Maxwell Kadenge

The rephonologisation of Shona loanwords from English: an optimality theory analysis

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In their quest to respond to scientific and educational demands, speakers of Shona, a Southern Bantu language spoken in Zimbabwe, have expanded its lexical stock by borrowing mainly from the English language. The two languages have different phonologies, the phonology of English being much more complex than that of Shona. This article examines some aspects of the phonology of Shona loanwords from English, focusing specifically on how they are constrained by the Bantu CV syllable structure underlying the receptor language. The focus is on vowel and glide epenthesis which are employed to repair "illegal" complex onsets, syllable codas and diphthongs.

Die herfonologisering van Shona-leenwoorde uit Engels: 'n optimaliteitsteorie-analise

In hul poging om tred te hou met wetenskaplike en opvoedkundige vereistes het sprekers van Shona, 'n Suidelike Bantoetaal wat in Zimbabwe gepraat word, die taal se leksikon uitgebrei deur hoofsaaklik woorde uit Engels te ontleen. Die twee tale beskik oor verskillende fonologiese sisteme, waar die fonologie van Engels aansienlik meer kompleks is as dié van Shona. Hierdie artikel ondersoek bepaalde aspekte van die fonologie van Shona-leenwoorde uit Engels, en fokus spesifiek op hoe hulle ingeperk word deur die CV sillabestruktuur van die Bantoetale wat onderliggend aan die ontvangertaal is. Daar word gefokus op vokaal- en glyerinvoeging, wat ingespan word om "onwettige" komplekse aansette, kodas en diftonge te herstel.

Dr M Kadenge, Dept of Linguistics, School of Literature and Language Studies, University of the Witwatersrand, Private Bag 3, Wits 2050; E-mail: maxwell.kadenge@wits.ac.za.

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SUN MEDIA BLOEMFONTEIN

Within the Optimality Theory (OT) framework (Prince & Smolensky 2004), linguistic variation is characterised as different rankings of the same set of constraints. More specifically, the grammar of an individual language is a specific way, out of many possible ways, to rank a set of universal and violable constraints. Therefore, the differences between the English and Shona phonologies are a result of the different rankings of the same set of violable constraints. For instance, the fact that English allows complex onsets (prevocalic consonants), complex syllable nuclei (long vowels and diphthongs) and syllable codas (postvocalic consonants) while Shona does not is a result of different rankings of the same set of syllable structure constraints. This observation leads to the question: what strategies does Shona use to accommodate the marked structures in English into its phonology? This article aims to shed light on loanword adaptation in Shona, a Southern Bantu language spoken as a home language by the majority of Zimbabweans. All the examples are drawn from two Shona terminological dictionaries, namely *Duramazwi reUrapi neUtano* (Mpofu 2004) and *Duramazwi reMimhanzi* (Mheta 2005).

In recent years, a long-standing debate in the field of loanword phonology has re-emerged regarding phonological and phonetic approaches to loanword adaptation (Rose & Demuth 2006). On the one hand, scholars such as Gussenhoven & Jacobs (1998) and Uffmann (2004, 2006), among others, argue that loanword adaptation processes are purely phonological and/or representational and have nothing to do with phonetics or perception. On the other hand, other scholars propose that loanword adaptation is to a large extent driven by phonetic or perceptual factors. For example, Fleischhacker (2001) and Kenstowicz (2003), among others, argue that while loanword adaptation is processed by the phonological component of grammar, the constraints regulating loanword adaptation are motivated on perceptual, rather than representational grounds. Silverman (1992) and Rose (1999) acknowledge the role of both perceptual and phonological components of grammar. They argue that while the phonology of the borrowing language

plays a determining role in the adaptation process, perceptual factors must be taken into consideration (Rose & Demuth 2006). While it is important to draw explanations from both phonetics and phonology, this article is purely phonological. It presents an OT account of the rephonologisation of Shona loanwords from English. A study of adoptives or loanwords is "... a great aid to our understanding of the intuitions of native speakers about deep phonological properties of utterances" (Khumalo 1984: 215).

Chimhundu (1983) is the first systematic investigation of the adaptation and adoption of Shona loanwords from European languages such as Portuguese and English and Bantu languages such as Swahili, Ndebele and Zulu, among others. He describes the segment substitution patterns and epenthetic processes which are employed to remove consonant clusters, diphthongs and syllable codas. On vowel epenthesis, he concludes that in the adoption process from English, vowels normally separate C-sequences in the models because Shona syllables are typically of the open CV type. The same observation is underscored in this paper. This article differs from Chimhundu's study in two important ways. First, in terms of theoretical framework, Chimhundu's thesis is purely descriptive whereas this article employs analytical tools from recent generative phonology theories, namely feature geometry (FG) and OT. This article's theoretical approach allows for a more principled and insightful analysis of the phonological processes involved in loanword incorporation, showing their predictability more clearly. Secondly, Chimhundu (1983) examines glide epenthesis in terms of default insertion whereas this article analyses it as a product of the spreading of V-Place features from input coronal and labial vowels. The article demonstrates that the choice of the epenthetic glide is determined by the place of articulation (V-Place) features of the input vowels.

Uffmann's (2004, 2006) studies focus on the statistical analysis of the quality of the epenthetic vowels in loanwords using examples from Shona, Sranan, Samoan and Kinyarwanda.

His analysis reveals that the "quality of the epenthetic vowel results from the complex interaction of three distinct processes, vowel harmony, local assimilation to the preceding consonant and default insertion" (Uffmann 2006: 1079). His findings show that /i/ is by far the most frequently chosen epenthetic vowel in Shona, at nearly 70%. Second most frequent is /u/ (13%); other vowels are marginal. This article expands Uffmann's (2004, 2006) findings by examining the phonological function of the epenthetic vowels rather than their articulatory qualities. It demonstrates that the epenthetic vowels are used to "repair" complex onsets, and syllable codas and glides are inserted to simplify complex syllable nuclei which are inadmissible in Shona. In addition, unlike Uffmann, this article describes and accounts for diphthong simplification through spreading.

Shona terminological dictionaries, namely *Duramazwi reUrapi neUtano* (henceforth *DUU*), a dictionary of biomedical terms (Mpofu 2004), and *Duramazwi reMimhanzi* (hereafter *DM*), a dictionary of musical terms (Mheta 2005), are the sources of the examples that are analysed in this article. Both dictionaries were compiled at the African Languages Research Institute (ALRI) of the University of Zimbabwe. In compiling the DUU lexicographers gleaned some of the technical terms from health professionals mainly from the Institute of Continuing Health Education (ICHE) and members of the Zimbabwe National Traditional Healers Association (ZINATHA). The aim of the dictionary is to provide a tool for communication between caregivers, namely doctors, pharmacists, nurses, and nurse-aides, on the one hand, and patients, on the other. It is evident in *DUU* that Shona has extensively borrowed biomedicine terms from English. All the terms are fully rephonologised and are presented in the current standard Shona orthography. *DM* is the second Shona terminological dictionary to be complied at ALRI, and the lexicographers worked in conjunction with music performers, teachers, college and university lecturers as well as music experts from the Zimbabwe Schools Examinations Council (ZIMSEC), Curriculum Development Unit (CDU)

and the Shona Language and Culture Association (SLCA) in the production of the dictionary. The two terminological dictionaries indicate a paradigm shift in Shona lexicography; a shift from the production of general synchronic Shona monolingual dictionaries to specialised dictionaries that utilise terminology development strategies such as borrowing, which is the focus of this article.

It is useful in this instance to sketch the basic outline of this article. The following section briefly defines the articulatory features of Shona vowel and consonant phonemes and discusses the characteristics of the language's permissible syllable structure. This is followed by the theoretical framework which discusses the main tenets of the FG and OT theories that are relevant to the data analysis. The data analysis section precedes the conclusion which summarises the major issues that are raised and discussed in the article and indicates the direction of envisaged future research.

1. Shona phonemes and syllable structure

This section presents the Shona vowel and consonant inventories as background to the description and analysis of the data.

1.1 Shona vowels

Shona has a simple vowel system comprising five short oral vowels, namely, /i/, /e/, /a/, /u/ and /o/ as shown in the following minimal set: /pírá/ 'worship ancestors', /pérá/ 'finished', /párá/ 'scrape', /púrá/ 'thrash' and /pórá/ 'cool down' (Kadenge 2010: 395). Table 1 presents the articulatory features of Shona vowels.

Table 1: The feature specification of the Shona vowel system

	/i/	/e/	/u/	/o/	/a/
[coronal]	•	•			
[labial]			•	•	
[pharyn-geal]					•
[open]		•		•	•

This article adopts Clements and Hume's (1995) model of FG. In this model, front vowels [i] and [e] are [coronal]; back, rounded vowels [u] and [o] are [labial] and the low vowel [a] is [pharyngeal]. We employ Clements' (1989) privative feature [open], for the aperture. The high vowels [i] and [u] lack the feature [open] and the vowels traditionally considered [-high], namely, [a e o] are [open] (Mudzingwa 2010; Kadenge & Mudzingwa 2011).

The next section presents the consonant phonemes of Shona. Based on their articulation, Shona consonants are divided into simple and complex segments (Mkanganwi 1995, Mudzingwa 2010, Kadenge 2010). Simple consonants are articulated with a constriction at one point in the oral cavity whereas complex consonants are produced with more than one constriction in the oral cavity (Clements & Hume 1995).

1.2 Shona simple consonants

Table 2: Shona simple consonants

	Labial	Alveolar	Palatal	Velar	Glottal
voiceless plosives	p	t		k	
breathy voiced plosives	b̤	d̤		g̤	
modal voiced implosives	ɓ	ɗ			
modal voiced nasals	m	n	ɲ	ŋ	
breathy voiced nasals	m̤	n̤			
voiceless fricatives	f	s	ʃ		
breathy voiced fricatives	v̤	z̤	ʒ̤		ɦ̤
voiceless labialised fricative		s̪			
breathy voiced labialised fricative		z̪̤			
modal voiced approximants	ʋ		j	w	
breathy voiced approximant				w̤	
modal voiced trill		r			
breathy voiced trill		r̤			

(Mkanganwi 1995: 20)

As shown in Table 2, Shona makes use of a three-way laryngeal distinction among obstruents (fricatives, plosives and affricates): modal voice, voicelessness and breathy voice. Among nasals, it employs a two-way laryngeal distinction: modal voice versus breathy voice. Contrary to Mkanganwi's (1995) classification of consonants which places [s̪ z̪ w w̤] in the same category with simple segments, in this article, we argue that whistling (retroflex) fricatives [s̪ z̪̤] and the labial-velar glides [w w̤] are complex consonants because their production involves more than a single point of constriction in the oral cavity. The fricatives are [labial-coronal] while the glides are [labial-dorsal]. As shown in Table 3, all Shona affricates,

prenasalised consonants (NCs) and velarised consonants (C^ws) are considered unitary segments in this article.[1] The following section briefly characterises the permissible syllable structure in Shona.

1.3 Shona complex consonants

Table 3: Shona complex consonants

	Labial	Alveolar	Palatal	Velar
voiceless affricates	pf	ts	ʧ	
breathy voiced affricates	b̤v	d̤z	dʒ	
voiceless labialised affricat		tsʷ		
breathy voiced labialised affricate		dzʷ		
modal voiced prenasalised stops	^{m}b	^{n}d		^{ŋ}g
modal voiced prenasalised fricatives	m^{v}	n^{z}		
modal voiced labialized prenasalised fricative	^{n}zʷ			
voiceless velarised plosives	p^{w}	t^{w}		k^{w}
breathy voiced velarised plosives	b̤^{w}	d̤^{w}		g^{w}
modal voiced velarised nasals	m^{w}	n^{w}		
modal voiced prenasalised velarised consonants	$^{m}b^{w}$	$^{n}z^{w}$		$^{ŋ}g^{w}$

(Mkanganwi 1995: 20)

1.4 The Shona syllable

Shona is characterised by the Bantu syllable structure which is typically of the CV shape. Onsetless (V-shaped) syllables do occur but are restricted, as in many languages, to the word-initial

1 *Cf* Mkanganwi (1995), Mudzingwa (2010), Kadenge (2010) for detailed discussions concerning the monosegmental treatment of these complex segments.

position as shown in the Shona first person pronoun [ì.nì][2] 'me'. Myers (1990: 220) observes that Shona syllables

> ... are all open, there are no long vowels or diphthongs, and the onset consists either of a single consonant, or a consonant followed by a glide.

Concerning velarised consonants (C^ws), Mkanganwi (1995: 25) states:

> ... if we treat postvelarization as being no more than a distinctive feature of Shona phonemes, then the phenomenon of clustering is eliminated from our account of the organization of Shona speech.

Rogers (2009) conducted an ultrasound and audio-visual analysis of some speech samples collected from a Karanga native speaker, and concluded that her analysis provides evidence in support of phonological analysis which argues that Cws are single, complex segments rather than clusters. Kadenge (2010) discusses phonological, morphological and distributional characteristics of Shona affricates, NCs and C^ws, and concludes that they are best treated as complex segments that occupy a single C-slot, suggesting that they are simple onsets. Considering these observations, we can claim that the typical or maximal Shona syllable is CV. As this article will demonstrate, English loanwords with complex onsets (consonantal clusters) are simplified to CV syllable structure when words containing such onsets are borrowed into Shona.

2. Theoretical framework

This section briefly discusses the analytical tools employed in this article. The analysis employs the FG system proposed by Clements & Hume (1995), with the overall analysis couched in OT (Prince & Smolensky 2004).

2 Throughout this article, the period or full stop (.) is used to mark syllable boundaries. Slash brackets // and square brackets [] are used as conventionally done in phonetics and phonology for data transcription. // stands for the underlying form or representation and [] shows the phonetic representation.

2.1 FG

There are different models of FG proposed.[3] In this article, we assume the FG model advanced by Clements and Hume (1995). In the FG theory, all phonological features are viewed as autosegments, and their behaviour and possible interaction are explained and constrained in the model. Features are hierarchically grouped. Class nodes group features that function and behave together as natural classes. Class nodes are also autosegments and act as single units in phonological constraints (Clements & Hume 1995). Figure 1 shows the hierarchical organisation of features.

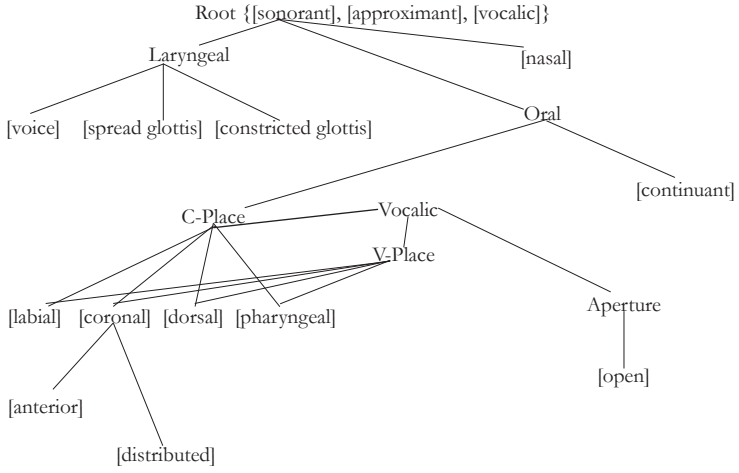

Figure 1: FG model of Clements & Hume (1995: 292) cited in Uffmann (2006: 1095)

One of the major strengths of Clements & Hume's (1995) model, and a point that is crucial in this article, is that it presents a unified account of Place in consonants and vowels. The feature [-back] is replaced with [coronal], while [+back] is replaced with [dorsal] and [+round] with [labial]. The mother

3 *Cf*, for example, Sagey (1990) and Clements & Hume (1995), among others.

node to which their features attach distinguishes consonants and vowels. Consonantal places of articulation attach to a C-Place node while vocalic articulations attach to a V-Place node. For consonants, the privative (one-valued, monovalent) place features [labial], [coronal], [dorsal] and [pharyngeal] are dependent on the C-place node, whereas vocalic place features are dependent on the V-Place node. The V-Place node is attached to the C-Place node via a Vocalic node. Laryngeal features, [voice], [spread glottis] and [constricted glottis] are placed under the Laryngeal node.

The model predicts that consonants and vowels that share particular place features form natural classes (Clements & Hume 1995). Thus, labial consonants and rounded or labial vowels form a natural class; coronal consonants and front vowels form a natural class, and the low vowels and pharyngeal consonants form a natural class. This aspect of the model explains the largely predictable vowel-consonant interactions in a straightforward way. The model captures the fact that vowels and glides (vocoids) are phonetically similar. Kadenge & Mudzingwa (2011) demonstrate that they share exactly the same structure and feature organisation, as illustrated in Figures 2 and 3.

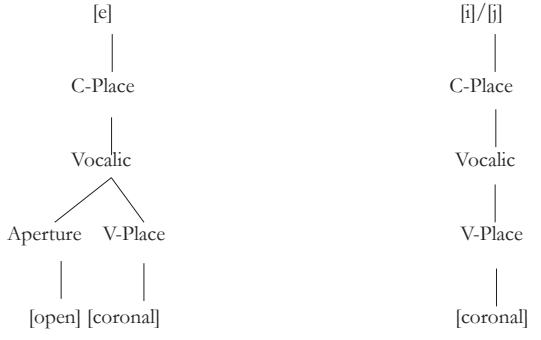

Figure 2: (a) Feature structure of [e] (b) Feature structure of [i]/[j]

The insertion of a glide in the context of a corresponding vowel is explained easily: "... except for the differences in moraic structure – vowels are moraic and the glides are not moraic – the two have the same feature content" (Kadenge & Mudzingwa 2011: 147).

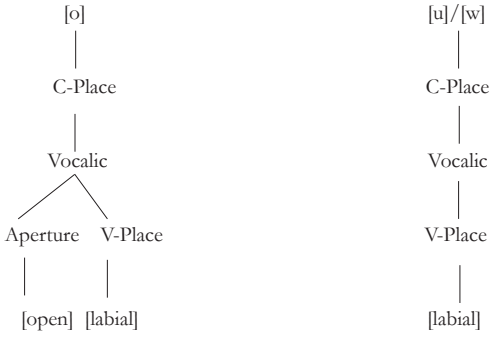

Figure 3: (a) Feature structure of [o] (b) Feature structure of [u]/[w]

2.2 OT

The overall analysis in this article is couched in OT, which states that phonological constraints are hierarchically ranked and violable (Prince & Smolensky 2004). The central idea of this theory is that surface forms of language reflect resolutions of conflicts between competing demands or constraints. A surface form is "optimal" or "harmonic" in the sense that it incurs the least serious violations of a set of violable constraints, ranked in a language-specific hierarchy (Kager 1999). Languages differ in the ranking of constraints, giving priorities to some constraints over others. The mapping from underlying to surface forms is a matter of negotiating the demands of the language-specific constraint hierarchy (Kadenge & Mudzingwa 2011). One of the merits of employing OT is that the theory recognises the role of the marked configuration, complex onsets, codas and

complex syllable nuclei, in this article. In considering the different candidates, OT not only captures the optimal repair strategy employed but the other potential repair strategies which may be applied. This helps account for the strategy chosen and for the strategies that are not chosen but which, for instance, are employed cross-linguistically (Kadenge & Mudzingwa 2011). In an OT grammar, phonological processes are manifest when some markedness constraint dominates a faithfulness constraint, thereby forcing an alternation. A summary of the core principles of OT is given below.[4]

- Violability: constraints are violable, but violation must be minimal.
- Optimality: an output is "optimal" when it incurs the least serious violations of a set of constraints, taking into account their hierarchical ranking.
- Domination: the higher ranked of a pair of conflicting constraints takes precedence over the lower ranked one.

According to these principles, the role of grammar is to select the optimal form from among many candidates. Constraints are hierarchically ranked, and the well-formed forms are less likely to violate the higher ranked constraints. Thus, OT shifts the explanatory burden of linguistic theory from input-based rules to output-based constraints. This article pays special attention to epenthetic processes, namely word-medial vowel epenthesis, word-final vowel epenthesis and spreading (glide epenthesis). These processes form a "conspiracy" (a term originally due to Haj Ross): they are all mobilised to eliminate complex onsets, complex syllable peaks and syllable codas in order to preserve the Shona CV syllable structure. Such functional unity of processes was identified as a conspiracy by Kisseberth (1970) who describes it as a set of rules (processes) that serve the same purpose namely to rid the surface forms of the language of certain undesirable (marked) configurations. McCarthy (2002: 93) calls this "homogeneity of target/

4 *Cf* Kager (1999: 9-13) for a detailed discussion.

heterogeneity of processes". This is where an output target is achieved in different ways across contexts in the same language or across languages. Epenthesis (rather than deletion) is a common process in loanword adaptation and is employed to satisfy constraints on phonotactics and syllable structure in the receptor language. In order to insightfully analyse the epenthetic processes in Shona loanword phonology, this article invokes the following markedness and faithfulness constraints:

*$[_{\sigma}$CC
: Onsets are simple (Kager 1999: 97).

*C$]_{\sigma}$
: Syllables are open (Kager 1999: 94).

*COMPLEXPEAK
: Long vowels, diphthongs and triphthongs are prohibited (Archangeli & Langedeon 1997: 7).

MAX-IO
: Input segments must have output correspondents (No deletion) (Kager 1999: 102).

DEP-IO
: Output segments must have input correspondents (No epenthesis) (Kager 1999: 100).

UNIQUE
: ∀*x*, where *x* is a feature or class node, *x* must have a unique segmental anchor *y* (Benua 1997, Kadenge & Mudzingwa 2011: 151).

This article demonstrates that loanword rephonologisation is mainly governed by the syllable structure well-formedness of the recipient language. English words violate some constraints of Shona syllable structure well-formedness. As a result, they are "repaired" in order to make them fit into the Shona preferred phonological structure. This is explained in this article using the concept of constraint interaction.

3. Substitution of English segments with Shona segments

Before delving into the analysis of syllable structure adjustments, we present the segment substitution patterns that characterise Shona loanwords from English. The substitution process eliminates English vowels and consonants that do not exist in Shona as shown in Table 4.

Table 4: Monophthongal substitutions

English vowels	Shona realisation	Shona form	English form[5]	Gloss
/ɪ/, /ɔ/ and /ə/	[i], [o] and [a]	[r̰ékódə̀]	/rɪkɔdər/	recorder
/æ/	[e]	[bɛ́ⁿdí]	/bænd/	band
/ɜ/	[e]	[nésì]	/nɜːs/	nurse
/ʌ/ and /iː/	[a] and [i]	[káⁿdírí]	/kʌntriː/	country
/ɒ/	[o]	[d̰ókòtà]	/dɒktər/	doctor
/ɑ/	[o]	[òpérà]	/ɑprə/	opera
/uː/	[u]	[bə̀súní]]	/bəsuːn/	bassoon
/ʊ/	[u]	[sàwúró]	/səʊl/	soul

Table 4 shows that the English native monophthongs are substituted with Shona vowels which are articulatorily, acoustically and auditorily or perceptually closest to them. Similarly, Khumalo (1984: 210) examines Zulu adoptives from English and Afrikaans and discovers that

> ... when a root that is being adopted into Zulu has been divided into acceptable Zulu syllables, then the vowels occurring in such a root are converted to Zulu vowels with which they share most phonological features.

There are more vowel substitutions than consonantal ones. As for the consonants, the English lateral approximant /l/ is realised as the Shona breathy voiced alveolar trill [r̤]. For

5 Throughout this article, the transcription of all English words is taken from the Online Cambridge Dictionary which is based on British English (http://dictionary.cambridge.org).

example, 'lorry' and 'ruler' are realised in Shona as [ɾ̤òɾ̤ì] and [ɾ̤ùɾ̤à], respectively. The English nasal + voiceless consonant clusters (NÇ) are realised as voiced prenasalised consonants (nasal + voiced oral articulation) in Shona because the language only allows NCs in which the C is a voiced consonant – suggesting that the markedness constraint *NÇ (no nasal plus voiceless obstruent sequence) is undominated in Shona. As a result, English 'amplifier' and 'rent' are realised as [à.^{m}bú.rí.fá.já] and [ɾ̤è.^{n}dí], respectively. In addition, all English modal voiced obstruents are realised as breathy voiced consonants in Shona. The following section examines how English complex onsets (consonant clusters) are "repaired" in Shona.

4. Dealing with complex onsets

One of the major differences between Shona and English phonologies is that Shona, unlike English, does not allow complex onsets. Loanwords from English with complex onsets receive a vowel in Shona to break up the illicit clusters as shown in Table 5 (consonant clusters in English and epenthetic vowels in Shona are given in bold).

Table 5: Vowel epenthesis to simplify complex onsets

English form	Shona form	Gloss
/p**rə**ʊtiːn/	[p**ù**ɾótéɲì]	protein
/st**rə**ʊk/	[sìt**ù**ɾókù]	stroke
/e**ksr**eɪ/	[ékì**sì**ɾèjì]	x-ray
/ɒ**ksɪ**ʤən/	[ókì**sì**ʤéɲì]	oxygen
/ɑ**pr**ə/	[òp**é**ɾà]	opera
/**fl**uːt/	[f**ù**ɾétí]	flute
/**dr**ʌm/	[d̤**ì**ɾámù]	drum

Table 5 shows that English complex onsets such as /pɾ/, /stɾ/, /ks/, /fl/, /pɾ/ and /dɾ/ are simplified through vowel epenthesis in Shona. The driving force for the vowel epenthesis is the

undominated *[σCC constraint which bans consonantal clusters and the formalisation of this process is given in Tableau 1.

Tableau 1: The realisation of the word "protein" in Shona

/prəuti:n/	*[σCC	*C]σ	*COMPLEX-PEAK	MAX-IO	DEP-IO
a.[pró.tén]	*!	*			
b.[pù.ró.tén]		*!			*
c.[pù.rəu.té.nì]			*!		**
d.[pù.ró.té]				*!	*
☞e.[pù.ró.té.nì]					**

Candidate (a), which does not repair the word-initial complex onset [pr], is disqualified for violating the undominated *[σCC which militates against complex onsets. Shona allows a maximum of a single consonant in the onset position. It also violates *C]σ which does not allow syllable codas. Candidate (b), which epenthesises a vowel to simplify the complex onset [pr], is ruled out for violating the high-ranked *C]σ. Candidate (c) does well to epenthesise vowels word-medially and word-finally to repair the complex onset and syllable coda, respectively. It is, however, not optimal because it fatally violates *COMPLEXPEAK, which prohibits diphthongs – suggesting that diphthongisation can never be a hiatus resolution strategy in Shona, since diphthongs are banned in the language. As shown in Table 1, the Shona vowel inventory does not have diphthongs. Candidate (d), which deletes [n] to remove a syllable coda (or to satisfy *C]σ), is ruled out for fatally violating MAX-IO, suggesting that it is better to add segments than to delete them in loanword incorporation. Candidate (e), which epenthesises [u] word-medially to break up the consonant cluster [pr] and [i] word-finally to open up a closed syllable, wins. In the process, it violates the least ranked DEP-IO twice. As mentioned earlier, in Shona, all syllables are open and have simple onsets.

5. Dealing with closed syllables

Unlike Shona, English allows syllable codas. Syllable codas are considered stray consonants in Shona. All English words with syllable codas receive a syllable nucleus in the form of an epenthetic vowel in Shona as shown in Table 6 (the epenthetic vowels are given in bold).

Table 6: Vowel epenthesis to "repair" syllable codas

English form	Shona form	Gloss
/æsɪd/	[ásìd̪ì]	acid
/ʤɜ:mz/	[màʤémùsì]	germs
/bæŋk/	[b̪éŋgì]/ [b̪áŋgì]	bank
/drʌm/	[d̪ìrámù]	drum
/flu:t/	[fùrétí]	flute
/dɪsk/	[d̪ìsìkì]	disk
/beɪs/	[b̪ésì]	bass

In Table 6 vowels are epenthesised word-finally to remove syllable codas, since Shona native phonology does not allow them. It is interesting to note that in four of the seven examples given the coronal vowel [i] is epenthesised when immediately preceded by a coronal consonant, and [u] is epenthesised when immediately preceded by a labial consonant. If either fails, [i], which is the default or least marked vowel in Shona, is inserted. We consider [i] as the default vowel in Shona, because it is the most frequently selected vowel in epenthetic processes. For example, in the Zezuru dialect of Shona, [i] is epenthesised word-initially to words such as [ì.^{m}b^{w}á] 'dog' (*cf.* [tù.^{m}b^{w}á] 'dogs'), [ì.gò] 'wasp' (*cf.* [mà.gò] 'wasps') and [ì.ɗá] 'love' (*cf.* [kù.ɗá] 'to love') to maintain the language's disyllabic minimal word size. The [i] appears after dorsal consonants in words for 'bank' and 'disk'.

However, Uffman (2004, 2006) presents a statistical analysis of the typology of epenthetic vowels in loanwords in languages such as Yoruba, Shona, Kikuyu, Japanese, Samoan and Fijian, and concludes that the idea of a default epenthetic vowel is

not tenable in loanwords, but that the preceding consonant influences which type of vowel is epenthesised. The general strategy is one in which the epenthetic vowel assimilates in place to the preceding consonant: after labial [u] is found, and after coronal /i/ is found. After dorsal consonants, no such assimilation, conceivable as a spreading process of consonantal place is found. In coronal assimilation, the V-Place features of the epenthetic vowel are spread from the preceding coronal consonant as illustrated below:

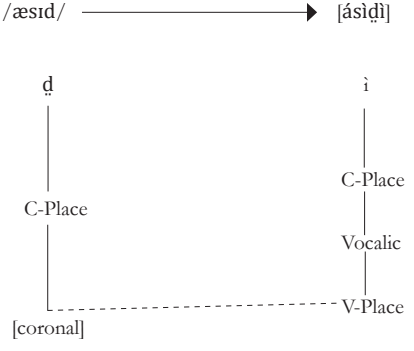

Figure 4: Spreading from a coronal consonant

Figure 4 shows that due to progressive spreading a [coronal] vowel is epenthesised after a [coronal] consonant. Figure 5 shows that a [labial] vowel is epenthesised after a [labial] consonant. According to Katamba (1989: 80),

> ... the advantage of having assimilation is that it results in smoother, more effortless, more economical transitions from one sound to another. It facilitates the task of speaking.

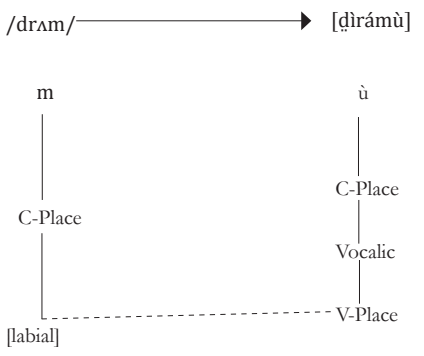

Figure 5: Spreading from a labial consonant

While Figures 4 and 5 demonstrate that the place of articulation of the preceding consonant influences the quality of the epenthetic vowel, they do not account for the phonological function of the epenthetic vowel. It is the concern of this article to provide such an account. Tableau 2 presents a formal analysis of the realisation of the word 'disk' in Shona and shows that the word-final vowel epenthesis is motivated by the need to "repair" syllable codas. It also demonstrates the preference of epenthesis over deletion in Shona loanword phonology.

Tableau 2: The realisation of the word 'disk' in Shona

/dɪsk/	*[$_{\sigma}$CC	*C]$_{\sigma}$	*COMPLEXPEAK	MAX-IO	DEP-IO
a. [d̪ì.skì]	*!				*
b. [d̪ì.sìk]		*!			*
c. [d̪ì.sì:kì]			*!		**
d. [d̪ì.sì]				*!	*
e.☞[d̪ì.sì.kì]					**

Candidate (a) does not repair the [sk] cluster. As a result, it fatally violates *[σCC which bans complex onsets. In Shona native phonology, consonant clusters do not exist. Candidate (b) repairs the [sk] cluster through word-medial [i] epenthesis but is

disqualified for violating the undominated *C]σ. In Shona, all syllables are open. Candidate (c) is not optimal because it violates *COMPLEXPEAK through the lengthening of the epenthetic vowel [i:]. In the Shona vowel inventory, contrastive long vowels do not exist. Candidate (d) does well in repairing the word-final syllable coda through the deletion of [k] but is ruled out for violating the undominated MAX-IO. Candidate (e) is the optimal candidate. It inserts [i] word-medially to repair the [sk] cluster and inserts a vowel word-finally to repair the syllable coda. In the process, it violates the least ranked DEP-IO twice. As mentioned earlier, it is better to insert segments than to delete them. The following section examines how English diphthongs are repaired through spreading in Shona loanword phonology.

6. Spreading

Epenthesis is often used as a cover term for spreading and default segmentism. In spreading, all features are supplied by an input segment, and in default segmentism, all features of the epenthetic segment are inserted (Mudzingwa 2010, Kadenge & Mudzingwa 2011). The major advantage of default insertion is that bijectivity is maintained. However, the major demerit is that all the features of the epenthetic segment are inserted: an input segment does not sponsor them. Shona does not employ default segmentism, but intermediate cases exist. These are cases where some features are spread and others are inserted.[6] Table 7 presents examples in which spreading from a coronal vowel results in the formation of a coronal onset [j].

6 *Cf* Mudzingwa (2010) for a detailed discussion concerning spreading as a hiatus resolution strategy.

Table 7: Spreading from a [labial] vowel

English form	Shona form	Gloss
/eksreɪ/	[ékìsìɾ̪ɛ̀j̪ì]	x-ray
/pɔɪzən/	[pójì̪z̪ɛ̀nì]	poison
/paɪnt/	[pájì̪ndì]	pint
/staɪl/	[ʧ̪ìtájíɾà]	style

The driving force for the spreading process is the constraint that prohibits *COMPLEXPEAK in Shona. As illustrated in Table 1, the Shona vowel inventory comprises five short oral vowels. It has no diphthongs. In Table 7, the strategy that is employed to avoid diphthongs is the spreading of V-Place features from the second part of the diphthong, which in the above instances is a coronal vowel. This results in the formation of a homorganic glide. A faithfulness constraint militating against spreading is UNIQUE. In "repairing" the dispreferred diphthongs, the speakers prefer to spread rather than default insertion of place features. The spreading of the V-Place feature of the coronal vowel to form the coronal glide is illustrated below:

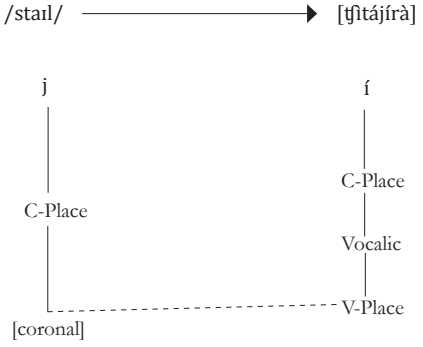

Figure 6: Spreading from a [coronal] vowel

Figure 6 shows that the regressive spreading of the V-Place feature of the coronal vowel [i] results in the formation of a homorganic glide [j] which splits the components of the English diphthong into two monophthongs. The spreading process is formalised in Tableau 3.

Tableau 3: The realisation of the word 'style' in Shona

/staɪl/	*[$_{\sigma}$CC	*C]$_{\sigma}$	*COMPLEX-PEAK	MAX-IO	DEP-IO	Unique
a. [stá.jí.rà]	*!				*	*
b. [ʧì.tá.jír]		*!			*	*
c. [tá.jí.rà]				*!		*
d. [ʧì.taɪ.rà]			*!		**	
☞e. [ʧì.tá.jí.rà]					**	*

Candidate (a) repairs the diphthong through spreading but is not optimal because it violates the undominated *[σCC. As mentioned earlier, Shona does not allow complex onsets. The insertion of the word-final vowel violates the low-ranked DEP-IO while the spreading process which results in the formation of [j] to break up the diphthong violates the lowest ranked UNIQUE. Candidate (b), which repairs the diphthong through spreading is ruled out for fatally violating *C]σ. As mentioned earlier, Shona does not allow syllable codas. Candidate (c) does well to delete the word-initial [s] to satisfy *[σCC. It is, however, disqualified for violating the undominated MAX-IO. Candidate (d) is ruled out for violating the undominated *COMPLEXPEAK. Shona does not have diphthongs. Candidate (e) is the optimal candidate. It satisfies all the high-ranked constraints in the language. The word-initial cluster [st] is substituted with an affricate (a monosegmental consonant); the diphthong is split through spreading, and the word-final coda receives a nucleus. In the process, it violates the low-ranked constraints, namely DEP-IO and UNIQUE. Table 8 presents examples of loanwords in which spreading from the input labial vowel results in the formation of the labial glide [w].

Table 8: Spreading from the labial vowel: [w]

English form	Shona form	Gloss
/gaʊt/	[gá**w**ùtì]	gout
/ɔdli/	[mù**w**ó̤d̤àrì	orderly (male nurse)
/kaʊntəpɔɪnt/	[ká**w**ùndápójíndì]	counterpoint
/saʊnd/	[sá**w**ùndì]	sound
/səʊl/	[só**w**ùrù]	soul music

Table 8 shows the environments in which spreading of the V-Place feature of the labial vowel [u] results in the formation of the labial glide [w], as illustrated in Figure 7.

Figure 7 shows that the regressive spreading of V-Place features from [u] results in the formation of [w]. This process splits the English diphthong into two monophthongal vowels separated by a homorganic glide and the process is formalised in Tableau 4.

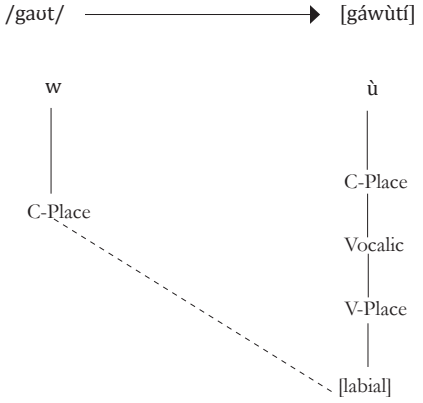

Figure 7: Spreading from a [labial] vowel

Tableau 4: The realization of the word 'gout' in Shona

/gaʊt/	*C]σ	*COMPLEX-PEAK	MAX-IO	DEP-IO	Unique
a. [gaʊt]	*!	*			
b. [gá.wùt]	*!				*
c. [gá.wù]			*!		*
☞d. [gá.wù.tì]				*	*

Candidate (a), which is fully faithful to the input, violates the undominated *C]σ. As mentioned earlier, Shona does not allow closed syllables. In addition, it violates the high-ranked *COMPLEXPEAK, the constraint that prohibits diphthongs. Candidate (b), which breaks up the diphthong through the spreading of the V-Place feature [labial] from [u] to create the epenthetic homorganic glide [w], violates the lowly ranked UNIQUE. The candidate is, however, disqualified for violating the undominated *C]σ. Candidate (c) does well to break up the diphthong with [w] but is disqualified for fatally violating MAX-IO because it deletes the word-final [t]. It also violates the least ranked constraint UNIQUE. Finally, candidate (d), which repairs the diphthong through the spreading of the V-Place feature from [u] to create [w] and epenthesises the word-final [i] to provide a syllable nucleus to [t], is the optimal candidate. It, however, violates the low-ranked constraints DEP-IO and UNIQUE.

The preference for spreading features rather than inserting them is in keeping with the demands of Shona native phonology. For instance, Mudzingwa (2010) demonstrates that in order to resolve hiatus (*$V_1.V_2$ – a heterosyllabic sequence of vowels) in Shona, one of the strategies is to insert an epenthetic segment. The preference is to spread all of the features of the epenthetic consonant from a neighbouring segment. Mudzingwa observes that place features are never inserted but always borrowed from a neighbouring input segment. In the following examples, the features of the hiatus-breaker (given in bold) are borrowed from a neighbouring segment.

(1a)	/rí-ù^{n}g-è/ CL5.SG.OM-gather-SUBJCT 'gather it'	[rí**w**ù^{n}gè]
(1b)	/n̪à-ì-kùm-ì/ NEG-CL9.SG.OM-roar-SUBJCT. 'it does not roar'	[n̪à**j**ìkùmì]
(1c)	/kù-í^{m}b-á/ CL15.INF-sing-FV 'to sing'	[kù**j**í^{m}bá]
(1d)	/ʋà-è^{n}d-í/ CL2.PL-go-NOM 'the goers' (travelers)	[ʋà**j**è^{n}dí]

The above examples show that [j] is inserted in the context of a coronal V2 [i] or [e] and [w] is inserted in the context of a labial V2 [u]. As shown in Figures 7 and 8, in Shona loanword phonology, epenthetic glides, which are products of V-Place spreading, are used to simplify diphthongs. Kadenge & Mudzingwa (2011) examine glide epenthesis (spreading) processes in the English speech of Shona native speakers and conclude that the target for spreading is to "repair" the dispreferred diphthongs. It is evident that the patterns of spreading in Shona hiatus resolution and in Shona-English are similar to those in Shona loanwords from English.

7. Conclusion

This article set out to analyse some phonological aspects of loanword incorporation into the Southern Bantu language – Shona, using OT. English words with complex onsets, complex syllable nuclei (long vowels, diphthongs) and syllable codas are "repaired" through vowel epenthesis and spreading. The article showed that vowel epenthesis has a dual function in Shona loanword phonology. First, it is used to simplify consonantal clusters (complex onsets) and, secondly, to remove

syllable codas. These processes make English words with such marked structures fit into the Shona native phonology which is characterised by the strict CV syllable structure. Codas, complex syllable peaks and complex onsets are not permissible in Shona. Glide epenthesis is used to "repair" diphthongs and it involves the spreading of V-Place features from input coronal and labial vowels, resulting in homorganic oral glides, namely [j] and [w], respectively. This pattern of diphthong simplification is in keeping with the processes of Shona native phonology, which spread V-Place features to create hiatus breakers such as [j w]. This shows strict adherence to the constraint hierarchy of Shona native phonology which preserves the language's CV syllable structure. While the substitution of vowels and consonants is common in loanword incorporation, it has not received an in-depth analysis in this article. This is left for future research. It is hoped that this article will lay the foundation for a thorough and detailed OT analysis of Shona loanword phonology. A follow-up article will compare Shona loanword phonology of monolingual speakers with that of bilingual speakers, with the goal of presenting a systematic and holistic account of the synchronic segmental features of the Shona language.

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