Arabic Loanwords in Wolof: A TCRS-Based Analysis

Muteb al-Qarni

Assistant Professor, Dept. of English, Faculty of Languages & Translation, King Khalid University, Saudi Arabia

Abstract

Within the framework of the Theory of Constraints and Repair Strategies (TCRS) proposed by Paradis and further developed in Paradis & LaCharité, I sketch an analysis of Arabic loanwords in Wolof, a language primarily spoken in Senegal. The analysis draws on an English-translated 89-word list extracted from Wolof-French Dictionary (Diouf). In TCRS framework, the Threshold Principle stipulates that an ill-formed segment can be universally adapted with 2 repairs, otherwise it will be completely deleted, e.g., Fula, a Senegalese language, requires only two repairs for loanword adaptation (Paradis & LaCharité). The current article, however, presents a challenge to the Threshold Principle. It demonstrates that Wolof still adapts an ill-formed segment with more than two repairs (i.e., three repairs) before the segment gets deleted.

1. Introduction

Loanword phonology has attracted a considerable amount of research in the previous decades (e.g., see Silverman, Yip, Paradis & LaCharité, Broselow, Jacobs & Gussenhoven among many others). This field of phonology has grown in interest with the advent of constraint-based models of phonology such as the Theory of Constraints and Repair Strategies (TCRS) (Paradis) and Optimality Theory (Prince & Smolensky) which use output constraints to motivate the adaptation processes.

In this paper, I use the TCRS loanword model to analyze Arabic loanwords in Wolof. Loanwords or lexical loans are words borrowed from a donor language (i.e., L2) by a borrowing language (i.e., L1). According to Paradis & LaCharité (henceforth P&L), inspired by the definition used in Poplack et al., a lexical loan is ''an L2 word or compound which is incorporated into the discourse of a borrowing language, which has a mental representation in that language (in contrast to code-switches, see Myers-Scotton) and which respects at least the peripheral phonological constraints of the borrowing language'' (391).

When a loanword becomes part of the lexicon of L1, it undergoes modification/adaptation processes to conform to the rules and constraints of L1 native phonology. Adaptation means the processes under which the phonological structure of a loanword is affected by inserting, deleting or altering segmental, phonotactic, suprasegmental and morphophonological information. For example, [avɔka] 'lawyer', in French becomes [awɔka] in Fula after [v] changes into [w] (P&L). As a general rule, the foreign sounds in a loanword are adapted to the closest sounds to it in terms of their phonetic features. Thus, in case of a language that disallows [p] and [t] but allows [b] and [d] in its phonology, the loanwords that bear [p] and [t] will be adapted to the closest counterparts, i.e., [b] and [d].

This paper is organized as follows. In section (2), I present the TCRS loanword framework along with its principles and hypotheses. In section (3), I address the phonological properties of the two languages under study: Wolof and Arabic, by comparing their consonant and vowel inventories. Section (4) analyzes the data. Concluding remarks are summarized in section (5).

2. Framework: TCRS

The Loanword Model of the Theory of Constraints and Repair Strategies (TCRS) (Paradis & LaCharité) has been an influential framework in the field of loanword phonology. In the view of the TCRS Loanword Model, a language has a set of constraints, either universal or non-universal. The violation of

these constraints triggers the application of repair strategies. Repair strategy is defined in (1).

(1) Repair strategy

> A universal, non-contextual phonological operation that is triggered by the violation of a phonological constraint, and which inserts or deletes content or structure to ensure conformity to the violated constraint (P&L 384, ex. 2).

In other words, repair by insertion occurs when a constraint violation is caused due to lack of content/structure in a loanword, whereas by deletion when a constraint is violated by superfluous content/structure. Since the input may undergo distortion by deletion/insertion, P&L (1997) govern these repairs by the Preservation Principle summarized in (2) below.

(2) Preservation Principle

> Segmental information is maximally preserved within the limits of the Threshold Principle (P&L 384, ex. 3).

That is, the preservation principle is responsible for the preservation of the input by discouraging the rate of segment deletion. The high rate of adaptation, as opposed to the very low rate of deletion of foreign elements in loanwords, is due to the fact that repair strategies are governed and minimalized by the preservation principle. This principle resists the loss of phonological information (deletion) giving preference to insertion, which may satisfy the demands of a constraint while preserving the input maximally.

Nevertheless, P&L impose Threshold Hypothesis/Principle that limits the demands for preservations. Threshold hypothesis/principle determines the price a language can afford to preserve segmental information from complete loss. The Threshold Principle is presented in (3).

(3) Threshold Hypothesis/Principle

> a. All languages have a tolerance threshold to the amount of repair needed to enforce segment preservation.
>
> b. This threshold is the same for all languages: two steps (or two repairs) within a given constraint domain (P&L 385 ex. 4).

According to the Threshold hypothesis/principle, a problematic segment in a loanword is not protected by preservation principle if it demands more than two steps to be adapted within a constraint domain, i.e., the scope of a constraint violation. In other words, languages have a limited budget to fix an ill-formed phonological content/structure; the budget limit is universally set at 2 steps/repairs, beyond which a repair becomes useless and demolition/

deletion of the whole segment is necessary. This limit (2 steps/repairs) has been found to hold for Fula (Paradis & Lebel), Fulfulde (Abu-Manga) and for Kinyarwanda (Rose). Although (3b) above clearly posits that ‘‘this threshold is the same for all languages’’, I claim that the threshold can be set differently in other languages, and must be parameterized, so the budget of repair can go up to three repairs as we will see in Wolof.

Moreover, repair, according to P&L, must apply economically be it deletion or insertion. This is enforced by the Minimality Principle in (4).

(4) Minimality Principle

a. A repair strategy must apply at the lowest phonological level to which the violated constraint refers.

b. Repair must involve as few strategies (steps) as possible (P&L 386 ex. 5).

The "lowest phonological level" in (4a) is governed by the Phonological Level Hierarchy (PLF) defined in (5)

(5) Phonological Level Hierarchy (PLF):

metrical level > syllabic level > skeletal level > root node > feature with a dependent > feature without a dependent (P&L, 386 ex. 6).

In other words, Minimality Principle should not allow the deletion of a syllable if deleting a feature without a dependent will fix the ill-formed structure because a feature without a dependent is lower than syllables in the phonological level hierarchy. This principle ensures that the loss of phonological information is minimized as much as possible.

P&L also posits the Precedence Convention to establish which constraint has priority in case of a constraint conflict as presented in (6).

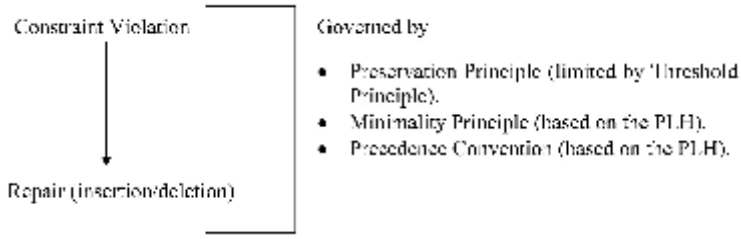
(6) Precedence Convention

In a situation involving two or more violated constraints, priority is given to that constraint referring to the highest phonological levels of PLH (P&L 386 ex. 7).

The Precedence Convention holds that in a situation involving two problems, the biggest problem, i.e., the problem related to the highest level in PLF, should be addressed first. Thus, problems related to syllables should be treated before problems related to features.

Based on the principles and hypotheses above, the TCRS loanword model can be schematized in (7).

(7) TCRS Loanword Model



According to the TCRS Loanword Model, the phonological structure of a language results from parameter settings. Principles (universal constraints) are common to all languages, yet parameter settings handle the contrasts/differences among languages by turning on or off these principles (see Chomsky). Parameters are marked options and the default reply to these options is no. Consider the parameter settings between Arabic and Wolof in (8).

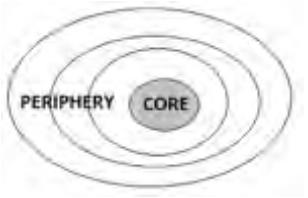
(8)	**Parameters**	Arabic	Wolof
	Pharyngeal?	YES	NO
	Glottal Stop?	YES	YES
	Emphatic consonants?	YES	NO
	Prenasalized Sounds?	NO	YES
	Palatal Plosives?	NO	YES
	..etc		

The reply 'No' means the rejection of phonological content and structure, hence a negative constraint. For example, Wolof's response 'No' to the parameter *pharyngeal* implies Wolof's rejection of this type of sound, but Arabic's response 'Yes' implies its allowance of this sound in its phonology. Therefore, one can find a reasonable hypothesis why Wolof alters Arabic words [ʕaada] and [ruuḥ] into [ʔaada] and [ruu], resp, the response of Wolof to the glottal stop [ʔ] is 'Yes'. This predicts that there will be no adaptation for this sound because the Arabic [ʔ] finds the best equivalent sound, i.e., the Wolof [ʔ].

Nevertheless, it is not always the case that L1 constraints exert influence on loanword segments. It is important to distinguish between prohibited segments, which require adaptation or elimination as soon as they are introduced into a language (like pharyngeal sounds in Wolof) and tolerated segments that are not adapted although they violate the constraints of L1. These tolerated segments are called ''imports'' (Haugen). Let us illustrate this

case with an example from P&L. Although Fula does not have [v] and [z] in its consonant inventory, unlike French, these sounds do not cause any constraint violations; they are borrowed identically without adaptation in French Loanwords in Fula. To explain these irregularities, P&L propose that phonology is organized into domains: core and periphery as in (9).

(9)



According to P&L, the core constitutes a language's constraints, since it defines the phonology of that language and its vocabulary. Since items such as interjections, onomatopoeia, proper names, learned words and borrowings are not part of the core, they lie in the periphery. The layers of periphery have subsets of constraints that are not necessarily in harmony with the constraints of the core. Although all the constraints in the core are activated, it could be found that a constraint is positively set in the periphery, but negatively set in the core. For instance, the [ɹ] must be adapted in French because it violates a constraint relevant to this sound in the core of French vocabulary; however, this sound [ɹ] lies in the periphery of a version of French (Quebec French) and does not require adaptations in a large number of loanwords in Quebec French (for more details see P&L, 1997:389).

3. Wolof vs. Arabic

I will present the consonant/vowel inventory of Wolof (the borrowing language) in section (3.1), and follow it up with that of Arabic (the donor language) in section (3.2).

3.1. Wolof

As a member of the northern branch of the Atlantic family of Niger-Congo languages, Wolof is a language spoken in Senegal as well as in parts of Gambia and Mauritania on the West African coast. Over 80% of the population of Senegal identifies Wolof as a lingua franca either first or second language, with over 6 million or more (McLaughlin "Wolof"). Like most Niger-Congo languages (Clements), Wolof has a consonant inventory of six places of articulation: labial, alveolar, palatal, velar, uvular and glottal (Diallo; McLaughlin "Wolof") as shown in Table 1.

Table 1: Consonant Inventory in Wolof

Consonant	Labial	Alveolar	Palatal	Velar	Uvular	Glottal
Stops	p b	t d	c ɟ	k g	q	ʔ
Nasals	m	n	ɲ	ŋ		
Fricatives	f	s		x		
Prenasalized	^{m}b	^{n}d	^{n}ɟ	^{n}g		
Liquids		l r				
Glides	w		j			

Wolof has an eight-vowel system. Each vowel has either a plus or minus value for the advanced tongue root (ATR) features. The vowel system is shown in Table 2 (McLaughlin, "Wolof").

Table 2: Vowel Inventory in Wolof

[+ATR]	[-ATR]
i u	
é ó	e o
ë	a

3.2. Arabic

Arabic is a Semitic language introduced into Senegal as early as the 11th Century C.E with the southward spread of Islam. As a religious language, it is employed primarily in religious circles as well as in the public school system. In Senegal, there are minorities of native Arabic speaking populations from Syria, Lebanon, and Mauritania (a neighboring country to Senegal), which have been in contact with Senegalese populations for centuries. Syrian and Lebanese speakers migrated to Senegal as merchants during the French colonization and they have settled there for at least three generations (McLaughlin "Arabic").

Under a profound influence, indigenous Senegalese languages have been in contact with Arabic for a time long enough that they received a large number of expressions in various domains. The Arabic script was also adopted and adapted as a writing system for Senegalese languages such as Fula, Wolof, and Mandinka (McLaughlin "Arabic").

The consonant inventory of Arabic (Amayreh; Saleen & Dyson) shown in

Table 3 reflects eight primary places of articulation: labial, dental, alveolar, palatal, velar, uvular, pharyngeal and glottal as in Table 3. The phonemes with superscript /C^{ς}/ represent emphatic consonants, and they are basically four in Arabic: /t^{ς}/, /d^{ς}/,/$ð^{\varsigma}$/ and /s^{ς}/. Arabic has a three-vowel system, comprised of /i/, /u/, and /a/. The vowels contrast with long vowels /i:/, /u:/ and /a:/.

Table 3: Consonant Inventory in Arabic

Consonant					Palatal	Velar	Uvular	Pharyngeal	Glottal
Stops	b		t t^{ς}	d d^{ς}		k	q		ʔ
Nasals	m		n						
Fricatives	f	θ ð $ð^{\varsigma}$	s s^{ς}	z	ʃ	ʒ	x		ħ ʕ	h
Liquids			l	r					
Glides	w				j				

As is clear from the consonant inventories of Arabic and Wolof above, there is a set of sounds specific to one system but not the other. The Arabic system, on the one hand, does not include prenasalized and palatal plosives. Wolof, on the other hand, does not have emphatic and pharyngeal consonants. The main focus here is to investigate Wolof speaker's treatment of Arabic segments absent in their own system. There are several expectations that Wolof speakers will follow specific strategies during the adaptation of non-native consonants. Due to the high number of Arabic loanwords with gutturals (pharyngeal and laryngeal) and their variations plus the fact that gutturals pose difficulties to the TCRS framework (see the separate treatment of guttural deletion in P&L, 2001), I will put them aside for future work along with other problematic issues related to gemination and syllabification.

4. Analysis of Arabic Loanwords in Wolof

The current section demonstrates how the TCRS loanword Model governs the range of variations that occur in the segmental adaptation of Arabic loanwords in Wolof. It shows which repair strategies are favored in Wolof, in comparison with others. The Arabic data used here are words extracted and translated from the Wolof-French Dictionary (Diouf)[1]. It contains 89 forms. Only forms that have clear origins in Arabic were considered. The words were carefully investigated and reconfirmed by a Wolof-speaking consultant. For consistency purposes, English translations were given in place of the French ones found in the dictionary.

Consider the following statistics concerning segmental adaptations, and non-adaptation and ill-formed consonants from the perspective of Wolof:

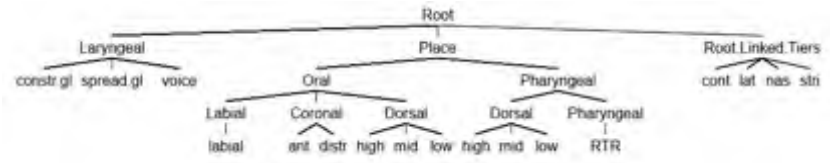
(10) Number of

Arabic Loanwords	89
Adaptations of ill-formed segments	59 (66%)
Non-Adaptation of segments	30 (34%)

As indicated in (10), Wolof adapts 66% of the ill-formed segments found in Arabic loanwords to close sounds in Wolof, while it keeps other Arabic segments without adaptation. The number of non-adaptation is relatively sizeable due to the presence of [q] and [x] in both languages, which constitutes around 32 cases of the data. These segments do not require any adaptation.

As for the budget repairs, I will argue that these ill-formed segments need 2 steps but some other segments require three repairs at the most before segment deletion. To illustrate this need, I assume that the features of the sounds are privative. Therefore, the deletion of a feature, say [voice], from a sound will be counted as one repair and it means that the sound will be by default voiceless. To show how the delinking/ inserting feature is accomplished, I adopted Roses Model but I expanded it further as shown in (11) below.

(11) Roses Model



As shown in (11), the oral node has three places: labial, coronal, and dorsal. For a consonant, only one or two place dependent nodes might be active below its place node. For example, for a coronal sound [t], the only active node is coronal with [ant] (with the absence of the node [distr]); the dorsal place (either under oral or pharyngeal) will be then deactivated since its dependent features, [high, mid and low], are not in effect. If the coronal sound [t] is adapted as an emphatic sound [$t^{ʕ}$] in any language (e.g., the English name [ɪəʊni] 'Tony' becomes [$t^{ʕ}$əʊni] in Arabic), the features [high, mid, low] under the node [dorsal] under the node Pharyngeal will be activated as well as the feature [RTR] under the pharyngeal node.

Let us now turn to a summary of the adaptation of Arabic ill-formed segments in Wolof as shown in Table (4).

Table 4: (non-) Adaptation of Arabic Ill-formed Segments

Arabic → Wolof	# of instances	100%
[d] → [d]	6	60%
[d] → [t]	4	40%
Total	10	100%
[b] → [b]	14	86%
[b] → [p]	2	14%
Total	16	100%
[z] → [s]	5	71%
[z] → [ʒ]	2	29%
Total	7	100%
[ʒ] → [ʒ]	15	79%
[ʒ] → [c]	3	16%
[ʒ] → [s]	1	5%
Total	19	100%
[ʃ] → [s]	4	100%
[θ] → [s]	1	50%
[θ] → [t]	1	50%
Total	2	100%
[ð] → [ʒ]	1	33.4%
[ð] → [s]	2	66.6%
Total	3	100%
[q] → [q]	4	21%
[q] → [x]	12	63%
[q] → [k]	2	11%
[q] → [g]	1	5%
Total	19	100%
[x] → [x]	11	85%
[x] → [q]	1	7.5%
[x] → [k]	1	7.5%
Total	13	100%
[dˤ] → [t]	3	100%
[tˤ] → [t]	8	100%
[sˤ] → [s]	5	100%

As shown in Table 4 regarding the phonological changes related to [d] and [b], it is important to note that [d] and [b] are part of the consonant inventories of both Arabic and Wolof. Thus, a large portion of the data keeps [d]→[d] (60%, e.g., [**d**araʒah] → [**d**araʒa] 'dignity') and [b]→[b] (84%, e.g., [**b**uru:ʒ] → [**b**uruc] 'zodiac') without adaptation. The change [d]→[t] and [b]→[p] occurs only word-finally as in (12)

(12)

	Arabic	Wolof	Gloss
a.	[mawli**d**]	[mawlu:**t**]	'commemoration of birth of prophet'
	[suʒu:**d**]	[suʒʒo:**t**]	'prostration'
	[jahu:**d**]	[jawu**t**]	'Jewish'
	[muri:**d**i]	[muri**t**]	'Mouride'
b.	[tusa**bb**iħ]	[tasa**p**]	'to count beads' (Islamic practice)
	[taw**b**ah]	[tu:**p**]	'repent'

Although it could be argued that Wolof adapts [d, b] to [t, p] word-finally, it is worthwhile to mention that Wolof has a rule that devoices all stops word-finally. Thus, the sounds [b] and [d] are not adapted; they are borrowed identically, yet they undergo a general devoicing rule like other native-Wolof words (Ka).

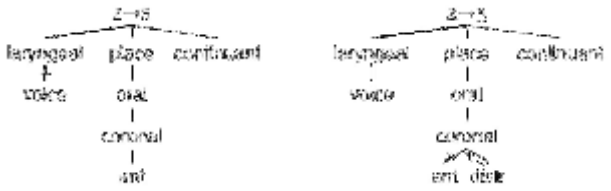
Let us turn to the adaptations [z]-- > [s] (71%) or [z]-- > [ʒ] (29%) in Table 4. Consider the examples below:

(13)

	Arabic	Wolof	Gloss
a.	[ʔa**zz**aka:h]	[ʔa**s**aka]	'alms given to the poor'
	[bar**z**ax]	[bars**a**:qə]	'place of souls until doomsday'
	[ʒana:**z**ah]	[ʒana:**s**ɛ]	'cemetery'
b.	[**z**ama:n]	[**ʒ**amənɔ]	'time'
	[zija:rah]	[**ʒ**ija:r]	'visit'

The high percentage of the adaptation [z] → [s] is predictable according to the Minimality Principle because the delinking of [voice] is less costly (i.e., one repair) than tampering with two features, [ant] and [distr], because [z] is [+ant] and [-distr] while [ʒ] is the reverse, i.e., [-ant] and [+distr], which means the adaptation will be costly, requiring two repairs. The change [z]→[s] requires one repair, i.e., deletion of [voice] results in the adaptation of [z]→[s] as in (14a). However, the change [z]→[ʒ] requires two repairs: the deletion of [ant] and the insertion of [distr] as in (14b).

(14) **a.** **b.**



It is important to note that the voiced palato-alveolar fricative [ʒ] is not part of Wolof phonology at all. Thus, the adaptation [z]→[ʒ] is not preferable (29%). It is apparent that [ʒ], in this case, is an imported novel segment and behaves as an ''import'' that does not need adaptation. I assume here that it is introduced at a later point in history and starts to be part of the PERIPHERY of Wolof phonology (see section 2).

The importation of [ʒ] to the Wolof consonant inventory is confirmed from Table 4 where the non-adaptation [ʒ]→[ʒ] (79%) is higher in percentage than the adaptations [ʒ]--> [c] (16%) and [ʒ]→[s] (5%). Most cases of Arabic [ʒ] are not adapted but imported, either word-initially, medially or intervocalically as in (15).

(15)

Arabic	Wolof	Gloss
[ʒajb]	[ʒiba]	'pocket'
[ʒumʕah]	[ʒuma:]	'Friday prayer'
[murʒa:n]	[murʒa:n]	'diamond'
[faʒir]	[faʒar]	'dawn'
[daraʒah]	[daraʒa]	'dignity'

However, the adaptation occurs word-finally where [ʒ]→[c] or [ʒ]→[s] as in (16).

(16)

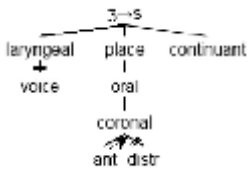
Arabic	Wolof	Gloss
a. [ha:ʒʒ]	[ʔac]	'go on a pilgrimage, pilgrim'
b. [buru:ʒ]	[burue]	'zodiac'
c. [huʒʒa:ʒ]	[ʔuʒa:c]	'pilgrims'
d. [ʔalha:ʒʒ]	[ʔcla:s]	'the pilgrim'

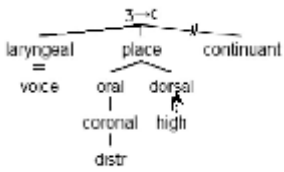
Comparing (16a) and (16d), they are the same word pilgrim but [ʒ] is adapted to either [c] or [s]. Although the sound [ʒ] will need more than two repairs to be adapted to [c] and [s], it is not deleted; rather, it applies three repairs for the adaptation process.

To illustrate, the change from [ʒ] to [s] requires that we insert [ant] and delink both [distr] and [voice] as in (17a) (i.e., three repairs). However, the change from [ʒ] to [c] requires delinking two features [voice] and [continuant]

as well as insertion of [high] to the deactivated node, Dorsal (i.e., three repairs) as in (17b). The node [dorsal] is a redundant articulator, i.e., deactivated; the activation of this node requires inserting a dependent feature to it such as [high].

(17) **a.**



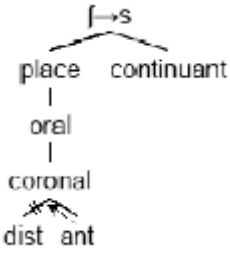


As for the voiceless alveo-palatal fricative [ʃ], it is always adapted to [s] (100%) in Table 4. Examples are given in (18).

	Arabic	Wolof	Gloss
a.	[ʔinʃa:ʔa ʔalla:h]	[ʔinsa:lla:]	'if it pleases God!'
b.	[ʃahadah]	[sɛ:dɛ]	'testify, testimony'
c.	[ʃajtˁa:n]	[sɛjta:nɛ]	'Satan'
d.	[ʃakk]	[sikkisa:kka]	'doubt'

To make the transition from [ʃ] to [s], the feature [distributed] is elided and [anterior] is inserted (2 repairs) as shown in (19).

(19)



Let us now turn to the dental sounds [θ] and [ð] As shown in Table 4, [θ] is adapted either to [s] or [t] in only two examples given in (20).

(20)

Arabic	Wolof	Gloss
[miθa:l]	[misa:l]	'illustration'
[θala:θa]	[tala:ta]	'Tuesday'

In either case, only one repair is in order. To change from [θ] to [s], the

feature [strident] is only inserted as in (21a) but to change from [θ] to [t] the feature [continuant] is deleted as in (21b).

(21) a. b.

As for the voiced dental [ð], it is adapted either to [s] (66.3%) or to [ʒ] (33.4%) as in (22).

(22)

Arabic	Wolof	Gloss
[ðalika]	[sa:lika-nɔ:nu]	'similarly, in like manner'
[ʔusta:ð]	[ʔusta:s]	'teacher of the Quran'
[ðanb]	[ʒa:mbu]	'betray themselves'

To accomplish the adaptation process, two features for each need to be treated. When [ð] is adapted to [s], two repairs are in effect: the feature [voice] is deleted and the feature [+strident] is inserted as in (23a). When [ð] is adapted as [ʒ], it requires 2 repairs as well: the feature [distributed] is inserted and [anterior] is delinked (i.e., yielding a [+distributed -anterior] sound, i.e., [ʒ]) as in (23b).

(23) a. b.

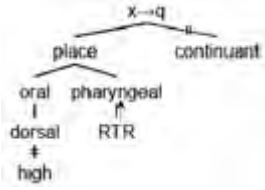
Let us move further to the cases of the velar [x] and the uvular [q]. As for [x], the non-adaptation instances of [x] are higher (85%) than its adapted instances ([x]→[q] or [k], 7.5% for each). This is a desirable result because of the presence of [x] in Wolof and Arabic. Examples of the non-adaptations of [x] are given in (24).

(24)

Arabic	Wolof	Gloss
[ʔalxami:s]	[ʔalxamɛs]	'Thursday'
[ʔalʔistixa:rah]	[listixa:r]	'The Hereafter'
[ta:ri:x]	[ta:rix]	'(religion) knowledge/history'
[xa:lisˁ]	[xa:lis]	'currency, money'
[xutˁbah]	[xutbə]	'sermon'

As for the adaptations, I will consider them as exceptions. In fact, the sound [x] adapts to [q] and [k] in only two examples in the whole data: [xali:fah]→[kilifə] 'caliph' ([x]→[k]) and [barzax]→[barsa:qə] 'place of souls until doomsday' ([x]→[q]). The former example [kilifə] 'caliph' might not be derived from the Arabic word [xali:fah] at all; it could be an indirect borrowing, introduced into L1 from L2 via a third language (Cannon). The example [kilifə] 'caliph' may be borrowed from other intermediate languages such as English [k] as in Caliph or French [k] in *Calife*. As for [barzax]→[barsa:qə] 'place of souls remain until doomsday', it could be a mere exception. Even under the hypothesis that it is not an exception, the adaptation of [x] to [q] requires three repairs (the addition of [RTR] to the Pharyngeal node and the deletion of [continuant] along with the deletion of [high] from the dorsal node) as in (25)[2].

(25)



As for the uvular [q], the non-adaptations are only 21% as shown in Table 4. Examples are given in (26).

(26)

Arabic	Wolof	Gloss
[ʕa:qq]	[ʔa:qə]	'offense, wrong'
[maqa:m]	[ma:qa:ma]	'ascending; greatness'
[muqaddam]	[muqa:dda:m]	'a Muslim cleric who has disciples.'
[na:faq]	[na:fe:qə]	'treacherous, to be treacherous.'

Given that [q] is part of the Wolof consonant inventory, the non-adaptation of [q] is predictable but its adaptation to [x], [k] or [q] is totally unpredictable. The change from [q] to [x] occurs for 63%, or to [k] for 11% or to [g] for 5%. Consider the examples in (27).

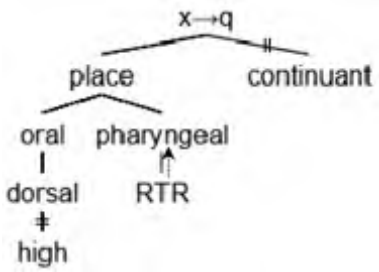
(27)

	Arabic	Wolof	Gloss	
a.	[ʔalbura:q]	[ʔalbura:x]	'horse of the angel Gabriel'	[q] → [x]
	[ʔalqurʔa:n]	[ʔalxura:n]	'The Quran'	[q] → [x]
	[sadaqah]	[sarax]	'alms, to do alms'	[q] → [x]
	[tˤabaq]	[tabax]	'to build a home'	[q] → [x]
	[waqt]	[waxtu]	'time'	[q] → [x]
	[qabr]	[xabru]	'a grave'	[q] → [x]
	[qalam]	[xalima]	'reed pen'	[q] → [x]
	[qarn]	[xarnu]	'century'	[q] → [x]
	[jawm ʔalqija:mah]	[jɔwmalxaa:m]	'Day of Judgment'	[q] → [x]
b.	[rizq]	[wərsək]	'blessing by chance'	[q] → [k]
	[ʔalqa:dˤi]	[ʔalka:ti]	'police officer'	[q] → [k]
	[waraqah]	[warga]	'tea leaves.'	[q] → [g]

These unpredictable adaptations raise issues about the authority of phonetic approximations, whereby a sound is always mapped to the closest sound in the borrowing language. In this case, [q] is adapted to consonants which are further than the more favorable similar-looking [q] in Wolof. It might be assumed that [q] is a new addition to the Wolof consonant inventory and was introduced at a certain point of time during the history of Wolof, when some words had already undergone adaptations to the available consonants such as [x], [k] and [g]. This is true in that [q]→[x] (63%) is higher in percentage than [q]→[q] (21%). After the introduction of [q], the non-adaptation may start to rise.

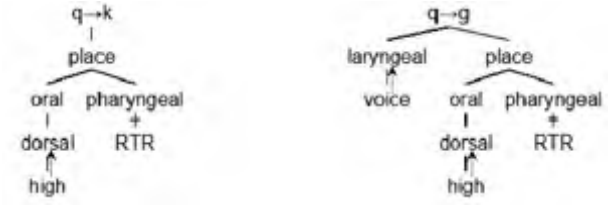
For the adaptation of [q] to [x] which is the tendency in the [q]-bearing cases, three repairs are necessary: two features [high] and [continuant] need to be inserted plus the delinkage of [RTR] from the Pharyngeal node.

(28)



For the adaptation of [q] to [k], only two repairs are in effect as in (29a): the feature [high] is inserted while the feature [RTR] is delinked to make the change from pharyngeal [q] to non-pharyngeal [k]. As for the change [q]→[g], three repairs are in order: the same two repairs mentioned above, alongside the insertion of [voice] to the laryngeal node to change from the voiceless [q] to the voiced [g].

(29) a. b



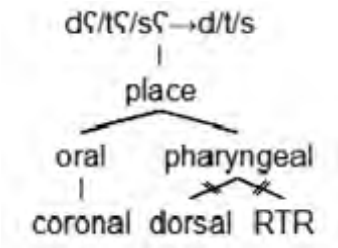
Let us now turn to the adaptation of emphatic sounds into non-emphatic sounds as exemplified in (30).

(30)

	Arabic	Wolof	Gloss	
a.	[sat^{ʕ}l]	[satala]	'kettle'	[t^{ʕ}] → [t]
	[t^{ʕ}a:lib]	[ta:libɛ]	'student'	[t^{ʕ}] → [t]
	[t^{ʕ}ablah]	[tabala]	'drum'	[t^{ʕ}] → [t]
b.	[mus^{ʕ}i:bah]	[musiba]	'woe'	[s^{ʕ}] → [s]
	[s^{ʕ}aha:bah]	[sa:ba]	'prophet's companion'	[s^{ʕ}] → [s]
	[xala:s^{ʕ}]	[xala:s]	'enough'	[s^{ʕ}] → [s]
c.	[ʔalqa:d^{ʕ}i]	[ʔalka:ti]	'police officer'	[d^{ʕ}] → [t]
	[fard^{ʕ}]	[farata]	'obligation'	[d^{ʕ}] → [t]

As shown above, the Arabic emphatic sounds [t^{ʕ}] and [s^{ʕ}] are adapted in Wolof to non-emphatic sounds [t] and [s] respectively. The geometry in (31) is modified to represent the emphatic sounds (Rose), where pharyngeal node bears two dependent nodes: Dorsal and RTR which make the emphatic sounds. To adapt emphatic to non-emphatic sounds, only two repairs are required: the deletion of [Dorsal] and [RTR] as in (31). This is attested in Wolof changes: [t^{ʕ}]-- > [t] and [s^{ʕ}]-- > [s].

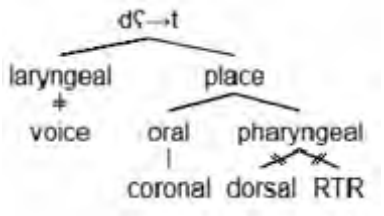
(31)



As for [d^{ʕ}]→[t], I assume here that there is no final stop devoicing as discussed earlier. In examples (30c), stops do not occur word finally. Thus, the devoicing rule should not be triggered. I propose for [d^{ʕ}]→[t] that the

emphatic sound [d] changes first to the non-emphatic sound [d], with two repairs as discussed in (31). Since [d] is voiced, the [voice] feature is deleted as a third repair and this is unexpected given the presence of [d] in the Wolof consonant inventory, thus rendering the voiced stop [d] to the voiceless counterpart [t] and increasing the number of repairs to three as in (32).

(32)



All in all, the adaptation of emphatic sounds to non-emphatic sounds requires two repairs: the deletion of dependent nodes [Dorsal] and [RTR] from pharyngeal will leave the oral place [coronal] preserved, resulting in the non-emphatic [t], [d] and [s]. Any modification concerning [voice] will be separately treated under the node Laryngeal, reaching the limit of three repairs.

5. Conclusion

In this paper, I provided an analysis of Arabic loanwords in Wolof within the TCRS loanword model. Unlike Fula (Paradis & Lebel), Kinyarwanda (Rose) and other languages discussed by P&L, I show that an ill-formed segment in Wolof is not deleted right after 2 repairs. Wolof seems to adapt ill-formed segments by applying three repairs maximally before the segment gets deleted. To preserve [ʒ] from deletion and adapt it to [s] or [c] we need three repairs. The same situation applies to the phonological adaptations [x]→[q], [q]→[x], [q]→[g] and [dˁ]→[t], each of which needs three repairs to be preserved. Although (3b) in Threshold Hypothesis/Principle clearly posits that ‘‘this threshold is the same for all languages: two steps (or two repairs) within a given constraint domain’’ (P&L 385 ex. 4), the threshold can be set differently in other languages, and must be parameterized, so the budget of repairs can go up to three repairs reaching three repairs as is the case in Wolof.

Notes

1 - I thank Dr. Fiona McLaughlin (professor at University of Florida) for providing me with a neat translated list of these loanwords.

2 - The literature is controversial over the classification of [x] in terms of its place of articulation. It is important to note here that Paradis and LaCharité treat [x] as uvular; under this classification, there would be only two repairs. In this article, I followed Al-Ani, Thelwall & Sa'adeddin, and Alkhairy in classifying [x] as velar (thus, requiring three repairs). At any case, the main proposition of the article remains intact and non-controversial as the sound adaptation [ʒ]→[s], [ʒ]→[c], [q]→[x], [q]→[g] and [dˤ]→[t] still require three repairs to be adapted.

Appendix: Examples of Arabic Loanwords in Wolof

	Arabic	Wolof	Gloss	
a.	[suʒu:**d**]	[suʒʒo:**t**]	'prostration'	[d] → [t]
	[mawli**d**]	[mawlu:**t**]	'commemoration of birth of prophet'	
	[jahu:**d**]	[jawu**t**]	'Jewish'	
	[muri:**d**i]	[muri**t**]	'Mouride'	
b.	[tawbah]	[tu:**p**]	'repent'	[b] → [p]
	[tusa**bb**īh]	[tasa**p**]	'to count beads' (Islamic practice)	
c.	[ʔa**zz**aka:h]	[ʔasaka]	'alms given to the poor'	[z] → [s]
	[barza**x**]	[barsa:qə]	'place of souls until doomsday'	
	[ʒana:**z**ah]	[ʒana:sɛ]	'cemetery'	
d.	[**z**ama:n]	[ʒamənə]	'time'	[z] → [ʒ]
	[**z**ija:rah]	[ʒija:r]	'visit'	
e.	[ʒajb]	[ʒiba]	'pocket'	[ʒ] → [ʒ]
	[ʒumʕah]	[ʒuma:]	'Friday prayer'	
	[murʒa:n]	[murʒa:n]	'diamond'	
	[faʒir]	[faʒar]	'dawn'	
	[daraʒah]	[daraʒa]	'dignity'	
f.	[ħa:**ʒʒ**]	[ʔa**c**]	'go on a pilgrimage, pilgrim'	[ʒ] → [c]
	[buru:**ʒ**]	[buru**c**]	'zodiac'	
	[ħuʒʒa:**ʒ**]	[ʔuʒa:**c**]	'pilgrims'	
	[ʔalħa:**ʒʒ**]	[ʔɛla:**s**]	'the pilgrim'	
g.	[ʔinʃa:ʔa ʔalla:h]	[ʔinsa:lla:]	'if it pleases God!'	[ʃ] → [s]
	[**ʃ**ahadah]	[**s**ɛ:dɛ]	'testify, testimony'	
	[**ʃ**ajtʕa:n]	[**s**ejta:nɛ]	'Satan'	
	[**ʃ**akk]	[**s**ikkisa:kka]	'doubt'	
h.	[mi**θ**a:l]	[misa:l]	'illustration'	[θ] → [s]
	[**θ**ala:**θ**a]	[tala:**t**a]	'Tuesday'	
i.	[**ð**alika]	[**s**a:lika-nɔ:nu]	'similarly, in like manner'	[ð] → [s]
	[ʔusta:**ð**]	[ʔusta:**s**]	'teacher of the Quran'	
	[**ð**anb]	[**ʒ**a:mbu]	'betray themselves'	[ð] → [ʒ]
j.	[ʔal**x**ami:s]	[ʔal**x**amɛs]	'Thursday'	[x] → [x]
	[ʔalʔisti**x**a:rah]	[listi**x**a:r]	'The Hereafter'	
	[ta:ri:**x**]	[ta:ri**x**]	'(religion) knowledge/history'	
	[**x**a:lisʕ]	[**x**a:lis]	'currency, money'	
	[**x**utʕbah]	[**x**utbə]	'sermon'	
	[ʕa:**qq**]	[ʔa:**q**ə]	'offense, wrong'	[q] → [q]

	[maqa:m]	[ma:qa:ma]	'ascending; greatness'	
	[muqaddam]	[muqa:dda:m]	'a Muslim cleric who has disciples.'	
	[na:faq]	[na:fe:qə]	'treacherous, to be treacherous.'	
k.	[ʔalbura:q]	[ʔalbura:x]	'horse of the angel Gabriel'	[q] → [x]
	[ʔalqurʔa:n]	[ʔalxura:n]	'The Quran'	
	[sadaqah]	[sarax]	'alms, to do alms'	
	[tˤabaq]	[tabax]	'to build a home'	
	[waqt]	[waxtu]	'time'	
	[qabr]	[xabru]	'a grave'	
	[qalam]	[xalima]	'reed pen'	
	[qarn]	[xarnu]	'century'	
	[jawm ʔalqija:mah]	[jɔwmalxaa:m]	'Day of Judgment'	
l.	[rizq]	[wərsək]	'blessing by chance'	[q] → [k]
	[ʔalqa:dˤi]	[ʔalka:ti]	'police officer'	
	[waraqah]	[warga]	'tea leaves.'	[q] → [g]
m.	[satˤl]	[satala]	'kettle'	[tˤ] → [t]
	[tˤa:lib]	[ta:libɛ]	'student'	
	[tˤablah]	[tabala]	'drum'	
n.	[musˤi:bah]	[musiba]	'woe'	[sˤ] → [s]
	[sˤaha:bah]	[sa:ba]	'prophet's companion'	
	[xala:sˤ]	[xala:s]	'enough'	
o.	[ʔalqa:dˤi]	[ʔalka:ti]	'police officer.'	[dˤ] → [t]
	[fardˤ]	[farata]	'obligation'	

Works Cited

Abu-Manga, Al-Amin. *Fulfulde in the Sudan: Process of Adaptation to Arabic*. Berlin: Verlag Von Dietrich Reimer, 1986.

Al-Ani, Salman. *Arabic Phonology: An Acoustical and Physiological Investigation*. The Hague: Mouton, 1970.

Amayreh, Mousa. "Completion of the Consonant Inventory of Arabic." *Journal of Speech, Language, and Hearing Research*, vol. 46, 2003, pp. 517-529.

Broselow, Ellen. "Stress, Epenthesis, and Segment Transformation in Selayarese Loans." *Proceedings of the Annual Meeting, Berkeley Linguistics Society*, 25, 1999, pp. 311-325.

Cannon, Garland. "Antedating Primarily Arabic Loans in English." *Diction-*

aries: Journal of the Dictionary Society of North America, 19, 1998, pp. 97-123.

Chomsky, Noam. *Knowledge of Language; Its Nature, Origin and Use*. New York: Praeger, 1986.

Clements, George. "Phonology." *African Languages: An Introduction* edited by Heine B and Nurse D.,= Cambridge University Press, 2000, pp. 123-160.

Diallo, Amadou. "Nanu seet lakku wolof." *Dakar: ExCAF*, 1995, p. 15.

Diouf, Jean-Leopold. *Dictionnaire Wolof-Français et Français-Wolof*. Paris: Karthala, 2003.

Haddad, Ghassan & Michael Kentstowicz. "A Note on the Parallels between the Definite Article and the Relative Clause Marker in Arabic." *Studies in the Linguistic Sciences*, 10, 1980, pp.141-7.

Haugen, Einar. "The Analysis of Linguistic Borrowings." *Language*, 26, 1950, pp. 210-231.

Jacobs, Haike & Carlos Gussenhoven. "Loan Phonology: Perception, Salience, the Lexicon and OT." *Optimality Theory: Phonology, Syntax, and Acquisition*, edited by Joost Dekkers, Frank van der Leeuw & Jeroen van de Weijer, Oxford University Press, 2000, pp. 193-210.

Ka, Omar. *Wolof Phonology and Morphology*. University Press of America, 1994.

Al-Khairy, Mohammed. "Acoustic Characteristics of Arabic Fricatives."PhD dissertation, Florida: 2005.

McLaughlin, Fiona. "Arabic in Senegal." *Encyclopedia of Arabic and Language and Linguistics*. Brill, 2008, pp. 179-185.

---. "Wolof." *Concise Encyclopedia of Languages of the World*. Elsevier Ltd., 2006, pp. 1484-1187.

Myers-Scotton, Carol. "Comparing Code Switching and Borrowing." *Journal of Multilingual and Multicultural Development*, vol. 13, 1992, pp. 19-39.

Paradis, Carole. "'Focus' in Gere Configurational Constraints." *Current Approaches to African Linguistics*, edited by John Hutchison & Victor Manfredi, vol. 7, 1990, pp. 53-62.

---. "On Constraints and Repair Strategies." *The Linguistic Review*, vol. 6, no. 1, 1988, pp. 71-97.

Paradis, Carole & Caroline Lebel. "Contrasts from Segmental Parameter Settings in Loanwords: Core and Periphery in Quebec French." *Toronto Working Papers in Linguistics*, vol. 13, 1994, pp. 75-95.

Paradis, Carole & Darlene & LaCharité. "Constraint-based Theories in Multilinear Phonology." *Special Issue of the Canadian Journal of Linguistics*, 38, 1993, pp. 127-303.

---. "Guttural Deletion in Loanwords." *Phonology*, vol. 18, no. 2, 2001, pp. 255-300.

---. "Preservation and Minimality in Loanword Adaptation." *Journal of Linguistics*, vol. 33, no. 2, 1997, pp. 379-430.

Poplack, Shana, David Sankof & Christopher Miller. "The Social Correlates and Linguistic Processes of Lexical Borrowing and Assimilation." *Linguistics*, vol. 26, no. 1, 1988, pp. 47-104.

Rose, Sharon. "Variable Laryngeals and Vowel Lowering." *Phonology*, vol. 13, no. 1, 1996, pp. 73-117.

Rose, Yvan. "L'adaptation des voyelles nasales en kinyarwanda: l'effet du principe de preservation." *Actes des VIII Journees de linguistique*. Laval University: Centre international de recherché en amenagement linguistique, 1994, pp. 162-165.

Saleem, A., & A. Dyson "Arabic Preschool Phonological Screening Test-Revised (APPST-R)." *Poster session presented at 2003 Annual Convention of the American Speech-Language -Hearing Association*, 2003.

Silverman, Daniel. "Multiple Scansions in Loanword Phonology: Evidence from Cantonese." *Phonology*, vol. 9, no. 2, 1992, pp. 289-328.

Thelwall, Robin & Akram Sa'adeddin. "Arabic." *Journal of the International Phonetic Association*, vol. 20, no. 2, 1990, pp. 37-39.

Yip, Moira. "Cantonese Loanword Phonology and Optimality Theory." *Journal of East Asian Linguistics*, vol. 2, no. 3, 1993, pp. 261-291.

Acknowledgement:

I am indebted to Fiona McLaughlin (professor at University of Florida) for providing me with a neat translated list of Wolof-Arabic loanwords, and to Saleh Batais (professor at King Saud University) for helping me understand the TCRS model and clarifying some controversial points.