus, *Complex Onset >> Max [place] >> Max Rt

Tableau 5

1. i-fi-akulja	No Hiatus	*Complex Onset	Max [place]	Max Rt
a. ifjakulja		*!		
b. ⇔ if ^h aku ^h a				*
c. ifiakulja	*!			

Candidate (b)'s optimality is the result of it only violating the lowest ranking constraint by eliding the vowel and attaching its place features on the preceding consonant. Although candidate (a) does not violate a lot of many constraints, it violates the high-ranking *Complex Onset by having a combination of [f] and [j] through glide-formation and this violation is fatal. Candidate (c) violates the highest ranking constraint **No Hiatus** by having a VV sequence. This form is, consequently, unacceptable in the language.

4.5.2.3 Elision

Elision of a vowel is used as one of the hiatus-resolution strategies as observed in section 4.7.2. In this case, when two or more vowels are in sequence, the first vowel(s) in the sequence are deleted leaving only one vowel. It will be noticed, however, that the elision takes place in the phonological environment where glide-formation occurs. Examples of these processes will be reproduced below for ease of reference.

Glide-formation

14. Sukwa phrase

				English gloss
u-mukasi u-a-ngu	(Class 1)	————→	umukasi wangu	my wife
u-mu-ana u-a-ngu	(Class 1)	————→	umwana wangu	my child
u-mu-tu u-a-ngu	(Class 3)	————→	umutu wangu	my head

Vowel elision

15. Sukwa word

				English gloss
u-a-lja	→	a ^h a	*walja	you (sing.) have come
u-a-tesja	→	ates ^h a	*watesja	you (sing.) have seen
u-a-isa	→	isa	*wisa	you (sing.) have come
u-a-i-mba	→	imba	*wimba	you (sing.) have sung

16. ni-a-lja	→	naa ^h a		I have danced
ni-a-juxa	→	najuxa		I have spoken
ni-a-wika	→	nawika		I have given
ti-a-ka-ise	→	takise		S/he will come
ti-a-ka-imbe	→	takimbe		S/he will run

The environment for glide-formation is that the high vowel /u/ will change into glide when it is followed by another vowel and not preceded by a consonant. This can be seen in the examples given in section 4.4.2 above where the Class 1 prefix marker /u/ changes into the glide /w/ when it is followed by another vowel. In our analysis, we accounted for this process through the fact that the constraint Max [Rt] ranks higher than Max μ which prevents the deletion of a vowel. If we are to follow this constraint ranking for the examples in the elision examples, the tableau would look like the one below:

Tableau 6

u-a-lja	No Hiatus	Max Rt	Max μ
⇒ a) wa ^l a			*
b) a ^l a		*!	*
c. ua ^l a	*!		

The examples in the tableau are presented in a strict ranking of the constraints as follows: **No Hiatus**>>**Max μ** >>**Max Rt**. Following this ranking, candidate a) wins because it does not violate any of the constraints except **Max μ** , and candidate b) loses out because it violates **Max Rt**. Candidate c) is not optimal because it fatally violates **No hiatus**, the highest ranking constraint in the hierarchy.

However, even though the constraint ranking given above presents candidate a) as the optimal one, the examples in the language data show that the output form in a) is not the correct form of pronunciation, but candidate b). The ranking, therefore, does not lead us to the expected results because where it was expected that glide-formation would take place, deletion occurs instead. If we follow this strict ranking, the theory will fail to account for this phenomenon.

In order to explain this puzzling situation, we will appeal to the theory of Cophonologies which has been invoked in the OT literature to account for morphologically conditioned processes. This theory was expounded by, among others, Inkelas (1998), Orgun (1998), Inkelas & Orgun (1998), and it claims that there are sets of phonological patterns that are associated with particular morphological constructions. Within the same language, a given set of constraints may show a particular ranking in one morphological construction and a reverse of the same constraints in another morphological construction. Furthermore, it is the entire bundle of rules or specific ranking of constraints constituting the cophonology which is morphologically indexed and not individual rules or

constraints. The notion of cophonologies thus accounts for the various exceptions or counter examples that are encountered in the application of phonological rules.

Inkelas & Zoll (2005:76) present a classic example of a Base-Reduplicant phonological mismatch in intensive reduplication in Sanskrit which is best accounted for through cophonology theory. Mtenje (2006c) also appeals to cophonologies to explain differences in reduplication patterns of the Malawian Bantu languages Nyika and Ndali and certain phonological processes in Tonga. He argues that for Ndali and Nyika, the usual pattern for the reduplicant (RED) is for it to appear with an onset in the initial position. However, in some morphological constructions such as the subjunctive, near future and perfective tenses, the RED violates the onset condition and starts with a vowel. He then proposes that the two constructions belong to two cophonologies i.e. the Base Cophonology and the Reduplicant Cophonology. In these cophonologies, the ranking of the same constraints is reversed depending on the morphological construction.

Mtenje (2006c) presents the two cophonologies for the constraints *Onset, Max-BR and DEP-IO as represented in the rankings given below where one constraint *Onset, is the highest ranking constraint in the Base cophonology but is ranked as the lowest in the Reduplicant Cophonology.

Base Cophonology: *Onset > Max-BR, DEP-IO

Reduplicant Cophonology: Max- BR, DEP-IO > *Onset

The theory of Cophonology can also be used to explain the differences in rule application between glide-formation and elision in Sukwa as presented above and seen in the examples given in 4.4.2, above, glide-formation occurs in nominal constructions where it changes a high vowel into a glide while vowel elision, the loss of one or more vowels when they are in a sequence, only takes place in verbal constructions.

We will argue that the difference in the morphological environments in which the two processes occur is the reason why they appear to involve two apparently contradictory constraint rankings. The cophonology solution we propose will also involve the positing of an additional markedness constraint which militates against glides as onsets, because in the noun constructions onsets as glides are allowed while they are not allowed in the verbal constructions. We will call this constraint ***Glide in onset** which states that:

Onsets must not be glides.

It will be recalled that the constraint ranking for glide-formation was as follows:

No Hiatus >> Max μ >> Max Rt

***Glide in onset** must therefore be ranked below **Max Rt** in the nominal constructions so that glide-formation must take place. In the verbal constructions, ***Glide in onset** must rank higher than **Max μ**. This will prevent glide-formation and vowel deletion may then take place.

A summary of the cophonologies is, therefore, as follows:

Nominal Cophonology: No Hiatus >> Max μ >> Max Rt >> *Glide in onset

Verbal Cophonology: No Hiatus >> Glide in onset >> Max Rt >> Max μ

The tableau for the nominal cophonology is therefore presented below:

Tableau 7

u-aŋga	No hiatus	Max Rt	Max μ	*Glide in onset
a. uaŋga	*!			
b. \Rightarrow waŋga			*	*
c. aŋga		*!	*	

Candidate (a) violates the highest ranking **No hiatus** so it is not the optimal candidate. Candidate (c) is also not optimal because it deletes the root and mora and the constraint calling for the preservation of the root node is a high-ranking constraint. Candidate (b) is acceptable because even though it violates **Max μ** by deleting a mora, glide-formation takes place because ***Glide in onset** is the lowest ranking constraint in the hierarchy.

For the verbal cophonology the tableau is as follows:

Tableau 8

u-alja	No hiatus	*Glide in onset	Max Rt	Max μ
a) ua ^l ʔa	*!			
b) wa ^l ʔa		*!		*
c) \Rightarrow a ^l ʔa			*	*

In the verbal cophonology, the constraint ranking allows for deletion to take place. As it can be observed, candidate (c) wins because it does not violate the high-ranking **No hiatus** and it also obeys ***Glide in onset**, a constraint which does not allow glide-formation as a hiatus resolution strategy. Candidate (b), although obeying **No hiatus** by forming a glide, violates ***Glide in onset** which is a high-ranking constraint and is, therefore, not optimal.

Two things should be noted when considering the phenomena of glide-formation and vowel elision in Sukwa as discussed above. Firstly, in order to obey **No hiatus**, Sukwa goes to the extent of deleting an important morphological marker, in this case, the /u/ of the second person subject marker. This is not common in many Bantu languages, but in this instance, we see phonological conditions (i.e. the avoidance of hiatus) overriding morphological considerations.

Secondly, we noted above that it is important to include the constraint ***Glide in onset** in order to explain why vowel elision, and not glide-formation, takes place in the verbal constructions where vowel sequences occur. In most Bantu languages, including the majority of the Malawian languages, in order to fulfil the onset condition and thus obey **No hiatus**, a glide may be inserted in between the two vowels (cf. Mtenje 1980, 1986 for examples of this strategy from Chewa). In Sukwa, however, as the constructions presented above illustrate, this option is not allowed.

4.6 Conclusion

A number of phonological processes which apply in Sukwa are discussed in this chapter, and it has been shown how they can be easily accounted for in Optimality Theory. It has been argued that Sukwa strives for non complex situations where there has to be identity in certain phonetic features such as voicing and place of articulation between the input and the output. It has also been shown that Sukwa disallows hiatus situations and that it employs strategies such as glide-formation, secondary articulation and vowel deletion to deal with such instances.

We have also argued that it is necessary to use the theory of cophologies in order to handle constraint rankings which are sometimes indexed to particular grammatical constructions in cases where similar phonological environments employ different hiatus resolution strategies.

Chapter 5: Summary and Recommendations

5.0 Introduction

In this chapter, we summarize all the issues that have been discussed in the last four chapters. We also provide recommendations for areas of further research for scholars. In addition, we make recommendations for language policy makers.

5.1 Summary

Sukwa, as presented in Chapter 1, is a Bantu language spoken in the most northern part of Malawi; in a district called Chitipa. It is a minority language and is highly under-documented. It forms a cluster with other varieties namely Lambya, Wandya, and Ndali. Since it is still under-described, we attempted to study phonological aspects of the language. In Chapter 1, we provided a brief explanation of the language and its people. We explained that speakers of Sukwa are multilingual because Chitipa district is a highly multilingual area. We also explained that the language is usually spoken in informal settings but the language users wish their language could be developed just like other languages such as Chewa and Tumbuka.

We also discussed the method of data collection in Chapter 1: data was collected from four Sukwa native speakers using a list of words which were translated into Sukwa. A digital recorder was used to record the data which were later on transcribed. We also explained that data were analyzed mainly using Prince and Smolensky's (1993) Optimality Theory. We provided arguments for the importance of studying the phonology of Sukwa. We explained that studies in Sukwa would contribute to the literature on Malawian and Bantu languages and enable scholars to make generalizations about this group of languages. We also argued that facts about the sound system of the language may assist in the production of an orthography for the language.

In Chapter 2, we reviewed the literature on OT and its application in various aspects of phonology. An overview of the theory was provided and we saw how OT was used to explain phenomena such as syllable structures and phonological processes.

The rest of the chapters were analyses of the language. In Chapter 1, we set out to achieve the following specific objectives:

- a) To establish the sounds of Sukwa;
- b) To examine the phonemic system of Sukwa;
- c) To analyse the syllable structure of Sukwa;
- d) To determine the main phonological processes in Sukwa;

- e) To present an Optimality Theoretic account of the processes established in (d) above.

Regarding the sounds of Sukwa, we established that the language has a five vowel system and 15 consonants running across six places of articulation. The stops, affricates and fricatives of Sukwa are mainly voiceless and voicing of these segments appears only after nasals with the exception of β and γ . Using phonological phenomena like the positioning of sounds in a word and the prevention of deletion of the pre-prefix before NC clusters, we argued that nasal consonant combinations in Sukwa should be considered as clusters and not a single unit. We therefore concluded that Sukwa generally has no clusters except the NC cluster.

The data in Sukwa illustrates that all syllables in Sukwa are open except the syllabic m, and the language has four syllable types namely: CV, V, C, NCV. CV is the most common syllable type for it is attested in most of the data, and various phonological processes are applied in order to achieve this syllable type. The C type of syllable is the least common as only a few examples were found in the data that have this structure.

By having simple consonants and a basic CV syllable structure it was argued that Sukwa is a language that ranks markedness constraints more highly than faithfulness constraints.

Chapter 4 is an analysis of the phonological processes in Sukwa and how they can be applied in Optimality Theory. The analysis is divided into two parts, namely nominal phonology and verbal phonology. In the nominal phonology, we discussed two assimilation processes and these were *Homorganic nasal assimilation* and *post-nasal voicing*. The former was applied in order to ensure that the nasal and the following consonant share the places of articulation while the latter ensured that the nasal and the following obstruent have identity in voicing.

The other phonological processes described in the nominal structures were syllable structure ones. We discussed that these processes work as strategies against hiatus situations. The syllable structure processes analysed include glide-formation and secondary articulation.

In the verb structures, the two types of phonological processes viz. assimilation processes and syllable structure processes were also attested. Homorganic nasal assimilation and more prominent cases of post-nasal stop voicing were observed. Glide-formation, secondary articulation and vowel deletion were the major syllable structure processes used to break VV sequences in structures.

Just as in the segmental system, Sukwa again strives for unmarked rather than maximally faithful outputs in its syllable structures. To ensure non-complex sounds and syllables, Sukwa ranks

markedness constraints higher than faithfulness ones. This is observed in the high-ranking of **ICC (place)** and ***NC [-vc]** for homorganic nasal assimilation and post-nasal stop voicing respectively. The high-ranking of the constraint **ICC (place)** and ***NC [-vc]** led to changes in the input and output in terms place of articulation features and voicing. In particular, we saw faithfulness constraints like **Ident (place) nasals** and **Ident obs vc** being violated in order to obey these markedness constraints.

For the syllable structure processes, markedness constraints feature highly in the constraint hierarchy of Sukwa. The constraint **No hiatus** is the highest ranking constraint in all processes. This markedness constraint causes segments to change their input features, i.e. in glide-formation and secondary articulation, while some segments are deleted, i.e. vowel elision. All these processes are costs to faithfulness constraints.

We also observed how processes fail to apply in a context where they normally would. This was seen when vowel deletion instead of glide-formation applied in a phonological context where glide-formation usually applies. A strict ranking of **No hiatus**>> **Max μ**>> **Max Rt** for glide-formation could not account for the deletion data because it yielded unacceptable candidates. We had to resort to Inkelas (1998), Orgun (1998), Inkelas & Orgun's (1998) theory of cophonologies which posits that constraints are morphologically indexed. Within the same language, a given set of constraints may show a particular ranking in one morphological construction and a reverse ranking of the same constraints in another. In addition, it was noted that according to this theory, it is the entire bundle of rules or specific ranking of constraints constituting the cophonology which is morphologically indexed and not individual rules or constraints. This led to two cophonologies for the nominal and verbal constructions. They were as follows:

Nominal Cophonology: No Hiatus>> Max μ >> Max Rt>>*Glide in onset

Verbal Cophonology : No Hiatus >>*Glide in onset>>Max Rt>>Max μ

The constraint ***Glide in onset** had to be invoked in order to explain why glides are not accepted in the verbal constructions while they are allowed to appear in the nominal ones. That is why glide-formation was to apply. However, we also discussed that the deletion of this particular segment was one that was crucial morphologically. This is because the segment that was deleted was a second person singular subject singular marker. Languages therefore at times may obey phonological conditions over morphological ones.

In conclusion, Sukwa is a fascinating language that generally strives for non complex phonological forms and this tendency is observed across the system, ranging from the type of sounds in its

inventory to its syllable structure. Phonological processes in the language warrant that markedness constraints are observed.

5.2 Recommendations

As indicated in Chapter 1, this is the first detailed study on the phonology of Sukwa. Therefore it only focuses on certain aspects of the language. Consequently, there are issues that still have to be explored in order to have a comprehensive account of the language. We therefore make the following recommendations:

- More evidence in the form of minimal pairs has to be provided in order to truly establish the phonemic sounds in Sukwa. This dissertation did not collect data with minimal pairs so such evidence will be crucial in examining the claims made in this dissertation.
- Much as this dissertation was on the phonology of Sukwa, issues in other aspects like tone, reduplication and loan phonology were not discussed. There is therefore need for research in these other areas of the field.
- Studies on the language should also be conducted in other fields of linguistics such morphology, syntax, semantics and pragmatics.
- Using this study and other research, it would also be interesting to investigate the interface between various areas of linguistics such as the phonology and morphology interface, phonology and syntax interface and the morphology and syntax interface.
- Considering that Chitipa is a highly multilingual district, sociolinguistic studies are warranted on issues on how language is negotiated among the different language groups, how the languages are affecting each other linguistically, on linguistic variation and how linguistic variables relate to social variables like age, sex and social class, just to mention a few. It would also be interesting to study whether there is language change in Sukwa due to the contact it has with other languages in the area.
- In Chapter 1 it was noted that Sukwa belongs to a cluster with other varieties such as Ndali, Nyika, Wandya and Lambya, and we would like to recommend a comparative study of these varieties of languages in order to observe how their phonologies diverge and converge. In an OT analysis, research has to be done to examine how the varieties resolve situations in the ranking of their constraints. It has been widely argued in the literature and also in this dissertation that syllable structure processes in Bantu are hiatus-resolution strategies. A

comparative study of this cluster would show how these are resolved and in turn shed more light on universals in Bantu languages.

- Other research opportunities could be in the compilation and collation of the lexicon or dictionary of Sukwa.
- For language policy makers, comparative studies with the other varieties in the cluster could assist in the writing of a proper orthography which would be required in the implementation of the language in education policy of Malawi. This would also lead to the production of reading materials in the language.

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Appendix 1: Data Elicitation

1: Tokens in isolation

A. Kinship terminology	Singular	Plural
1. father		
2. mother		
3. son		
4. daughter		
5. brother (male sibling)		
6. child		
7. wife		
8. sister (female sibling)		
9. husband		
10. boy		
11. girl		
12. man		
13. woman		
14. friend		
15. chief		
16. baby		
17. grand parents		
18. mother's sister		
19. mother's brother		
20. father's sister		
21. father's brother		

B. Body Parts	Singular	Plural
1. head		
2. lungs		
3. kidneys		
4. intestines		
5. stomach		
6. heart		
7. liver		
8. bladder		
9. womb		
10. face		
11. hair		
12. brain		
13. eye		
14. ear		
15. nose		
16. mouth		
17. tooth		
18. tongue		
19. arm		
20. shoulder		
21. elbow		
22. wrist		
23. hand		

24. finger
25. thumb
26. leg
27. ankle
28. knee
29. toe
30. foot
31. neck
32. bone
33. blood
34. beard (both singular and plural)
35. lip
36. breast
37. palm

C.	Animals	Singular	Plural
1.	cow		
2.	goat		
3.	fish		
4.	dog		
5.	bird		
6.	lion		
7.	snake		
8.	ant		
9.	sheep		
10.	cock		
11.	elephant		
12.	termites		
13.	animal		
14.	mosquito		
15.	bee		
16.	fly		
17.	honey		
18.	tick		
19.	hippos		
20.	chameleon		
21.	buffalo		
22.	giraffe		
23.	crocodile		
24.	dove		

D.	Numerals
1.	one
2.	two
3.	three
4.	four
5.	five
6.	six
7.	seven
8.	eight
9.	nine
10.	ten

11. one hundred
12. one thousand
13. two thousand

E. Plants	Singular	Plural
1. tree		
2. branch		
3. leaf		
4. bark		
5. groundnut		
6. beans		
7. rice		
8. root		
9. fruit		
10. seed		
11. danga		
12. grass		
13. flowers		

G. Adjectives

1. big
2. long
3. short
4. small
5. white
6. red
7. green
8. black
9. yellow
10. good
11. bad
12. hot
13. cold
14. round
15. tall
16. dry
17. few
18. old
19. new
20. young

F. Nominals	Singular	Plural
1. salt		
2. sky		
3. rain		
4. river		
5. borehole		
6. name		
7. mountain		
8. rock		

9. stone
10. food
11. water
12. fire
13. house
14. home
14. farm
15. smoke
16. ash
17. cloud
18. sun
19. moon
20. star
21. dress
22. shoes
23. meat
24. night
25. hill
26. summer
27. winter
28. anthill
29. firewood (single piece of + collective)
30. fish

H. Verbs

1. eat
2. drink
3. see
4. hear
5. bite
6. know
7. die
8. sleep
9. kill
10. fly
11. walk
12. run
13. come
14. sit (down)
15. stand (up)
16. give
17. say
18. cry
19. ask
20. push
21. pull
22. throw
23. fall down
24. hit/beat
25. cut

26. go
27. laugh
28. increase
29. bask by the fire
30. buy
31. sell
32. show
33. sleep
34. eat
35. drink
36. call
37. die
38. dig
39. run
40. love
41. dry up (e.g. a river/dam)
42. listen
43. marry (of man and woman, separately)
44. strangle/throttle
45. plough/cultivate
46. share/divide
47. give a share to

2. Carrier Frames

1. one

- a. house
- b. child
- c. goat
- d. cow
- e. stone
- f. egg
- g. man
- e. tree

2. two

- a. houses
- b. children
- c. goats
- d. cows
- e. stones
- f. eggs
- g. men
- e. trees

3. many

- a. houses
- b. children
- c. goats
- d. cows
- e. stones
- f. eggs

- g. men
- e. trees

4. this

- a. house
- b. child
- c. goat
- d. cow
- e. stone
- f. egg
- g. man
- e. tree

5. these

- a. houses
- b. children
- c. goats
- d. cows
- e. stones
- f. eggs
- g. men
- e. trees

6. that

- a. house
- b. child
- c. goat
- d. cow
- e. stone
- f. egg
- g. man
- e. tree

8. my

- a. house
- b. child
- c. goat
- d. cow
- e. head
- f. leg
- g. wife

9. your

- a. house
- b. child
- c. goat
- d. cow
- e. head
- f. leg
- g. wife

10. his/her

- a. house
- b. child
- c. goat

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- d. cow
- e. head
- f. leg
- g. wife

11. his/her

- a. houses
- b. children
- c. goats
- d. cows
- e. heads
- f. legs
- g. wives

12. their

- a. house
- b. child
- c. goat
- d. cow
- e. head
- f. leg
- g. wife

13. their

- a. houses
- b. children
- c. goats
- d. cows
- e. heads
- f. legs
- g. wife

14. Our

- a. house
- b. child
- c. goat
- d. cow
- e. head
- f. leg
- g. wife

15. Our

- a. houses
- b. children
- c. goats
- d. cows
- e. heads
- f. legs
- g. wives

16.

- a. to eat
- b. to come
- c. to drink
- d. to see
- f. to dance

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- g. to ran
- f. to talk

17. I have

- a. come
- b. eaten
- c. drank
- d. seen
- e. danced
- f. run
- g. talked

18. you (sing.) have

- a. come
- b. eaten
- c. drank
- d. seen
- e. danced
- f. run
- g. talked

19. you (plural) have

- a. come
- b. eaten
- c. drank
- d. seen
- e. danced
- f. run
- g. talked

20. they have

- a. come home
- b. eaten food
- c. drank water
- d. seen a boy
- e. danced
- f. run
- g. talked

21. I am

- a. coming
- b. eating
- c. walking
- d. drinking
- e. seeing
- f. dancing
- g. running
- h. talking

22. you (sing) are

- a. coming home
- b. eating food
- c. walking home
- d. drinking water

- d. seeing a girl
- e. dancing
- f. running
- g. talking

23. you (plural) are

- a. coming home
- b. eating food
- c. walking home
- d. drinking water
- d. seeing a girl
- e. dancing
- f. running
- g. talking

24. they are

- a. coming home
- b. eating food
- c. walking home
- d. drinking water
- d. seeing a girl
- e. dancing
- f. running
- g. talking

25. I will (near future)

- a. come
- b. sing
- c. drink
- d. eat
- e. sleep

26. you (sing.) will (near future)

- a. come
- b. sing
- c. drink
- d. eat
- e. sleep

27. you (plural.) will (near future)

- a. come
- b. sing
- c. drink
- d. eat
- e. sleep

28. He will (near future)

- a. come
- b. sing
- c. drink
- d. eat
- e. sleep

29. They will (near future).....
- a. come
 - b. sing
 - c. drink
 - d. eat
 - e. sleep
30. I will (near future) **not**
- a. come
 - b. sing
 - c. drink
 - d. eat
 - e. sleep
31. They will (near future) **not**
- a. come
 - b. sing
 - c. drink
 - d. eat
 - e. sleep
32. He will (near future) **not**
- a. come
 - b. sing
 - c. drink
 - d. eat
 - e. sleep
33. I will (distant future)
- a. come
 - b. sing
 - c. drink
 - d. eat
 - e. sleep
34. you (sing.) will (distant future)
- a. come
 - b. sing
 - c. drink
 - d. eat
 - e. sleep
35. you (plural.) will (distant future)
- a. come
 - b. sing
 - c. drink
 - d. eat
 - e. sleep
36. He will (distant future)
- a. come
 - b. sing
 - c. drink
 - d. eat
 - e. sleep
37. They will (distant future).....
- a. come

- b. sing
- c. drink
- d. eat
- e. sleep

38. They have **not**

- a. come
- b. sing
- c. drink
- d. eat
- e. sleep

39. I (near past).....

- a. came to Zomba
- b. ate food
- c. walked home
- d. drank water
- d. saw a girl
- e. danced
- f. run
- g. talked

40. You (near past).....

- a. came to Zomba
- b. ate food
- c. walked home
- d. drank water
- d. saw a girl
- e. danced
- f. run
- g. talked

41. He/she (near past)

- a. came to Zomba
- b. ate food
- c. walked home
- d. drank water
- e. saw a girl
- f. danced
- g. run
- h. talked

42. They (near past).....

- a. came to Zomba
- b. ate food
- c. walked home
- d. drank water
- e. saw a girl
- f. danced
- g. run
- h. talked

43. I (distant past).....

- a. came to Zomba

- b. ate food
- c. walked home
- d. drank water
- e. saw a girl
- f. danced
- g. run
- i. talked

44. You (distant past).....

- a. came to Zomba
- b. ate food
- c. walked home
- d. drank water
- e. saw a girl
- f. danced
- g. run
- h. talked

45. He/she (distant past)

- a. came to Zomba
- b. ate food
- c. walked home
- d. drank water
- d. saw a girl
- e. danced
- f. run
- g. talked

46. They (distant past).....

- a. came to Zomba
- b. ate food
- c. walked home
- d. drank water
- d. saw a girl
- e. danced
- f. run
- g. talked

47. I saw

- a. it
- b. the child
- c. a child
- d. children
- e. the house
- f. houses
- g. a house
- h. them

48. I have **not** seen

- a. it
- b. the child
- c. a child
- d. children
- e. the house
- f. houses

- g. a house
- h. them

49. I am.....

- a. cooking for him
- b. singing for the president
- c. drinking for my sister.
- d. dancing for the chief.
- e. eating for my baby.

50. I am

- a. making him/her cook.
- b. making him/her dance.
- c. making him/her drink.
- d. making him/her sing.
- e. making him/her eat.

51. I was.....

- a. beaten by the dog.
- b. killed by the lion.
- c. carried by the policeman.
- d. seen by my sister.
- e. called by my mother.

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