The Phonology of English Loanwords in UHA

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Declaration

I hereby declare that this thesis has not been and will not be, submitted in whole or in part to another University for the award of any other degree.

Signature:..

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SUMMARY

This thesis investigates the phonology of loanword adaptation focusing on English loanwords in Urban Hijazi Arabic (UHA). It investigates the segmental adaptations of English consonants that are absent in UHA as well as the various phonological adaptations of illicit syllabic structures. It is based on dataset of around 100 English loanwords that were integrated into UHA that contain several illicit consonants and syllable structures in the donor language. This dataset is compiled from different published sources along with a data collection exercise. The first significant source is Abdul-Rahim (2011) a dictionary of loanwords into Arabic, while the other one is Jarrah's (2013) study of English loanwords into Madinah Hijazi Arabic (MHA) adopting the on-line adaptation. The third source is original pronunciation data collected from current UHA speakers. Furthermore, the Oxford English Dictionary (OED) was consulted for the etymology and transcription of the English words.

The goal is to provide a thorough analysis of these phonological patterns whether consonantal or syllabic ones found in the adaptation of English loanwords into UHA. To accomplish this, the adaptations have been analysed according to two theoretical frameworks: the Theory of Constraints and Repair Strategies Loanword Model (TCRS-LM) proposed by Paradis and LaCharité (1997) and Optimality Theory (OT) introduced by Prince and Smolensky (1993). The different proposed analyses in this study facilitated an evaluation of the adequacy of each of these theories in accounting for the discussed phonological patterns found in UHA loan phonology. The thesis concludes that OT better explains the adaptations, but neither theory fully accounts for the variety of adaptations found in UHA.

Table of Contents

List of Tables

List of Figures

List of Abbreviations

BR	Base and Reduplicant
BHA	Bedouin Hijazi Arabic
CA	Cairene Arabic
C	Consonant
DICT	Dictionary
EVAL	Evaluator
L1	First language (Borrowing language)
GEN	Generator
IO	Input and output
IPA	International phonetic alphabet
VV	Long vowel
MHA	Madinah Hijazi Arabic
MSA	Modern Standard Arabic
N	Nucleus
O	Onset
OT	Optimality Theory
L2	Second language (Source language)
V	Short vowel
CON	The Constraint
OED	The oxford English Dictionary
PAM	The Perceptual Assimilation Model
PLH	The Phonological Level Hierarchy
SPE	The Sound Pattern of English
TCRS-LM	The Theory of Constraints and Repair Strategies Loanword Model
X	Timing Unit
UHA	Urban Hijazi Arabic
UG	Universal Grammar

CHAPTER I

Introduction

1.1. Introduction

The current study focuses on one of the phenomena of language contact and change known as borrowing. It concerns with lexical borrowing (loanwords) from English into one of the Arabic dialects, Urban Hijazi Arabic (hereafter UHA). These loanwords might undergo phonological or morphological changes, though this project will concentrate on the analysis of the phonological ones. Many linguists, including Arab linguists, have extensively investigated the phonological adaptation of loanwords. Similarly, some Arabic linguists have investigated the phonological adaptations of loanwords into Arabic, for instance AlAthwari (2003) focusing on Modern Standard Arabic (MSA), while its dialects have been explored by Galal (2004) and Hafez (2008) on Egyptian Arabic, Jarrah (2013) on Madinah Hijazi Arabic and Alomoush and Al Faqara (2010) on Jordanian Arabic.

Correspondingly, the present study will examine the adaptations of loanwords into UHA. It will attempt to analyse how English sounds and syllable sequences map onto UHA. Within the framework of the Theory of Constraint and Repair Strategies Loanword Model (henceforth TCRS-LM) proposed by Paradis and LaCharité (1997) and Optimality Theory (OT), introduced by Prince and Smolensky (1993), the study will discuss both the consonantal and syllabic adaptations. In this chapter, an introduction to loanwords will be presented by looking at the definitions proposed by different linguists as well as phonological adaptations. This is followed by the clarification of the current study purpose. The scope of the current research will be set out in the next section and finally an outline of the work will be presented.

1.2. Loanwords

Essentially, it is necessary to consider what exactly is meant by the term ***loanword***, prior to starting any phonological investigation into UHA loanwords. Another equivalent terminology for this term is lexical borrowings or solely loans. Haugen's (1950) work on '*The analysis of linguistic borrowing'* is widely considered as crucial for most current studies in loanword adaptations. In this work, Haugen differentiates between three main terms in this respect; loanwords, loanblends, and loanshifts as follows:

1. 'LOANWORDS: show morphemic importation without substitution. Any morphemic importation can be further classified according to the degree of its phonemic substitution: none, partial, or complete.
2. LOANBLENDS: show morphemic substitution as well as importation. All substitution involves a certain degree of analysis by the speaker of the model that he is imitating; only such 'hybrids' that involve a discoverable foreign model are included here.
3. LOANSHIFTS: show morphemic substitution without importation. These include what are usually called 'loan translations' and 'semantic loans'; the term 'shift' is suggested because they appear in the borrowing language only as functional shifts of native morphemes' (Haugen 1950:214-215).

Nevertheless, the current study is exclusively concerned with the first group of borrowings, loanwords. The basic definition of this concept can be taken from the Dictionary of Phonetics and Phonology that defined it as, ‘a word which has been copied into a language from another language, as a result of contact, such as French *weekend*, *jogging* and *strip-tease*, all loans from English’ (Trask 1996:210). Of central importance for the concern of this study, is the further fundamental distinction introduced by Haugen (1950). More specific is the distinction between the two concepts of **importation** and **substitution** that are defined as:

> ‘If the loan is similar enough to the model[1] so that a native speaker would accept it as his own, the borrowing speaker may be said to have IMPORTED the model into his language, provided it is an innovation in that language. But insofar as he has reproduced the model inadequately, he has normally SUBSTITUTED a similar pattern from his own language. This distinction between IMPORTATION and SUBSTITUTION applies not only to a given loan as a whole but to its constituent patterns as well, since different parts of the pattern may be treated differently’ (Haugen 1950:212).

Furthermore, Haugen (1950:215) distinguishes between simple substitution – that is, the use of a native segment in order to copy the foreign one – and importation, which is usually recognised by a native speaker of the new patterns as a ‘foreign accent’. Though it might be difficult for linguists to identify which particular sound in the native language is the most closely related to the foreign segment, however, knowing the sound system and sequences can greatly help in identifying which particular sounds are more likely to be substituted in a certain case (Haugen 1950: 215). Indeed, ‘loanword phonology is the attempt to recapture the process of analysis that results in phonemic substitution’ (Haugen 1950:215). Furthermore, Haugen (1950:216) states that the importation of new patterns might entirely depend on the speaker’s knowledge of other languages, as he will naturally import more foreign sequences into his native language. Indeed, some linguists distinguish the degree of phonological changes as ‘early’ and ‘late’ words, as the late words are more similar to their

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[1] According to Haugen (1950: 212), the term MODEL is referred here to ‘the original pattern’.

foreign patterns phonologically.

When loanwords are borrowed from a foreign language, they are normally modified (adapted) segmentally and supra-segmentally in order to conform to the phonological system of the borrowing language (Uffmann 2015: 644). The segmental adaptation involves 'identifying native phoneme categories to express the sounds of the original form', while supra-segmental adaptation modifies the borrowed loanwords in order to conform to native phonotactics and syllable structure constraints (Uffmann 2015: 644). These two levels of phonological adaptations are of special concern in the theoretical analysis of loanword adaptation. In segmental adaptation, speakers of L1 generally have two possibilities to deal with, such as the incoming sounds of L2 (2015: 644). They might either take the incoming phonetic sounds and search for an underlying representation in their L1 in which the output shares phonetic similarities to the original form as possible (2015: 644). Or they might evaluate the L2 in terms of phonemes and underlying contrasts in order to map these more abstract sets on L1 sets (2015: 644). Indeed, this crucial distinction is basically at the core of perceptual or phonetic rather than phonological approaches in loanword adaptation (2015: 644). In fact, segmental adaptations can be understood to a large degree as the mapping of an L2 phoneme system on the categories of the L1 (Uffmann 2015: 647). Still, other phonological information might be needed as they may interfere in this process (2015: 647).

Conversely, supra-segmental adaptations include two main types; syllable structure adaptations or more generally, phonotactic adaptations and stress and tone adaptations, though the first type of this category is of special interest in the current study (Uffmann 2015: 647). The syllable structure adaptations mainly occur when L2 has tighter syllable sequence constraints than L1, more precisely when L1 allows segment sequences that L2 firmly does not allow (Uffmann 2015: 647). A great example of such syllabic restrictions can be seen cross-linguistically in many languages that disallow consonant clusters, for instance, complex onsets or codas (2015: 647). A further example is the strict sonority sequencing restrictions that might be found in many languages, disallowing, for instance, [sC] clusters (a cluster with the obstruent fricative the /s/ as the first consonant along with any consonant)(2015: 647). When languages with such syllabic restrictions borrow loanwords from languages without these constraints, the shape of these loanwords has to be adapted in order to satisfy L1 syllabic restrictions (2015: 647). Indeed, this can be done in two different ways: either by the deletion of the problematic segments or by the insertion of additional segments into the prohibited syllabic sequences. To be clearer, consider a language that considers an initial onset cluster as an illicit syllable structure (as found in many Arabic dialects) borrowing from English, with its complex onset in syllable sequences. If this language borrows loanwords such as *speak or smoke*, this language therefore has three options: to delete one of the consonants in the onset cluster, to insert vowels before the initial consonant for instance speak→ [ispiːk] or between consonants in order to create syllable sequence acceptable in this language. The adaptation by the epenthesis of a vowel only is found in, for instance, Cairene Arabic (Galal 2004) and Fula (Paradis and LaCharité 1997), while some languages prefer importation of the cluster as in *smoke* → [smoko] in the English-based creole Sranan where the s/-nasal clusters are retained without adaptation, (Alber and Plag 2001, cited in Kang 2011: 2270). On the other hand, fewer languages employ both the deletion of consonant and vowel epenthesis is found in Telugu in which the deletion targets a /s/ in /s/-initial clusters (station → [teʃənu] ~ [isteʃənu]) (Broselow 1992, cited in cited in Kang 2011: 2271). The only language where the deletion of the consonant is the only preferred procedure over vowel epenthesis in adapting initial onset clusters is Finnish, in which all but one consonant are deleted (for instance Swedish *strand* → [ranta] 'shore', Russian *gramatika* → [raːmattu] 'bible') (Kang 2011: 2270). Nevertheless, in languages that prefer the deletion of a consonant to epenthesis, the importation of clusters is the alternative possibility to deletion (Kang 2011: 2270). Such procedures of deciding whether to use vowel epenthesis or consonant deletion allow languages to end up without initial onsets clusters. Though the applying of both procedures of deletion and epenthesis might be rarely found in some languages, given that vowel epenthesis is much more common than consonant deletion (Uffmann 2015: 648). Essentially, Paradis and LaCharité (1997) refer to this issue as the 'Preservation Principle' which they claim is a crucial principle in loanword phonology (more about this claim is given in **Chapter II and V**). Indeed, vowel epenthesis rather than consonant deletion is widely attested in dealing with illicit syllable structure in many languages cross-linguistically (Uffmann 2015: 647). This preference for epenthesis over deletion in loanword adaptation is remarkable.

The last issue that needs to be tackled in this respect is to see how the adaptations (whether segmental or supra-segmental) are motivated. This means knowing how speakers of L1 know exactly what to do with the incoming pattern in order to adapt it to conform with the phonological system of their language. Indeed, this issue has been widely addressed in the phonological research of loanword adaptation, and recently received an increasing interest among other issues in the field of phonology. It has been largely tackled in different theoretical frameworks, starting with the rule-based approaches to the recent constraint-based frameworks of phonology where repairs are proposed by a set of principles to deal with different problematic phonological patterns, as in the TCRS-LM framework by Paradis and LaCharité (1997), or entirely done, as in the OT approach (Prince and Smolensky 1993). This matter has been fully addressed in the next chapter (**Chapter II**).

1.3. UHA and English an overview

It is essential to provide an adequate background of the phonological system of both languages involved in the adaptations, more specifically the donor that is UHA and the target language, which is English. Sufficient background information about the languages of interest for the research will enable any phonological study of loanword adaptation to trace the phonological changes in the target language, which can be attributed possibly to the influence of loanwords and enhance our understanding of any patterns attested in the adaptation process. A detailed description and comparision are given in **Chapter III.** In the beginning, UHA is one of the Arabian Peninsula dialects that is widely used throughout the country for specific purposes, such as governmental and commercial purposes, and can be understood across the Arabian Peninsula (Margaret 1975: 6). It is the dialect of Jeddah

Mecca and Madinah, which are located in the western region of Saudi Arabia, and it has been largely influenced by other dialects, such as Cairene, Jordanian, and Palestinian (Margaret 1975).

Generally, there are some similarities and various differences between UHA and English. The major similarity is sharing most of the place and manner of articulations of segments despite the fact of lacking some classifications (for instance dental and affricates in UHA and glottal and pharyngeal in English). Equally, several differences between these two languages have been noticed. The main reason of these several differences is perhaps due to the fact that UHA and English belong to from different language families. Hence UHA is one of the varieties of Semitic languages, while English is Indo-European. One of the differences is in the number of vowels: UHA has a limited number of vowels in contrast to English, which has twelve vowels. The second crucial distinction is revealed in the consonantal inventories of both languages, as UHA lacks the English /p/, /ʤ/, /ʧ/, /ŋ/ and /v/ as phonemes, despite the fact that UHA has a larger number of consonants in contrast to English. In essence, the lack of an equivalent in UHA, the English consonant is usually replaced with the closest native UHA phoneme; only in a few cases does the English consonant remain unadapted (imported). Unlike the segmental differences, the distinctions between the syllable structures in the two languages is enormous, starting with the restricted number of allowed syllables sequences in UHA in contrast to English, to the banning of onset-less syllable and finally the disallowing of onset clusters. With only five types of permitted syllable sequences, more precisely CV, CVC, CVV, CVVC and CVCC, loanwords from English with different syllable structures will be considered illegal and demand adaptations. Furthermore, syllables with initial vowel (onset-less syllables) are not permissible in UHA phonology and is highly considered one of the principal illicit syllabic sequences besides consonant clusters. These fundamental syllabic differences between the phonology of UHA and English are the crucial cause of numerous types of syllabic adaptations found in UHA loanword adaptation.

1.4. Purpose of the Study

The main purpose of this study is to provide a better understanding of UHA loan phonology within the TCRS-LM framework along with the OT approach, of several consonantal and syllabic adaptations found in the study dataset. Essentially, the current work aims to:

1. State the different consonantal adaptations of English consonants that are absent in UHA phonology and attested in the UHA loanword data, such as voicing, devoicing, substitutions of certain consonants.
2. Find out the various phonological adaptations of illicit syllable structures in the UHA loanword dataset, by examining the epenthesis of consonants as well as vowels.
3. Analyse the attested consonantal alterations and syllabic adaptations within two phonological theories: TCRS-LM and OT.
4. Discuss the differences between the two frameworks in predicting the phonological adaptations whether at the consonantal or syllabic level in the UHA loanword dataset.

It is clear that these goals cannot be accomplished without referring to the previous studies on loanword adaptations adopting both theoretical models that have been fully reviewed in the background sections of the study.

1.5. The Scope and Limitations of the Study

The present study is confined to one Arabic dialect, specifically Urban Hijazi Arabic; other Arabic dialects such as MSA, Egyptian and Jordanian have also borrowed from English but acknowledged before in the literature of loanword adaptation. This starts with AlAthwari (2003) focusing on MSA, and Galal (2004) and Hafez (2008) on Egyptian Arabic and Alomoush and Al Faqara (2010) on Jordanian Arabic. One of the fundamental reasons for choosing the UHA dialect to analyse its loanwords is that this dialect has been rarely investigated with respect to Jarrah’s (2013) study on MHA. Another limitation that has been set out is restricting the study to analysing UHA loanwords borrowed from the English language (British English). Nevertheless, this study differs from the previous works on Arabic loanword adaptations in various aspects:

1. This study investigates both the consonantal and syllabic adaptations of English loanwords, not just concentrating on the analysis of syllabic adaptations of these loanwords.
2. This study varies in its sources of extracting the concerned data from using the data of formally published works to conduct its own data collection exercise, unlike earlier studies on Arabic loanword adaptations that rarely combined both sources.
3. This study adopts two theoretical approaches (TCRS-LM and OT), by proposing two analytic examinations of the data, not just solely depending on one theoretical framework that is largely seen in other works on Arabic loanword adaptations.
4. This study successfully involves, to some extent, a new clarification for several phonological patterns found in UHA loan phonology and perhaps that might be occurring in other Arabic dialects as well, for instance, the determining of the quality of the epenthetic vowel and the epenthesis of consonants that is fully discussed in **Chapters V** and **VI**.

This work is a phonological study. Two phonological issues are discussed here, segmental phonology and supra-segmental phonology. Segmental phonology deals with the analysis of segments while supra-segmental phonology is concerned with aspects larger than segments such as the syllable (Hyman 1975:186). The current study entails both segmental and supra-segmental phonology with some limitations. In segmental analysis, only the consonantal adaptations in UHA loanwords are considered leaving aside the issue of vowel adaptations. In supra-segmental analysis, the study investigates the adaptation of the main illicit syllabic sequences found in UHA loan phonology, other phonotactic issues such as stress are not addressed. Such limitations will enable the study to principally concentrate on these matters and get substantial generalisations.

1.6. Outline of the Study

The organisation of the current study can be generally distributed into the following main parts: introduction, theoretical background, the study data, analysis and discussion of the study data, and finally the conclusion. **Chapters II** and **III** provide the fundamental background information concerning the adopted theoretical approaches that form the basis of the study analysis. **Chapter IV** introduces the study dataset and the various sources that were used in their extraction. **Chapters V** and **VI** present two theoretical-analytic explorations of the study dataset and discuss their generalisations. **Chapter VII** concludes the study with the main theoretical considerations and recommendations for future research. More particularly, individual chapters are designed as follows:

The background of the adopted theoretical frameworks in the study is given in **Chapter II,** this starts with a general overview of the theories of loanword adaptation in Section 2.2. The first theoretical framework assumed in the analysis and interpretation of the phonological adaptation of English loanwords into UHA; the Theory of Constraints and Repair Strategies Loanword Model (TCRS-LM) proposed by Paradis and LaCharité (1997) is fully described in Section 2.2.1, while the other theoretical framework is Optimality Theory (Prince and Smolensky 1993), defined in Section 2.2.3. This is followed by subsections that are devoted to a discussion of how the two frameworks analyse the consonantal as well as syllabic adaptations by discussing related literature that used these frameworks in analysing loanword adaptation. Section 2.2.2 reviews some of the main related works in loanword adaptation following the TCRS-LM, starting with Ulrich's (1997) comprehensive analysis of the segmental and syllable structure of Lama[2] loanword adaptation. This is followed by the study of Brasington (1997), that focuses on the exploration of syllable structure adaptations, Rose's (1999) research that assesses the TCRS-LM's principles, Adler's (2006) positive judgments regarding the TCRS-LM analysis of the Hawaiian loanword adaptations and finally Stoltzfus (2014) recent proposal for the Too-Many-Solutions problem in this framework. Section 2.2.4 provides the relevant

[2] Lama is a Gur language spoken by the Lamba people in Togo, Benin, and by a few in Ghana.

research under the optimality-theoretic approach, firstly two studies concerned with the investigation of segmental adaptation, more explicitly Lee's (2003) study of Korean loanwords as well as Adler's (2006) analysis of Hawaiian loanwords. There are two further works on Arabic loanwords, namely the studies of Galal (2004), which analyse English loanwords into Cairene Arabic, and Jarrah's (2013) study on Madina Hijazi Arabic loanwords. Finally, a special study of on segmental epenthesis in loanword adaptations is provided (Uffmann 2014). Besides, a fundamental comparison between the two theoretical perspectives, the TCRS-LM and OT, is provided in Section 2.3. At the end, this chapter concludes with the main themes that frame the present study in Section 2.4.

After the clarification of the adopted theoretical frameworks in the previous chapter, it was necessary to describe the two languages concerned in the study, more specifically the UHA and English (**Chapter III)**. On balance, a brief introduction to UHA phonology in comparison with English phonology along with an overview of UHA is provided. The next section, the segmental inventories of UHA and English are given for comparison. The final section discusses syllable structure in both UHA and English. Finally, the chapter concludes with a summary domenstrating the key phonological contrasts between English and UHA.

With the clarification of the fundamental information concerning the study's theoretical background, **Chapter IV** presents the study dataset and describes the various sources that were used in obtaining them. The UHA loanword dataset is compiled from different published sources along with a data collection exercise (Section 4.2); the first two significant sources are Abdul-Rahim (2011), a dictionary of loanwords into Arabic, the other one is the data collected by Jarrah (2013) and lastly, the Oxford English Dictionary (OED) was used. Besides these published works, a data collection exercise was conducted involving UHA speakers. Details of this exercise and a description of the adapted procedure in obtaining the data are also provided in this section. After setting out the primary sources that were mainly used in the study dataset, Section 4.4 provides a descriptive and statistical analysis of the current work data. Clearly, the extracted data from these various sources signifies clear evidence indicating the existence of the phonological adaptations of English loanwords into UHA. By examining these phonological changes, two main adaptations are found, consonantal changes (Section 4.4.1) and syllabic adaptations (Section 4.4.2). In this chapter, it was possible to state several generalisations regarding English loanwords in UHA, before offering any theoretical analysis of these findings within the TCRS-LM and OT in the following chapter. Concerning the consonantal adaptations, the data indicates that various adaptations of English consonants are particularly attested for consonants that are absent in the UHA inventory (the bilabial /p/, the two affricates /ʤ/ and /ʧ/, the nasal /ŋ/ and lastly the labiodental /v/), such as voicing, devoicing, and substitution. A substantial observation has been discovered in the adaptation of English consonants that is the variant adaptation of the voiced English labiodental /v/ in the UHA loanword dataset and it is mainly lexical variation. Additionally, the UHA loanword dataset reveals the main illicit syllable structure and the attested phonological patterns in their adaptations. An onset-less syllable is found to be the first illicit syllabic sequence adapted by the epenthesis of the consonant (glottal stop word-initially, the glide /j/ intervocalically), followed by the onset clusters, which were adapted by the epenthesis of vowel and in special condition, the epenthesis of vowel and glottal stop in initial onset sC or sCC clusters. Lastly, Section 4.5 concludes this chapter with a summary highlighting the main points.

The first theoretical-analytic examination of the current study data is proposed in **Chapter V,** where the phonological adaptations of UHA loanword dataset are analysed within TCRS-LM. Section 5.2 is devoted to the analysis of the phonological adaptations of the UHA loanword data within this approach. Section 5.2.1 specifies the adopted phonological representation assumptions. Section 5.2.2 deals with the consonantal adaptations, whereas Section 5.2.3 is allocated to the analysis of the syllabic adaptations. A primary concern of this theoretical approach was whether it could be capable of accounting for all the discussed consonantal and syllabic adaptations of UHA loanwords similar to Paradis and LaCharité's (1997) initial analysis of French loanwords in Fula. In the current study, the TCRS-LM principles, to some extent, make correct predictions regarding the adaptation of consonantal constraints in most of the cases while in the syllabic one, it exhibits conflicting predictions (Section 5.3). This chapter concludes with the fact that the TCRS-LM is not a sufficient theoretical framework for suggesting the exact prediction regarding the consonantal as well as the syllabic adaptation in UHA loanwords. Furthermore, it is the Preservation and Threshold Principles, which fail to account for syllabic adaptations while for the consonantal ones it is the Minimality Principle. All these substantial claims are based on several pieces of evidence found in the analysis of UHA consonantal and syllabic adaptations. The first of these is the failure of this theoretical model in accounting for the preference in the variant adaptation of the English voiced labiodental /v/ attested in UHA indicating that weakening will be more favourable than other alterations (devoicing or strengthening). Hence it demands a few steps in the adaptation, to the further failure discovered in the analysis of syllabic adaptation, specifically the multiple strategies applied in the adaptation of sCC onset cluster demanding the epenthesis of the vowel as well as the glottal stop. This definitely exceeds the limit of the Threshold Principle and goes against the predictions of the TCRS-LM's principles. Subsequently, after discussing these significant findings and setting out main generalisations drawn from the phonological analysis of UHA loanword adaptation using TCRS-LM in line with the existing literature adopting the same theoretical approach, this chapter closes with a summary presented in Section 5.4.

Apparently, this study shows that the TCRS-LM analysis is unsatisfactory in accounting for UHA loanword adaptation. It proposes an alternative theoretical analysis under the Optimality Theory framework in **Chapter VI.** It begins with an outline of the considered Optimality Theory constraints that will be explicitly used in the analysis (Section 6.2). The optimality-theoretic analysis of the adaptation and importation of consonants is discussed in the subsections 6.2.1 and 6.2.2 correspondingly. The OT analysis of the syllabic adaptations that includes the discussion of the epenthesis of consonant and vowel and the quality of the epenthetic vowel is given in Section 6.2.3. Indeed, the OT account adequately analyses the consonantal and syllabic adaptation of English loanwords into UHA. With the use of certain markedness and faithfulness constraints along with their specific ranking sufficiently account for several phonological patterns attested in the UHA loanword dataset without any contradiction demands assuming specifically defined new constraints. This chapter has shown that it is possible to model different phonological patterns attested in the UHA loanword dataset under the OT perspective (Section 6.3). Within the general framework of OT, Prince and Smolensky (1993) propose a functional model of constraints' interaction (markedness and faithfulness) to account for different phonological patterns in UHA loanword adaptation. The relative ranking of these constraints with respect to each other generates different processes in order to expect the best output among different possible candidates, more precisely the optimal one. Furthermore, the suggested optimality-theoretic analysis accounts to some extent for the attested consonantal adaptations as well as the importations in the UHA loanword dataset. Under the OT approach, it can be possible to account for the epenthesis of segments (consonant and vowels) in onset-less syllables as well as onset clusters. Even the quality of the epenthetic vowel can be accounted for under this theoretical framework. On balance, these main findings obtained from the OT analysis of UHA loanword adaptation are further discussed with the existing literature findings adopting the same theoretical approach. At the end, this chapter concludes with a summary provided in Section 6.4.

The conclusion of the current study is provided in **Chapter VII** that summarises the main findings and sheds light on the most important theoretical issues regarding the adopted phonological models in the analysis of UHA loan phonology, and lastly proposes some recommendations for future research in the field. Section 7.2 provides a general summary of the study and highlights the main points. Section 7.3 points out the main theoretical issues concerning the adopted approaches in the analysis of English loanwords into UHA (TCRS-LM and OT) and evaluating the capability of the models in predicting the attested consonantal and syllabic adaptations in UHA loanwords. Section 7.4 presents some suggested recommendations for future research and concludes the study.

CHAPTER II

Loanword Phonology: Theoretical Background

2.1. Introduction

This study focuses on the phenomenon of language contact and change known as borrowing, more precisely, lexical borrowing (loanwords). It is necessary to shed light on the definition of loanword types and approaches before the analysis of the phonological adaptation of English loanwords into UHA. The main aim of this chapter is to provide a comprehensive discussion of the theoretical background regarding the phonology of loanword adaptation. At the beginning a general overview of the theories of loanword adaptation are discussed in Section 2.2. This starts with an introduction and a detailed description of the first theoretical framework adopted here; that is the Theory of Constraints and Repair Strategies Loanword Model (TCRS-LM) by Paradis and LaCharité (1997) provided in Section 2.2.1. A review of related works in loanword adaptation within the TCRS-LM (Ulrich 1997, Brasington 1997, Rose 1999, Adler 2006 and Stoltzfus 2014 among others) is presented in Section 2.2.2. The other theoretical framework is Optimality Theory (Prince and Smolensky 1993), which is defined in Section 2.2.3. This is followed by relevant research in this framework (Lee 2003, Galal 2004, Adler 2006, Jarrah 2013 and Uffmann 2014) in Section 2.2.4. Additionally, a comparison between the two theoretical perspectives, the TCRS-LM and OT, is provided in Section 2.3. Lastly, this chapter concludes with the main themes that frame the present study in Section 2.4.

2.2. Theories of Loanword Adaptation

The study of loanword adaptation and the integration between languages raises several theoretical issues that have grasped the attention of many researchers. One of these issues is the motivation of adapting loanwords and how the integration of the incoming form, to conform to the L2 system, is achieved. Unlike the traditional rule-based perspective that sets up rules for the adaptation, constraint-based frameworks, as in the Theory of Constraints and Repair Strategies (TCRS-LM), achieves the adaptation through the application of principles or constraints (Paradis and LaCharité 1997) or motivates it merely by constraint interaction as in Optimality Theory (OT) (Prince and Smolensky 1993). In fact, loanwords usually comprise segment or syllable patterns that violate the phonological constraints of the borrowing language in cases where the structure of the recipient language is more complex than that of the borrowing language. In the TCRS-LM, this violation of constraints can be solved by repair strategies that are subject to a set of principles (Paradis and LaCharité 1997). On the other hand, in Optimality Theory (OT) there is no need for these repair strategies in the adaptation of loanwords; instead the phonological adaptations are determined by the interaction between constraints deciding between possible outputs (Prince and Smolensky 1993). The present study examines two theoretical perspectives, the Theory of Constraint and Repair Strategies Loanword Model and Optimality Theory in analysing the phonological adaptation of English loanwords into Urban Hijazi Arabic (UHA). To do this, it is necessary to review aspects of both theoretical frameworks. This section is devoted to discussing a review of phonological theories of loanword adaptation (TCRS-LM and OT) as well as examining related literature that used these frameworks in analysing loanword adaptation.

2.2.1. TCRS Model of Loanword Adaptation

In 1997, Paradis and LaCharité analysed the segmental and syllabic adaptations of French loanwords in Fula using what they described as 'a formal constraint-based model', the Theory of Constraints and Repair Strategies (TCRS-LM) (Paradis and LaCharité 1997: 381). Paradis and LaCharité investigated five corpora of loanwords 11,348, consisting of French loanwords that integrated into Kinyarwanda, Fula[3] and Moroccan Arabic, and English loanwords into Quebec French where they examined 15,686 illicit segmental and syllable structures (1997). Paradis and LaCharité (1997: 394) propose what they call 'The model of loanword integration' where an acoustic signal is adopted as input; the model is presented in Figure 1:

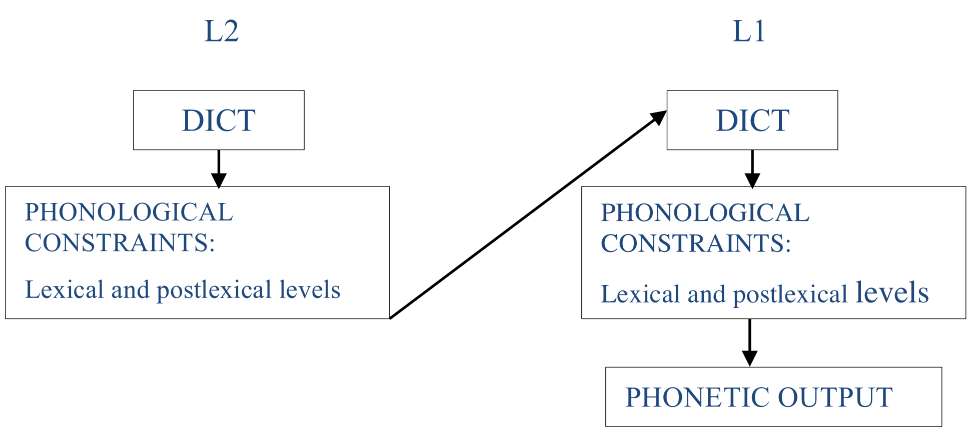

Figure 1: The model of loanword integration

In this model, it can be seen that 'the phonological output of L2 is directly incorporated into the L1 dictionary (DICT), the first input list to the lexicon' even if the phonological output might comprise malformations in L1's view (Paradis and LaCharité 1997: 394). More precisely, phonological output that might be permitted at the phonetic level, is excluded in the lexicon, which is fed by the DICT (Paradis and LaCharité 1997: 394). Paradis and

[3] Kinyarwanda and Fula are Niger-Congo languages, Kinyarwanda is spoken mainly in Rwanda whereas Fula in West Africa.

LaCharité (1997: 394) further explain that the lexical and postlexical levels of the L2 are integrated as it is not clearly identified whether it is the lexical or postlexical level that is incorporated into the restricted dictionary of L1 or whether it can vary from one language to another or even one loanword to another (Stoltzfus 2014: 22).

In the TCRS-LM, parameter settings are held to be responsible for the phonological system of any language (Paradis and LaCharité 1997: 387). In fact, Paradis and LaCharité (1997: 387) explained the two concepts or 'principles' as 'universal constraints' that all languages generally share, while 'parameter settings' deal with any contrasts that might be found between languages (Chomsky 1986). Hence Universal Grammar proposes these parameter settings, which can be seen as 'marked options' by the TCRS-LM. In this account, a language can reject these options by saying (no) if the given option becomes problematic, 'and thus a negative constraint in the language in question' (Paradis and LaCharité 1997: 387). Actually, in any language the segmental inventory can be considered 'as the direct result of positive and negative language-specific answers (settings) to segmental options offered by Universal Grammar (parameters)' (Paradis and LaCharité 1997: 387). In particular, the combination of features that characterizes one of these phonemes can be answered by (yes) in a language, while another language can answer (no), and eliminate the phoneme from its inventory. For instance, in Lama loanwords, the reason for which the English word *zink* is realized as *tôle* /sə́nkɪ̀/ rather than /zɪŋk/ in Lama is that Lama says (no) to the particular constellation of features that make up voiced obstruents on the phonological level. This is what is illustrated in the of the negstive parameter settings stated in (1) (Ulrich 1997: 418):

(1)

Voiced obstruents?	**French, English:** yes
([-sonorant,+voice])	**Lama:** no (negative constraint)

The TCRS-LM model of loanword adaptation considers the phonology of any language as comprising a number of universal and non-universal constraints, and in cases when the violation of these constraints are found, Repair Strategies must be applied, that are described as follows:

> **‘Repair Strategies:**
>
> ‘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’ (Paradis and LaCharité 1997: 384).

The violation of such constraints requires the application of a repair strategy in order to solve this violation involving only two phonological procedure, namely the inserting or the delinking of phonological materials in order to satisfy the violated constraint (Paradis and LaCharité 1997: 384). Moreover, the TCRS-LM indicates several sources for constraint violation that might be a result of morphological operations, ill-formedness or constraint conflicts. Thus, the violation of these constraints needs to be repaired as economically as possible according to the Minimality Principle:

> **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.’ (Paradis and LaCharité 1997: 386).

According to the Minimality Principle, the application of Repair Strategy must be at ‘the lowest phonological level’ that is controlled by the Phonological Level Hierarchy:

> **Phonological Level Hierarchy:**
>
> Metrical level > syllabic level > skeletal level > root node > feature with a dependent > feature without a dependent’ (Paradis and LaCharité 1997: 386).

The Phonological Level Hierarchy (PLH) is not only responsible for determining the 'lowest phonological level', but also the consequence of constraint conflict:

> **Precedence Convention:**
>
> In a situation involving two or more violated constraints, priority is given to that constraint referring to the highest phonological level of the PLH.' (1997: 386).

Another main principle of the TCRS-LM is the Preservation Principle that maintains the input and disfavours segment deletion.

> **Preservation Principle:**
>
> Segmental information is maximally preserved within the limits of the Threshold Principle.' (1997: 384).

However, the Preservation Principle is controlled by the Threshold Hypothesis/Principle:

> **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.' (1997: 385).

The concept 'constraint domain' is formally defined by Paradis (1996: 518 cited in Stoltzfus 2014) as 'a constraint domain represents the phonological scope of a constraint'. Based on the Threshold Principle, when the adaptation of a foreign segment needs three or more steps, deletion of this segment is definitely favoured. An outline of the TCRS-LM Loanword Model (taken from Paradis and LaCharité 1997: 387) is presented in (2):

(2)

TCRS:

Constraint Violation
↓
Repair
(Insertion /deletion)

Governed by the
• Preservation Principle (limited by the Threshold Principle)
• Minimality Principle (based on the PLH)
• Precedence Convention (based on the PLH)

Paradis and LaCharité, (1997: 387) distinguish between two concepts; prohibited segments 'that are systematically and immediately adapted or eliminated as soon as they are introduced into a language (for example, the English interdentals in French)' and tolerated ones 'that is, non-adaptations for example, English [ɹ] or [ɚ] in Quebec French'. The issue of tolerated segments that traditionally defined by Haugen (1950) as importation is further specified by Paradis and Lebel (1994: 87), as follow:

> 'On the one hand, how can we posit constraints, that is, negative parameter settings, against segments that are after all tolerated in several borrowings, sometimes for a very long time, if not forever, in the language? On the other hand, if there are no constraints against these tolerated segments, a) why are they nevertheless often adapted..., b) why are they absent in the native vocabulary, and c) why do they not form new words?' (Paradis and Lebel 1994: 87)

In order to account for the distinction between prohibited and tolerated segments within the TCRS-LM, Paradis and LaCharité (1997: 388) 'conceives the phonology of a language to be organized into domains' that are 'CORE and PERIPHERY' in which:

> 'The core contains all of a language's constraints; by and large, the core defines the phonology of a language and governs its vocabulary... The periphery contains a subset of a language's constraints, which means that items in the periphery are not subject to all the constraints that govern the core. That is to say, the parameter settings for some Universal Grammar options may be set to 'yes' rather than 'no' in the periphery – or some domains of the periphery – which effectively deactivates those particular constraints' (Paradis and LaCharité 1997: 388)

In fact, the difference between core and periphery is not newly discovered by the TCRS-

LM, as it was earlier proposed by Chomsky (1986). Moreover, Paradis and LaCharité (1997: 389) further subdivided ‘the periphery itself into domains’ in order to capture ‘the different strengths of constraints’, where the ‘decreasing strength of a constraint is reflected in diminishing likelihood of adaptation’ with respect to ‘particular ill-formed structures in loanwords’. Essentially, there are seven criteria indicated by Paradis and LaCharité (1997 cited in Stoltzfus 2014) in order to determine the peripheral phonemes given below:

‘A peripheral phoneme is a phoneme that:

a) Is not limited to the nominal catogry
b) Is not used to form new words
c) Is lexically less frequent than the most of the other phonemes
d) Often alternates with another phoneme considered as being less marked from the point of view of the core or central nucleus of the language
e) Is often limited to certain words or to certain specific positions in the syllable
f) Is often contained in a word that does not undergo all the regular phonological processes
g) Often appears together with other phonemes that also possess that characteristics that have just been listed’. (1997 cited in Stoltzfus 2014: 35)

Generally, the TCRS-LM supports several concepts as stated by Paradis and LaCharité (1997: 396):

- ‘The lexicon is an abstract space constituted of a core and a periphery.
- The periphery is the domain where some constraints of the core are eliminated or weakened, that is, their scope becomes more limited.
- The periphery plays a crucial role in loanword phonology in accounting for segment non-adaptation.
- Loanwords are introduced by bilinguals, through code-switches, nonces and idiosyncrasies.

- Nonces and idiosyncrasies (by contrast with code-switches) are adapted by bilinguals to comply with at least the outermost peripheral constraints of L1.
- Peripheral segments can be adapted by monolinguals, but they are very often adapted by bilinguals, especially when they talk to monolinguals who resist or look down on new borrowings.
- The L2 output is incorporated into the L1 DICT.
- The input to the L1 DICT contains the distinctive feature combinations of L2 but no redundant information from the point of view of L1, unless there are already well established L2 distinctive segments in the periphery of the L1 speakers, and this redundant information is identified as highly characteristic of L2, and thus prestigious in the view of the borrowing language.' (1997: 396).

Furthermore, Paradis and LaCharité (1997) adopt two essential assumptions in the TCRS-LM, the first one is assuming that the phonological representation is underspecified in which the underlying form can be incomplete. The second one is that Paradis and LaCharité (1997: 403), and later Ulrich (1997) assume radical underspecification (Archangeli 1984) where only marked features are represented in the underlying form. The radical underspecification assumptions are of special concern when it comes to minimality in deciding the best repair strategy among other alternatives. More details about the adopted feature geometry model and the radical underspecification assumptions are provided in **Chapter V**.

2.2.2. Loanword Adaptations within the TCRS Model

Few studies in loanword adaptations test the TCRS-LM proposed by Paradis and LaCharité (1997). Among these studies is the work of Ulrich (1997) that analyses loanword adaptation in Lama, followed by the studies by Brasington (1997), Rose (1999), Adler (2006) and more recently Stoltzfus (2014). Particular consideration is given to these studies as they contribute to the current study in many ways. Ulrich's (1997) comprehensive analysis of segmental and syllable structure, where the TCRS-LM principle is applied, shows clearly how the principles of TCRS-LM work together. The study by Brasington (1997) focuses on the investigation of syllable structure alterations, namely epenthesis and deletion, with a particular discussion of the Threshold Principle. Rose's (1999) research criticises the Threshold Principle, and Adler's (2006) study concluded with the fact that the TCRS-LM makes correct predictions of most of the loanword adaptations. Finally, Stoltzfus (2014) proposed the Too-Many-Solutions problem in this framework. The present study is concerned with investigating the segmental alterations and the syllable structures; analysis of any other phonological changes is ignored.

2.2.2.1. Lama loanwords (Ulrich 1997)

Ulrich's (1997) study is one of the earliest works on the TCRS-LM model, investigating Lama loanwords. The study tests this model in the analysis of 614 loanwords in one of the Lama dialects (Kante'); the majority of the data were integrated from French or English whereas the rest are from Hausa, Ewe and Yoruba. The data were obtained from two sources, Brinneman and Brinneman's (1995) dictionary and Brinneman's (1993) list of proper nouns in the New Testament. Ulrich (1997) considers the intermediate language that interferes in the adaptation process between the recipient and the source language as the source language in the cases where an intermediate language was found. Concerning the Lama phonology, There are three main aspects in Lama's that are related to the adaptation of loanwords, firstly there are no laryngeal contrasts in the Lama consonants as all soronants are voiced and all obstruents are voiceless. Secondly, it lacks the palatal fricative /ʃ/ and the front rounded glide /ɥ/. Lastly trhe maximal syllable of Lama is CVːC, Lama does not allow onset clusters and diphthongs. The study by Ulrich (1997) discusses the segmental and syllabic adaptations of loanwords in Lama. In the segmental adaptations, the ill-formed segments were voiced obstruents, palatal fricatives and front rounded glides. According to Ulrich (1997), the TCRS-LM predicts precisely 94% of the ill-formed segments and fails to predict 5% (1% is for deletion cases). Indeed, the Preservation Principle favours adaptations over deletion, whereas the Minimality Principle predicts the repair strategy of the ill-formed segments. Details of Ulrich's (1997) data are presented in

Table 1.

	Constraints violated	Adaptations		Deletions	Total of all adaptations
		Predicted	Other		
b	voiced obstruents	p 94 (97%)	kp 2 (2%)	1 (1%)	97 (100%)
d	voiced obstruents	t 66 (80%)	ɖ 12 (15%) r 2 (2%)	2 (2%) 0	82 (100%)
ð	voiced obstruents	t 1 (100%)	0	0	1 (100%)
ʤ	voiced obstruents	c 5 (100%)	0	0	5 (100%)
g	voiced obstruents	k 38 (100%)	0	0	38 (100%)
v	voiced obstruents	f 27 (96%)	p 1 (4%)	0	28 (100%)
z	voiced obstruents	s 59 (100%)	0	0	59 (100%)
ʒ	voiced obstruents palatal fricatives	s 46 (98%) c 1 (2%)	0	0 0	47 (100%)
ʃ	palatal fricatives	s 16 (100%)	0	0	16 (100%)
ɥ	front rounded	u 2 (50%) i̯ 1 (25%)	0	1 (25%)	4 (100%)
Total of all illicit segments		356 (94%)	17 (5%)	4 (1%)	377 (100%)

Table 1: Adaptation of problematic segments in Lama loanwords (Ulrich 1997: 427)

According to Ulrich (1997: 427), this table shows for each illicit segment (given in the left-handed column), the column labelled 'Adaptations: Predicted' provides the adaptation predicted by the TCRS-LM, along with the number of cases bearing out that prediction. The column labelled 'Adaptations: Other' lists attested adaptations not predicted by the TCRS-LM. The presentage of tokens of a given ill-formed segment revealing the predicted adaptation, other adaptations, or deletion is given in parentheses. The column labelled 'Total of adaptations' provides the total number of tokens of each ill-formed segment. The row labelled 'Total of illicit segments' shows the total number and percentage of tokens revealing predicted adaptations, other adaptations, and deletions.

Ulrich (1997: 424) indicates that the voiced obstruents such as /b/, /d/, /g/, /v/, /z/ and /ʒ/ in Lama loanwords are either 'devoiced or weakened to sonorants' and this repair strategy is predicted by the Minimality Principle; hence, this principle indicates that problematic segments should be repaired involving as few steps as possible (Paradis and LaCharité 1997: 386). For instance, the problematic segment /b/ is repaired either by deleting of [+voice] feature and becoming /p/ or by deleting of [-sonorant], though in the data, the preferred strategy is devoicing, that attested in 94% of the cases, whereas in the remaining cases (which is 4%), the voiced obstruents are either adapted into retroflex (/d/ >/ɖ/), or other adaptation (/d/ > /r/ or /b/ > /kp/), or deletion (Ulrich 1997: 424). The other segmental constraint violation is exhibited by the palatal fricatives (/ʃ/ and /ʒ/) which can be adapted by deletion either of [+continuant] or [-anterior], resulting in /c/ or /s/ respectively. Ulrich (1997: 425) indicates that neither principle, the Preservation Principle nor the Minimality Principle, favours one repair strategy over the other, and the choice is left to 'the social convention'. Indeed, the preferred choice is the /ʃ/ > /s/ and /ʒ/ > /s/ which are found in most of the cases, with one irregular adaptation of /ʒ/ > /c/ attested in one case. The final segmental constraint discussed by Ulrich (1997: 426) is the adaptation of front rounded glides. Ulrich (1997: 426) states that 'the Minimality Principle makes no prediction about which articulator node will be deleted since they equally ranked on the PLH' though, this segmental constraint is repaired by delinking [labial] or [coronal], resulting in either front unrounded or back rounded segments which are both attested in the data. Ulrich's (1997: 427) study gives evidence of how the TCRS-LM makes correct predictions in 94% of cases, while it fails to predict the repairs in 17 of the cases of adaptation (5%) (see Table 1). The Preservation Principle favours adaptation of problematic segments over deletion (as the deletion cases are few when compared to the adaptation ones).

For the syllabic adaptations, the ill-formed syllable structures were branching onsets, branching codas, palatal codas and obstruent codas. Table 2 shows the various repair strategies found in Lama loanwords in the adaptation of illicit onsets and codas:

	Total of all illicit onsets		**Total of all illicit codas**	
	N	**%**	**N**	**%**
Epenthesis	89	63	318	96
Deletion	14	10	6	2
Other strategies	38	27	5	2
Non-adaptation	1	1	1	1
Total of all adaptations	142	100	332	100

Table 2: Adaptation of illicit onsets and codas in Lama loanwords (Ulrich 1997: 430-433)

In fact, it clearly indicates that the rate of epenthesis is higher in contrast to deletion cases and this is basically supported by the Preservation Principle. Indeed, Ulrich's (1997) corpus comprises 474 violations of syllabic constraints, which are classified into four distributions, branching onsets, branching codas, palatal codas and obstruent codas. The first syllabic constraint is branching onset; as onset clusters are prohibited in Lama, the repair strategy suggested for this violation is determined by the Phonological Level Hierarchy where repair is applied at the lowest phonological level, which is the skeletal level as predicted by the Minimality Principle (Ulrich 1997). This violation can be repaired either by deletion of a consonant or epenthesis of a vowel; the latter is particularly favoured by the Preservation Principle though both strategies are found in Lama loanwords. Vowel epenthesis is applied when the cluster comprises either obstruents or nasals, liquids (/r/ or /l/ or the back glide /w/), or front glides; though when the second consonant is found to be a front glide, the applied strategy is vocalisation. Metathesis is found in clusters where the second consonant is /r/. Additionally, there are two more strategies for this violation, 'vocalisation of glides and metathesis of /r/', along with one non-adaptation case, and the schwa is attested as the epenthetic vowel (93%) (Ulrich 1997: 428). The deletion of the second consonant, which is found in 10% of cases, applied only if this consonant is a liquid or glide. The second syllabic constraint is branching codas; Lama disallows consonant clusters in codas. Similarly, the predicted strategy for this violation should be applied at the skeletal level according to the Minimality Principle. The epenthesis of a vowel, found in 96% of cases, occurred after any obstruents and between two sonorants, though two vowels are inserted between two obstruents (Ulrich 1997: 431).

The other syllabic constraint violation is palatal codas, more specifically the palatal nasal /n/ and the palatal glide /y/ that indicate the [-anterior] feature. Here the violation is repaired at this level as predicted by the Minimality Principle (deletion of the feature) while this strategy is unpredicted according to the Preservation Principle; hence, it prevents the change of 'segmental information' (Ulrich 1997: 431). In this regard, the favoured strategy is epenthesis, which is found in palatal obstruents and nasal clusters. On the other hand, palatal glides have variation in adaptation as they are repaired by epenthesis, deletion or even remain the same in some cases (non-adaptation). The final syllabic constraint is obstruent codas; here the repair occurs on the feature, namely [-sonorant]. The predicted strategy for this violation is deletion of the feature [-sonorant] based on the Minimality Principle (weakening), whereas this is not preferred by the Preservation Principle; indeed, epenthesis of the vowel is more likely to be accepted. In the data, the vowel is epenthesised after the obstruent resulting in re-syllabification, while the repair strategies such as deletion, back-formation or metathesis are attested in other cases. Ulrich (1997: 460) concludes with the fact that the principles of the TCRS-LM do not specifically suggest one favoured strategy, but rather ‘two equally-valued strategies’, and that is:

> ‘Repair strategies are not entirely predictable from (universal and language-specific) constraints on representations. Rather, there must be a language-specific component of the grammar that selects repair strategies from those that satisfy universal principles’ (Ulrich 1997: 460)

According to Ulrich (1997: 460), the Preservation Principle in fact makes correct predictions regarding the infrequent cases of deletion in Lama loanwords, though the Threshold Principle doesn’t clearly predict the cases where deletion is attested. While the Threshold Principle indicates that the deletion of a segment is found if and only if the adaptation needs three or more steps, in the case of Lama loanwords, Ulrich (1997: 456) finds that in cases that require three steps to be repaired, the adaptation is applied with no deletion of segments. On the other hand, in cases that don’t need three steps to be repaired, deletion is applied. For instance, Ulrich (1997: 456) indicates that the deletion cases (20 cases) are not determined by the Threshold Principle in the Lama loanword corpus. Deletion occurs in four cases that need vocalisation (not even a step)[4], and eight cases which demand only one step (typically epenthesis of vowel), four cases that require three or more steps and finally two cases in which the deletion prevents the word from needing the

[4] According to Ulrich (1997: 456), since French syllable structure is not carried into Lama, the high vocoids as in ‘attention’ /atɑ̃sjɔ̃/ > /ȁtȁsô/ might be simply syllabifed as nuclei, avoiding any need for adaptation of the onset. In such cases, deletion actually adds a step: a. attested: sj>s (deletion), b. unattested: sj>si̩ (vocalization), c. unattested: sj> sə̩j (epenthesis).

additional step, that is the deletion of the /b/ instead of adaptation with two repair strategies, namely epenthesis and devoicing. Indeed, even in the final situation when the deletion is applied, the constraint could possibly be repaired with two steps (not three or more) (Ulrich 1997: 456).

In fact, Ulrich (1997: 460) finds that the Threshold Principle has no impact on Lama loanwords. Concerning the Minimality Principle, Ulrich (1997: 460) finds that although this principle appropriately predicts most of the cases regarding the adaptation of the illicit segments, it 'fails to identify a unique repair for any of the segmental constraints'. For instance, the adaptation of front rounded vocoids is applied by backing or unrounding, both strategies are in fact found in Lama loanwords. In this account Ulrich (1997: 460) states that 'the non-unique predictions of the TCRS-LM are actually the correct predictions: predicting a unique repair for violations of any of these constraints would fail to handle the cross-linguistic data'. So, the TCRS-LM correctly accounts for variations which is an important point. Ulrich (1997: 459) also indicates situations in which the two principles of the TCRS-LM, the Preservation Principle and the Minimality Principle, conflict and these cases are violation of the constraint that involves segmental feature and syllabic structure. Ulrich (1997: 460) further explains that the Preservation Principle prefers a repair strategy applied at the syllabic level, that is segment epenthesis (schwa), while the Minimality Principle tends to select a repair strategy at the segmental feature; for instance, fronting of palatal codas. In this regard, Ulrich (1997: 460) states that 'languages are free to choose between an adaptation favoured by the Minimality Principle and an adaptation favoured by the Preservation Principle when no single adaptation is favoured by both principles'. Finally, Ulrich (1997: 460) agrees with the claim of Paradis and LaCharité (1997:394) regarding loanword data, in which 'the form in which loanwords are stored in the dictionary of the borrowing language is equivalent to the output of the phonology of the source language, even when that includes segments that are ill-formed in the borrowing language' as Lama loanwords support this claim.

2.2.2.2. English loanwords in Marshallese (Brasington 1997)

Brasington (1997: 1) investigates English loanwords into Marshallese[5] within the TCRS-LM framework in which he indicates that 'structure preservation[6] is subject only to a cost threshold principle'. Another aspect is that his work provides suggestions for the TCRS-LM, more precisely, the Threshold Principle, within the framework of Optimality Theory. Brasington (1997: 5) strongly supports Paradis and LaCharité (1997) in their claim regarding the Threshold Principle that segment epenthesis is only applied 'when the cost of an epenthetic solution exceeds the Threshold Principle limit'. Another issue that Brasington (1997: 4) finds more complicated is how to determine 'the notion step in a repair strategy'. Building on his earlier work (1981), Brasington (1997: 1) analyses the epenthesis and deletion of English loanwords into Marshallese based on data consisting of 758 loanwords extracted from Abo et al. (1976 Marshallese - English Dictionary). The study by Brasington (1997) concentrates on examining illicit syllabic patterns; Marshallese prohibits consonant clusters initially or finally, so that only one consonant is allowed in onset or coda. Based on the data of his study, Brasington (1997) finds that an initial consonant cluster is largely adapted by epenthesis, whereas for final clusters, the deletion of the segment is more favoured[7]. Table 3 shows the initial and final cases of consonant clusters along with epenthesis and deletion cases taken from Brasington (1997: 3):

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[5] Marshallese is the spoken language in the Marshall Islands, which has been largely influenced by German, English and Japanese (Brasington 1981: 2)

6 According to Brasington (1997), structure preservation is the required step in repairing illicit syllable structure, more precisely the consonant clusters.

[7] Brasington (1997: 6) indicates that that in final positions, the deletion occurred 'for nasal + non sibilant obstruent groups, the figures are: deletion 33, epenthesis 3, but for lateral + obstruent types the modifications are: deletion 3, epenthesis 3', in which 'loans containing final clusters of nasal and homorganic stop'.

	Epenthesis	Deletion	Total
Initial Position	101	5	106
Final Position	12	56	68
Total	113	61	174

Table 3: Adaptation of illicit initial and final clusters in Marshallese loanwords (Brasington (1997: 3)

In Table 3, the preferred adaptation is deletion for repairing final clusters in Marshallese loanwords, even for the 'post-nasal plain homorganic stops' clusters following the Threshold Principle (Brasington 1997: 8). Brasington (1997: 8) further explains that the constraint violation in the final cluster in the English '*pump'* > [bam] can be simply repaired by epenthesis according to the Preservation Principle. However, it was repaired by deletion and the reason for such a preference is the difference between the Marshallese /b/ and the English /p/ so that such segmental differences require more steps to be repaired which definitely exceeds the cost, implying that the type of cluster is found to have a strong influence in selecting the preference strategy (epenthesis vs. deletion) rather than to see the cost of any other strategies required Brasington (1997: 8). In this regard, Brasington (1997: 8) gives an example of 'the particularly high vulnerability of voiced stops in this position' as in English (*bomb/bombardier*) and (*long/longer*). Brasington (1997: 6) indicates that adaptation strategy, whether epenthesis or deletion, is strongly determined by the position of segments along with the types of consonants in clusters, as for the Marshallese loanword clusters. Brasington (1997) indicates that the Preservation Principle prevents segment deletion even if these cases are more favoured when they occurred in some positions. In this regard, he notes the need for restriction in the application of the Preservation Principle. To do so, Brasington (1997) further suggests an additional principle for the TCRS-LM, called Benefit Threshold Principle, which in fact works with the original (cost) Threshold Principle in order to limit structure preservation. In this way, segment deletion will be freely chosen 'either when costs exceed the cost threshold or when benefits drop below the benefit threshold', and this can be illustrated as follows (Brasington 1997: 14):

> ‘Preserve information unless:
>
> (a) The cost is high (Cost Threshold Principle)
>
> (b) The benefit is low (Benefit Threshold Principle)’ (Brasington 1997: 14).

Concerning the benefit, Brasington (1997: 14) raises the following question:

> ‘Whether it will be possible to devise a measure of benefit, which takes into account the contribution of both segmental features and structural position, and which at the same time allows the specific degree of benefit to be as simply computed as cost is in the current model is an open question’.

2.2.2.3. French loanwords in Fula and Kinyarwanda (Rose 1999)

Rose (1999) investigates French loanwords that are integrated into Fula and Kinyarwanda. For the analysis, he uses the data that have been previously analysed for the two Fula sources, Lebel (1994) and Paradis and LaCharité (1997) whereas the Kinyarwanda data is from Rose (1995). In these corpora, Rose (1999: 362) investigates the deletion of the root node in rising diphthongs and nasal vowels; he concentrates on analysing the consonant-glide-vowel (CGV) structures[8]. Rose’s (1999: 362) study proposed what he describes as a ‘universalist view under which the input is represented according to the default options offered by Universal Grammar (UG)’ that is defined on typological settings. Rose’s (1999: 362, 391) view on the preservation and deletion that occurs on the root node in the adaptation of loanwords is that the input root nodes are preserved if they ‘host their own

[8] The consonant-glide-vowel (CGV) sequences, which are allowed in French, are prohibited in both of the borrowing languages. These contrasts between French, Fula, and Kinyarwanda are expressed in the following (Rose, 1999: 367): Syllabic constraint: CGV sequences French: yes
Fula: NO (*σ[CGV)
Kinyarwanda: NO

timing units' and they are deleted if they 'share a unique timing unit'. Rose's (1999: 362, 391) proposal and argument against perceptual salience are not of concern here, only his analysis of Paradis and LaCharité's (1997) data; more particularly segment deletion resulting from the Threshold Principle and the argument against this principle is considered.

Additionally, Rose (1999: 400) examines the analysis of Paradis and LaCharité (1997) regarding CL clusters when they occur word-initially, where they violate the syllabic constraint (branching onsets). Within the TCRS-LM, this violation can be repaired either by epenthesis of the vowel or deletion of one consonant, though the epenthesis is favoured by the Preservation Principle and it attested in loanword data. Rose (1999: 400) agrees with Paradis and LaCharité's (1997) analysis of the adaptation of initial consonant clusters that are repaired firstly by the epenthesis of a nucleus between the clusters in which they consider the epenthesis of 'a timing unit and of the syllabic constituent that dominates it as a single step', and then a vowel is spread in order to fill the nucleus. This way the violation of the constraints (branching onset) is repaired without any change of 'phonological information'. This adaptation needs just two steps, and there is no need to apply the Threshold Principle.

Conversely, Rose (1999: 400) indicates that in the deletion of segments the Threshold Principle is needed in cases where adaptation involves more than two steps, following Paradis and LaCharité (1997). This can be explained in the violation of the constraint Labial-Coronal in Fula[9], based on the analysis of Paradis and LaCharité (1997). When there

[9] The features Labial and Coronal are contrastive in Fula and Kinyarwanda as neither of the two languages combines these features in their native vowel inventory. Indeed, the French Labial-Coronal has to be adapted in Fula and Kinyarwanda since French and Fula project the feature [ATR] in their representations, this feature is not part of the Fula phonological system (Rose 1999: 366). This negative setting will have a direct consequence on French loanwords containing these segments adapted by Fula. This distinction can be formalized as follows (Rose 1999: 366):
The segmental constraint: Labial-Coronal French: yes
Fula: NO (e.g., *ɥ, *y *∅, *æ)

is violation of two constraints the Labial-Coronal and branching onsets, the adaptation here requires more than two steps, which is too costly for the Threshold Principle. Therefore, deletion of these segments is applied even if it is against the Preservation Principle; for instance, 'biscuit' [bisk<u>ɥi</u>] > [bisk<u>i</u>] in Fula (Rose (1999: 402). Similar to Ulrich (1997), Rose (1999) notes some considerations against the Threshold Principle that favours the deletion of complicated phonological patterns rather than preservation in the adaptation of loanwords according to Paradis and LaCharité (1997). One of Rose's (1999: 402) criticisms against the Threshold Principle is that this principle indicates that before applying any repair strategies, structure should be evaluated first, to determine the selection of adaptation or deletion. It also refers to the fact that the counting of steps is involved in the adaptation before determining the adequate repair strategy. Rose (1999: 402) questions such a process; the possibility of using such an 'abstract evaluation' in deciding on the preferred strategy within a derivational perspective. The other issue regarding the Threshold Principle, is that it indicates that 'phonology is a component of the grammar that is able to count' whereas the choice between segment preservation and deletion depends on 'the sum of the derivational steps involved in a given adaptation' (1999: 402). In this regard, Rose states:

> 'In a derivational approach to phonology, it is logical to expect that inputs containing malformations at both the segmental and syllabic levels require a great number of steps to be adapted. However, this does not entail that the number of steps involved is really the *cause* of the segmental deletions observed' Rose (1999: 402)

This implies that for Paradis and LaCharité (1997: 385) the counting in linguistic theory is essential, that language does count 'syllables, moræ, metrical feet and so on', though in fact Rose (1999: 402) disagrees with this view regarding counting. Rose (1999: 403) indicates that there might be a difficulty regarding the identification of steps required in the adaptation of loanwords when other theories are adopted. For instance, the insertion of glides between two vowels needs two steps according to the Skeletal Theory, whereas in the Moraic Theory only one step is required. Rose (1999: 403) inquires if there might be a distinction between various derivational steps, in which for instance the insertion of a timing unit can reasonably correspond to feature epenthesis or deletion, as Paradis and LaCharité (1997) treat all the steps equally, and even segmental versus syllabic procedures are considered comparable. Moreover, Rose (1999: 403) argues for the rationale of considering some procedures as a step to be counted in the evaluation, such as the epenthesis of syllabic constituents as opposed to the epenthesis of a segment. Rose (1999: 404) further observes that all segment deletions that have been formally analysed by Paradis and LaCharité (1997) are attested in 'contexts where a melodically ill-formed segment appears in an unsyllabifiable sequence'. In fact, the Threshold Principle ignores the connection between 'segmental and higher prosodic structure' and the distinction between for instance, 'insertion of segmental features versus insertion of syllabic constituents' is neglected in the counting procedure. Rose (1999: 404) concludes with the fact that the Threshold Principle, as a principle that is responsible for the deletion of segments in loanword adaptation, should be ruled out from the TCRS-LM.

2.2.2.4. English loanwords in Hawaiian (Adler 2006)

Adler (2006: 1024) investigates the on-line adaptations that English loanwords undergo when taken into the Hawaiian language. The study relies on data that were obtained firstly from Pukui and Elbert's (1979) Hawaiian – English dictionary, in which only loanwords that comprise related prohibited segments are included (the coronal stops and fricatives) In this account, Adler (2006: 1026) indicates that it is not sufficient to depend on the extracted data from a dictionary, so he shows a list of 200 English loanwords to two English–Hawaiian bilingual speakers and asks the two subjects to imitate the Hawaiian pronunciation when they produce the English word in a Hawaiian sentence. Adler (2006: 1026) states that the results show that one subject's pronunciation of the English word list is closer to the Hawaiian language than the other, she decides to concentrate on this subject's data in the analysis though she finds that the only difference between the obtained data from the subjects and the dictionary is the adaptation of strident fricatives.

Adler (2006: 1024) adopts three loanword approaches in the analysis of the extracted data, which are the P-map approach (Steriade 2009), the Perceptual Assimilation Model (PAM) (Best 1994, 1995) and the TCRS-LM (Paradis 1988); the last analysis is of concern here. Adler (2006: 1033) indicates that the analysis of the phonological adaptation of loanwords within the TCRS-LM framework depends on feature geometry. Additionally, the prediction of some of the outputs is more likely equivalent in the TCRS-LM and the perceptual perspective, whereas in other cases the TCRS-LM tends to fail in predicting the attested cases (Adler 2006: 1033). The Hawaiian language has no coronal stop /t/ and /d/, the coronal and [-sonorant] is violated as the two sonorants /n/ and /l/ are the only coronal consonants. Following the Minimality Principle, this violation should be repaired at the segmental level, the coronal feature could be changed into either dorsal or labial, and hence the two nodes are comparable according to feature geometry (Adler 2006: 1038). The change of coronal into dorsal is more preferred than into labial, as the coronal and dorsal are supposed to be 'dependents of a lingual node in the feature tree', so applying this repair is minimal (Adler 2006: 1038).

Conversely, the TCRS-LM fails to predict the adaptation of fricatives in the Hawaiian language. The violation of the constraint [+continuant] and [-sonorant] is repaired[10] by the modification of the feature of [continuant], which is found in the adaptation of /f/ >/p/, though this is not the only repair for /f/ as it changes into /h/ (Adler 2006: 1039). In fact, this 'debuccalisation' is complicated to account for according to the TCRS-LM, as it requires 'loss of featural content (delinking the whole Oral node)' and it is definitely disfavoured by the Preservation Principle as it involves 'large loss in segmental information' (Adler 2006: 1040). Additionally, Adler (2006: 1040) observes that the change of the [continuant] feature can not be applied in the adaptation of the strident fricative /s/, as the Hawaiian language lacks (oral) coronal stops; indeed, the potential repairs for this segment are presented in Table 4:

[10] According to Adler (2006), the constraint here is related to the TCRS-LM rather than OT.

s → p	s → k	s → n	s → l	s → h
Delink: 1. +strident 2. +continuant 3. Coronal Insert 4. Labial	Delink: 1. +strident 2. +continuant 3. Coronal Insert 4. Dorsal	Delink: 1. +strident 2. +continuant Insert 3. +sonorant 4. +nasal (5. +voice)	Delink: 1. +strident Insert 2. +sonorant 3. +lateral (4. +voice)	Delink: 1. Oral node 2. +strident 3. +consonantal Insert 4. +sonorant

Table 4: The TCRS Predicted adaptation of /s/ (Adler 2006: 1040)

In this account, Adler (2006: 1040) further argues with Paradis (1988) regarding the change into /k/ or /p/ ‘for treating [+sonorant], [+nasal], and [+strident] as on a par with terminal features such as [voice] and [place] because they are non-branching’ in which they are comparable with any terminal feature in any modification required. Based on this, the change /s/ > /l/ is predicted and this strategy is even favoured by the Preservation Principle, though adaptation is not attested in the data. Furthermore, the change /s/ > /h/ is not predicted as explained earlier (Adler 2006: 1041). Adler (2006: 1040) concludes with the fact that the TCRS-LM fail to make correct predictions regarding the adaptation of /s/ in Hawaiian loanwords. In the TCRS-LM, Adler (2006: 1042) indicates that the Preservation Principle requires keeping segments though this is difficult in some cases ‘when a syllabic and segmental violation occur in a single cluster’, as Paradis calls it ‘double malformation’. In such cases, the repair strategy is determined following the Threshold Principle, which is attested in the Hawaiian data as it is repaired by deletion (Adler 2006: 1042).

In the end, Adler (2006: 1044) concludes with the fact that ‘the position of a segment in a string can influence its adaptation’, that segments occurring in ‘a coda or cluster in the input were not always retained’. Unlike Ulrich (1997) and Rose (1999), Adler (2006: 1044) supports the Threshold Principle in which it ‘predicts that segments requiring too many repairs (by some language-specific metric) will not be retained’. Furthermore, Adler (2006: 1044) indicates that the TCRS-LM principles fail to choose ‘the attested segmental adaptations’ which is found in the Hawaiian data.

2.2.2.5. The Project CoPho loanwords (Stoltzfus 2014)

Stoltzfus (2014) is one of the most recent works on the TCRS-LM concentrating specifically on the consonantal adaptations of loanwords. The main aim of his research is to indicate the possible minimal adaptations in dealing with illicit consonants, besides verifying the most preferred repair strategies among other alternatives at the featural level. The main criticism that Stoltzfus (2014: 10) finds in the TCRS-LM is that 'more than one minimal adaptation possible for a given problematic phoneme according to the minimality principle'. According to Stoltzfus (2014: 10), An example for such problem is that the illicit French consonant /p/ in Moroccan Arabic might 'be minimally adapted into at least two phonemes, /b/ or /f/, both of which occur in Moroccan Arabic'. Stoltzfus (2014: 10) further implies research within the TCRS-LM might often 'invoke cultural or sociolinguistic reasons in order to explain the choice of one adaptation over another when more than one possibility is minimal'. In this regard, Stoltzfus (2014: 10) further states that:

> 'Paradis and LaCharité (1997) speculate that certain minimal adaptations that are chosen over other available minimal adaptations could derive from the Preservation Principle, a principle that if applied at the featural level, may suggest we should expect a repair that inserts new material rather than a strategy that results in the loss of phonological information' (Stoltzfus 2014: 10)

Paradis and LaCharité (1997: 404-405) propose this explanation in order to explain the adaptation (/v/ > /w/) demanding [+sonorant] insertion, as opposed to (/v/ > /b/) delinking of [+continuant] or (/v/ > /f/) delinking of [+voice] (Stoltzfus 2014: 11). On balance, Stoltzfus (2014: 11) further indicates that:

> 'Despite the lack of precision present in TC in precisely predicting the choice of adaptation strategy when it comes to features, the present ability of the TC framework to eliminate most unlikely adaptation strategies currently does a much better job at dealing with the Too-Many-Solutions problem than does the OT framework, the framework adopted by Steriade and Miao' (Stoltzfus 2014: 11)

Building on Miao (2005) and Steriade's (2009) previous observations, Stoltzfus's (2014) research attempt to assert the resistance of manner features to change in contrast to non-manner features in the adaptation of consonants. Another important issue regarding Stoltzfus's (2014: 211) research is proposing that 'phonological adaptation moves towards the less marked and markedness factors play a role in importation rates'. The data of Stoltzfus (2014: 211) comprise 3,200 consonantal adaptations along with 2,815 importation cases with an overall of 6,015 cases that was extracted from Project CoPho along Ulrich's (1997) data of Lama loanwords and Leslau's (1997) data of Afar[11]. The findings of Stoltzfus's (2014: 211) study indicate that 'in loanword adaptation manner features are no more resilient to change than others' as it 'quite often delinked in order to repair a problematic consonant'. Indeed, 'manner features were found to be delinked in 50% (1,584/3,167) of all adaptation cases' as it 'was targeted over [±anterior] in 58% (278/482) of cases' while the adaptation of interdentals in 98.9% (185/187) (2014: 211). It has been seen that the principal of consonantal adaptation 'targeted [±continuant] over [±voice] for 44.4% of L2C where both adaptation options were available'(2014: 227). Essentially, Stoltzfus (2014: 211) further states that his findings are contrary to Miao's (2005) claim regarding the resistance of manner features to change during loanword adaptation in contrast to non-manner features such as place and laryngeal features. On the other hand, Stoltzfus (2014: 212) concludes with the fact that 'marked features had a strong tendency to be delinked' instead of manner features in which the delinking of 'a marked feature accounts for 87.5%' of the consonantal adaptations, which indicates that 'languages adapt with the goal of eliminating marked features rather than inserting them'.

Given the fact that Stoltzfus (2014: 214) adopted the TCRS-LM in his analysis of the resistance of certain consonantal features to deletion and insertion during the phonological adaptation of loanwords, he indicates that these generalisations on markedness are not restricted to this framework as it can be freely applied other theoretical frameworks such as OT. Furthermore, this generalisation is consistent with that of de Lacy (2006). According to Stoltzfus (2014: 214), these findings can 'help alleviate the Too-Many- Solutions

[11] Afar is an Afroasiatic language, belonging to the family's Cushitic branch.

problem in regards to repairs and processes' a problem that Steriade (2009) formally 'resorts to perceptual salience to solve' it 'apart from the fact that perceptual salience is often an unclear notion'. Another important issue about this generalization is that it is 'able to account for the consonant importations in my vast corpus of L2 consonants' (Stoltzfus 2014: 214).

Table 5 outlines the languages studied, loanword data, phonological adaptation and the main findings of studies (Ulrich 1997, Brasington 1997, Rose 1999, Adler 2006 and Stoltzfus 2014) that adopted the Theory of Constraints and Repair Strategies (TCRS-LM) Loanword Model by Paradis and LaCharité (1997) in their analysis, which have influenced the present research.

The Study	Language Studied	Data Source	Investigated Phonological Patterns	Findings
Ulrich (1997)	English ➔Lama French ➔Lama	- Brinneman & Brinneman's (1995) dictionary -Brinneman's (1993) list of proper nouns	-Illicit segments (voiced obstruents, palatal fricatives & front rounded glides) -Illicit syllabic structure (branching onsets, branching codas, palatal codas & obstruent	-The TCRS principles do not specify one preferred strategy -The Threshold Principle has no impact on the adaptation
Brasington (1997)	English ➔Marshallese	Marshallese - English Dictionary (Abo et al 1976)	- Illicit syllabic structure (initial & final consonant clusters)	-The preservation of patterns is determined to a cost Threshold Principle -Proposed additional principle 'Benefit Threshold Principle -segment position and cluster types influence the adaptation
Rose (1999)	French➔Fula French ➔Kinyarwanda	- Fula data (Lebel 1994, Paradis & LaCharité 1997) - Kinyarwanda data (Rose 1995).	-Illicit syllabic structure (consonant-glide-vowel (CGV) patterns)	-The Threshold Principle is not responsible for the deletion
Adler (2006)	English ➔Hawaiian	- Hawaiian– English dictionary (Pukui & Elbert 1979) - On-line adaptations, elicited from two Hawaiian–English bilingual speakers.	-Illicit segments (coronal stops, fricatives)	-Feature geometry is important in the TCRS -Segment position can influence its alteration -The Threshold Principle predicts correctly the deletion
Stoltzfus (2014)	The Project CoPho loanword database (Variety of languages)	-The Project CoPho loanword database -Ulrich (1997) data -Leslau (1997) data	-The adaptation and importation of illicit consonants	-More than one repair strategy is minimal in the TCRS-LM -The possible role of markedness in alleviating the Too-Many- Solutions problem

Table 5: Outline of (Ulrich 1997, Brasington 1997, Rose 1999, Adler 2006 & Stoltzfus 2014) studies, data details, investigated phonological patterns and findings within the TCRS-LM framework.

2.2.3. Optimality Theory

In (1993), Prince and Smolensky introduced a new theoretical approach in language that not only dealt with different aspects of phonology, but also had a great impact on other linguistic fields such as morphology and syntax. In fact, this aspect distinguishes it from the TCRS, which is specifically designed for analysing phonology. Unlike the traditional phonological theory in the work of Chomsky and Halle's (1968) *The Sound Pattern of English* (SPE), the relation between the underlying and surface forms is managed by certain conditions according to optimality theory that is basically different from 'taking an underlying form and transforming it deterministically step- by-step to its associated ouput' (McCarthy and Prince 1993: 5), the way other language theories change the input map into the output whether operational, rule based, or transformational ones while in the OT the procedure is basically comparative (McCarthy 2002). The term 'optimality' is given to this approach referred specifically to the optimal output 'that the grammar associates with the input' which in turn is called optimal (McCarthy and Prince 1993: 5).

According to Prince and Smolensky (1993), the new approach that is optimality theory responds to fundamental theoretical issues and it addresses the following two questions (McCarthy 2007: 4):

> i. How are constraints on the output of the grammar satisfied? What is the relationship between constraints on output structures and the operations that transform inputs into outputs? How are triggering and blocking effects accounted for?
>
> ii. What is the relationship between the universal and the language-particular? How can constraints differ in their activity from language to language?

McCarthy (2007: 4) indicates that the answers to these questions can be seen directly from the fundamental properties of OT. Indeed, OT sets up a basic dichotomy between the operational component of the grammar and the constraint component (McCarthy (2007: 4). The operational component, called GEN, constructs a set of candidate output forms that deviate from the input in various ways. The constraint component, called EVAL, selects a member of this set to be the actual output of the grammar (McCarthy (2007: 4).

In optimality theory, the input-output relation is controlled by 'conditions on the well-formedness of the *output*, "markedness constraints", and by conditions asking for the exact preservation of the input in the output along various dimensions, "faithfulness constraints"' (1993: 4). The term 'constraint' is not new in the field of phonology, it has been found in Generative Phonology as 'additional conditions on the well-formedness of phonological representations', for instance either as 'morpheme structure conditions' or to clarify 'the apparent conspiracy of rules' (Uffmann 2007b: 17). While it is true that the term 'constraint' was used before OT, it is also true that in OT a 'constraint' is a different concept, since it is violable. In OT, a large number of possible candidates (outputs) are generated and evaluated by the well-formedness constraints that eventually lead to the selection of the true output from the set of given candidates (Prince and Smolensky 1993: 4). The grammar of the OT framework as illustrated by McCarthy and Prince (1993: 5) in (3) shows clearly the interaction between different elements:

(3) GEN (in_i) $\rightarrow$ { Out_1, Out_2, ... }

H- eval (OUT_1, $1 \leq i \leq \infty$) $\rightarrow$ Out_{real} (Prince and Smolensky 1993: 4)

The schema in (3) indicates that EVAL operates on the output of GEN to optimise the most harmonious candidate, the one that best satisfies the language specific ranking of CON. IN OT grammar has basic components that particularly deal with the input-output relations; the constraints (CON), the language particular constraints hierarchy (H), the universal function evaluator (EVAL) and the universal candidate generator (GEN) (Prince and Smolensky

1993). The language particular constraints hierarchy (H) is mainly the ordering of a set of universal constraints according to particular language settings. What is important is the way these constraints are ranked, since all constraints are universal (Prince and Smolensky 1993). Additionally, the generator (GEN) linked each input with an infinite set of candidates of possible output (McCarthy and Prince 1993: 5). Hence the GEN is universal; it generates diverse candidates that are sufficient to fulfil the differences among languages and this aspect of the GEN is called '*freedom of analysis'* (Prince and Smolensky 1993). The GEN is essential in constructing the candidates and indicating the relations between the candidates (output) and the input (McCarthy 2002). These candidates are subject to the second component which is the evaluator (EVAL), as it applies the language particular constraint hierarchy H to these candidates, which in turn examines the 'well-formedness' of each candidate based on the given constraints (CON), and eventually determines the candidate (output) that satisfies the given constraints is the 'well-formed' one and thus it is the optimal among the given candidates (McCarthy and Prince 1993: 5). Figure 2 illustrates the mapping of input to output in OT grammar, adapted from Archangeli (1997) cited in Uffmann 2007b: 17):

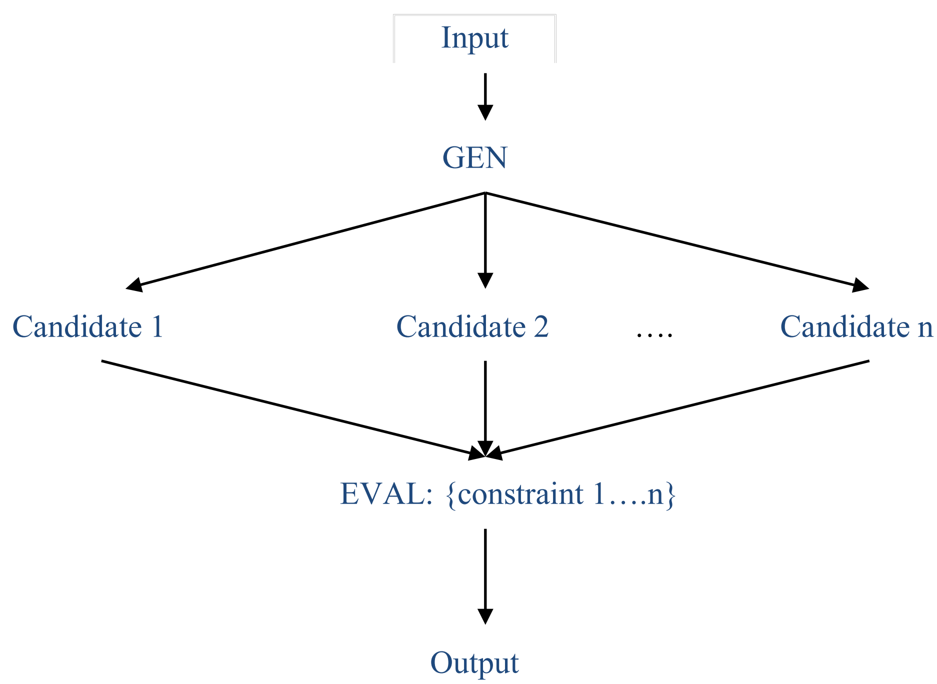

Figure 2: The mapping of input to output in OT grammar, adapted from Archangeli (1997) cited in Uffmann 2007b: 17)

In OT, Prince and Smolensky (1993: 6) claim that it is difficult for the output to satisfy each constraint. Though it sometimes violates several constraints frequently, in this regard, constraints are allowed to be violated and it is the notion of 'best-satisfaction' of constraints conflict that controls this violation. It is the core principle of OT that ranking constraints in a hierarchy of significance in which 'lower-ranked constraints can be violated in an optimal output form to secure success on higher-ranked constraints' is stated by the Universal Grammar 'of which grammars are constructed' (McCarthy and Prince 1993: 5). Indeed, the fundamental principles of Optimality Theory are Violability, Ranking, Inclusiveness, Parallelism and Universality. Each of these principles is clarified below (Prince and Smolensky 1993; McCarthy and Prince 1993):

1. **Violability**: Constraints are violable; but violation is minimal.

2. **Ranking**: Constraints are ranked on a language-particular basis; the notion of minimal violation (or best-satisfaction) is defined in terms of this ranking.

3. **Inclusiveness**: The candidate analyses, which are evaluated by the constraint hierarchy, are admitted by very general considerations of structural well-formedness; there are no specific rules or repair strategies with specific structural descriptions or structural changes or with connections to specific constraints.

4. **Parallelism**: Best-satisfaction of the constraint hierarchy is computed over the whole hierarchy and the whole candidate set.

5. **Universality:** constraints are universal.

(McCarthy and Prince 1993: 5)

In OT, the 'tableau' is the fundamental means of representation that visably illustrates the evaluation of candidates, as in (4) which is a tabluea for a simple domination:

(4)

Input	CONSTRAINT A	CONSTRAINT B	CONSTRAINT C
Candidate 1	*!		
Candidate 2		*!	
☞Candidate 3			*

Assuming that a grammar comprises of three constraints, A, B and C, they are ranked from left to right according to their importance, as the most important constraint is A in tableau (4). Supposing the set of candidates, Candidate 1, Candidate 2 and Candidate 3 are created by the GEN, which are listed in the Input column. Supposing that Candidate 1 violates constraint A, which is the most significant among other constraints (B and C), this violation of constraint A is illustrated by asterisks and excludes Candidate 1. By examining the other candidates, it can be noted that Candidates 2 and 3 violate the other constraints B and C, accordingly. The OT considers Candidate 3 as the most harmonic candidate among other candidates since it only violates constraint C, which is the least dominant. Therefore, Candidate 3 is chosen as the optimal form (this is shown by the ☞symbol).

Additionally, there are some basic conventions required to understand the previous tableau (McCarthy and Prince 1993: 8):

• The order of the constraints depends on their domination from left to right column, as the first column is for the constraint with higher rank, while the last column comprises the least power.

• The symbol (*) implies the violation of that constraint.

• A blank cell demonstrates the satisfaction of the constraint.

• A Shaded cell highlights that there is no relation between the constraint and the outcome of the candidate. Hence the outcome of this candidate is determined by other higher constraint.

• A fatal violation is marked by the symbol !. It indicates that this candidate is excluded from further competition with other candidates due to this violation.

• The optimal candidate is indicated by the symbol ☞.

2.2.3.1. Correspondence Theory

In (1995), McCarthy and Prince introduced Correspondence Theory as an extension from earlier work (Prince and Smolensky 1993) that fundamentally states more clearly the correspondence or the relation between input and output (IO correspondence). Correspondence wasn't firstly states the connections between input-output in OT but was expanded into the input-output relation. Basically, Correspondence is defined as in (5):

(5) **Correspondence** (McCarthy and Prince 1995: 262)

Given two strings S_1 and S_2, correspondence is a relation $\mathcal{R}$ from the elements of S_1 to those of S_2. Elements $\alpha \in S_1$ and $\beta \in S_2$ are referred to as correspondents of one another when $\alpha \mathcal{R} \beta$.

In this theory, candidates of either reduplicants or outputs are evaluated along with the correspondent base or input. There are certainly constraints in this theory that deal with both the relation (correspondence) and identity of the correspondent elements (McCarthy and Prince 1995: 264). The three main correspondence constraints, which are essential in this theory, are detailed in the following, that all relates to the relation of the string S_1 to the string S_2 (McCarthy and Prince 1995: 264):

(6) The **MAX** constraint (deletion is not allowed)

Every segment of S_1 has a correspondent in S_2.

Which includes the specific constraint:

MAX-IO Every segment of the input has a correspondence in the output.

(7) The **DEP** constraint (epenthesis is not allowed)

Every segment of S_2 has a correspondent in S_1.

That comprises the specific constraint:

DEP-IO Every segment of the output has a correspondence in the input.

(8) The **IDENT (F)** constraint

Let α be a segment in S_1 and β be any correspondence of α in S_2. If α is [$_{\Upsilon}$F], then β is [$_{\Upsilon}$F]

It includes the specific constraint:

IDENT-IO (F) Output correspondents of an input [$_{\Upsilon}$F] segment are also [$_{\Upsilon}$F].

2.2.4. Loanword Adaptations within OT

Unlike the Theory of Constraints and Repair Strategies (TCRS-LM) where few studies use this framework, there has been much work in the phonology of loanword adaptation adopting the Optimality Theory (OT) perspective (Prince and Smolensky 1993; McCarthy and Prince 1993). Loanword adaptation is largely debated within the OT framework among linguists and several generalisations are agreed upon, but only relevant literature that deals with the present study focus, that is, the segmental alterations, epenthesis and deletion of segments, are discussed here. In the TCRS, no work, to the researcher's knowledge, has adopted this model in the investigation of loanwords in Arabic dialects, whereas in OT, many studies follow this framework in their analysis. Among these works are the studies of Galal (2004), and Jarrah (2013). The two works were chosen here as they contribute to the present research in many ways. Galal (2004) analyses English loanwords into Cairene

Arabic[12], in which it focuses on several issues regarding the epenthesis of vowels. The other study is Jarrah (2013) that examines loanwords in Madina Hijazi Arabic[13], which discuss syllable structure adaptations. Additionally, an important piece of work on segmental epenthesis in loanword adaptations is discussed, that is, the study of Uffmann (2014). Since these works concentrate on the analysis of syllable structure, additional studies discussing segment adaptations are needed. So, Lee's (2003) study of English loanwords in Korean, more precisely, his analysis of segmental changes, and Adler's (2006) analysis of segment adaptation in Hawaiian loanwords are both reviewed here.

2.2.4.1. English loanwords in Korean (Lee 2003)

As part of the research on Korean loanwords, the essential aspect of Lee's study (2003) is that it proposed a full analysis of English loanwords in Korean within the OT framework. The data used in this study focuses on English loanwords in Korean which are extracted from different sources, namely, a loanword dictionary, newspapers, magazines, television, without specifying the number of the loanwords used in the analysis, but the loanwords dictionary alone (Pae's (1981) Dictionary of Loanwords) yields more than 9,000 words (Lee 2003:8). Lee (2003: 87) criticises previous accounts of loanword phonology, most importantly the TCRS-LM (Paradis and LaCharité 1997), for the way that it is not constantly true regarding the claim that 'borrowing integrators and adapters have access to the word representation of L2', as he further clarifies that 'most loanwords in Korean are adopted as some kind of settled lexical form in Korean, not as foreign forms', and these words eventually become part of the Korean lexicon. Additionally, he states that his analysis within the OT framework is more adequate than 'the Paradis and LaCharité (1997) constraint-based derivational analysis'. Even though their model is based on the proposed 'One-Process Hypothesis', their constraints are still 'applied one after the other in serial order' (Lee 2003: 90). In fact, the analysis of loanword adaptation is more complicated

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[12] Many works in Arabic dialects indicate similarities between CA and UHA, for instance Holes (2004).

[13] Although Jarrah (2013) states that his study investigates English loanwords specifically in Madina Hijazi Arabic (MHA), it still can be clearly considered as Urban Hijazi Arabic (UHA), since Madina is one of the Hijazi regions and definitely different from Bedouin Hijazi Arabic (BHA).

using such serial frameworks, more precisely the TCRS-LM, instead, 'in parallel OT this problem disappears because these phonological processes are evaluated by constraint interaction' as the OT has the Richness of the Base principle[14], in which input constraints are ignored and loanword phonology is only determined by the output ones (Lee 2003: 132).

In Korean loanwords, Lee (2003: 132) indicates that segmental adaptations can be sufficiently analysed within the OT framework as 'these phonological processes are evaluated by constraint interaction' in which there is no need to use 'L2 specific constraints'. These segmental changes are presented in Table 6 (Lee 2003: 133):

Source Language	Loanword Output
p f	p^h
p v	p
θ	s'/ t'
t	t^h
d	t
θ	t
ʧ	c^h
z	c
l	r/l
k	k^h
g	k

Table 6: The Segmental Changes in English loanwords in Korean (Lee 2003: 133)

[14] *Richness of the Base* principle is considered the most important property of the input in OT in which there are no constraints on possible inputs (Uffmann 2011: 191. Based on this principle, one might posit hypothetical input forms for some loanword EVAL would then select an output form that is a possible surface form of English (Uffmann 2011: 191). The theoretical importance of this is that the analyst cannot exclude certain input forms by stipulation; any possible form has to be taken into consideration (Uffmann 2011: 191).

Lee's (2003) study reveals various segmental adaptations of English loanwords in Korean, as its inventory lacks segments such as /b/, /v/. In fact, Lee (2003) notes that voiced segments are adapted into voiceless ones, the /d/ and /g/ into /t/ and /k/, accordingly, when they occur word-initially. This change can be illustrated within the OT perspective, by evaluating the two constraints, the markedness constraint *** $_w$[d** and the faithfulness constraint **IDENT-IO (F)** as follows (Lee 2003: 145):

a. **IDENT-IO (F)** (McCarthy and Prince 1995: 264)
The output correspondents of an input [$_Y$F] segment are also [$_Y$F]

b. Markedness constraint: *** $_w$[d, * $_w$[g**

Concerning the ranking of these constraints, Lee (2003) argues that the * $_w$[d, * $_w$[g are ranked higher than the faithfulness ones **IDENT-IO (VOICE)** and cannot be violated. The interaction between these constraints is presented in the next tableau in (9) and (10) for the adaptation of the two English loanwords 'dubbing' > /təbiŋ/ and 'goal' > /kol/ (Lee 2003: 145):

(9)

'dubbing'	*** $_w$[d**	**IDENT-IO (VOICE)**
☞ təbiŋ		*
dəbiŋ	*!	

(10)

'goal'	*** $_w$[g**	**IDENT-IO (VOICE)**
gol	*!	
☞kol		*

Similarly, the adaptation of /v/ and /b/ can be illustrated by the interaction between the **IDENT-IO (VOICE)** and the ***v, * $_w$[b** with similar ranking, the tableau in (11) demonstrates the adaptation of /v/ > [p] in the English loanword 'vinyl' >/ pinil/ (Lee 2003:

135).

(11)

'vinyl'	*v	IDENT-IO (VOICE)
vinil	*!	
☞pinil		*

In the analysis of all of these segmental changes, Lee (2003: 138) indicates that 'a markedness constraint outranks faithfulness', in which 'there is no need for L2-specific constraints'. Other segmental adaptations such as the change /ʧ/ > [cʰ], and /z/ > [c], can be evaluated within the constraint rankings ***ʧ>> IDENT-IO(F),** and ***z>> IDENT-IO(F),** accordingly (Lee 2003: 146). The final segmental change that has been analysed by Lee (2003) is the adaptation of interdental fricatives, which he finds to be an arbitrary change. In Korean loanwords, there is a variation in the adaptation of /θ/ > [s], [s'], [t] or [t'], that is similarly found in other languages. For instance, Paradis and LaCharité (1997: 423) find that the English /θ/ is realised as [s] in French, while in Quebec French it is realised as [t]. However, Lee (2003: 149) disagrees with Paradis and LaCharité (1997: 423) as they relate this variation in the adaptation of /θ/ to 'social factors in adaptation' where 'the selection of one particular strategy over another is due to cultural conventions within the community'. Indeed, Lee (2003: 149) refers to this adaptation as 'a matter of free variation. Speakers have two options where two different pronunciations are possible'. Lee's (2003: 97) study also discusses epenthesis and deletion in Korean loanwords. The epenthetic vowels are [ɨ], [i] and [u], where the insertion of the last two is determined by 'the place of articulation of the preceding consonant'. In coda condition (**Coda-Cond**) cases that allows only 7 consonants [p, t, k, m, n, ŋ, l]. If a loanword of monosyllabic CVC 'has a coda which does not satisfy the **Coda-Cond** of Korean will it split into CV.CV'. Furthermore, Lee (2003) discusses the deletion of [r] in coda position and the gemination of liquid in Korean loanwords. In sum, Lee's (2003) analysis of the epenthesis, deletion, and gemination in Korean loanwords will not be considered here; only the analysis of segmental adaptation is considered.

2.2.4.2. English loanwords in Cairene Arabic (Galal 2004)

Galal (2004) investigates English loanwords in Cairene Arabic (CA), that is an Afro-Asiatic, Semitic dialect spoken in Cairo the capital of Egypt within the framework of OT. The study concentrates on analysing the adaptation of prohibited syllable structure, more precisely by using epenthesis. To do so, three issues regarding epenthesis in CA Loanwords are the focus of Galal (2004). These are identifying the constraints accountable for selecting epenthesis over deletion, recognising the quality of the inserted segments (vowels) and, lastly, finding the epenthetic vowel positions. The majority of the study data are extracted from an Egyptian Arabic Dictionary (Hinds and Badawy 1986), whereas the remaining words are collected from Galal's (2004) personal interaction with CA native speakers, though he did not specify the number of loanwords that he analysed. Galal (2004: 3) classifies the data into two categories, depending on the epenthetic vowel. The first category deals with vowel positions, whereas the second deals with vowel quality. Examples of the English loanwords in CA that Galal (2004: 2-3) studied are presented in Table 7.

Different Vowel Positions		Variation in Vowel Quality	
CA	**English**	**CA**	**English**
firizar	freezer	burujiktur	projector
Biristul	Bristol	fulurusint	florescent
birinter	printer	furuut	fruit
kirimbilin	Crimplene	guruub	group
ʔistiryu	stereo	kɑlɑtʃ	clutch
ʔisbiitʃ	speech	filæʃ	flash
ʔisbireeh	spray	kitæʃ	clash
bankinut	banknote	ʔistaf	staff
ʃarkiskiin	shark skin (cloth)	ʔistuk	stock
bustiman	postman	ʔistub	stop

Table 7: variations in the epenthetic vowel quality and position in CA loanwords (Galal 2004: 2-3)

Regarding the position of the epenthetic vowel, Galal (2004: 3) observes two positions in CA loanwords with CC clusters which either cluster internally, as in ‘freezer’ [firizar] and ‘bristol’ [biristul], or externally, as in ‘stereo’ [ʔistiryu] and ‘speech’ [ʔisbiitʃ]. If the word has CCC, Galal (2004: 3) notes that the epenthetic vowel is inserted after the second consonant: consider ‘banknote’ [bankinut]. Galal (2004: 6) indicates the following constraint is found in CA phonology, hence it prohibits consonant clusters CC in the initial position of the syllable:

(12) ***COMPLEX$^{\mathbf{ONS}}$:** complex onsets are not allowed.

In CA, vowel epenthesis is chosen to resolve complex clusters, though there are two potential positions, either externally or internally. The other constraint found in CA is in (13) as a vowel initial syllable is not accepted in CA.

(13) **ONSET:** Syllables must have onsets.

Regarding constraint ranking in CA, Galal (2004: 6) argues that it is necessary to rank the two constraints ***COMPLEX** and **ONSET** similarly. Galal (2004: 7) states that conflict can be noticed between the latter constraint (**ONSET**) and the **DEP-IO** constraint as it prohibits segment epenthesis as described in (14):

(14)**DEP-IO**: Output segments must have input correspondents (No epenthesis)

Galal (2004: 7) indicates that **ONSET** is ranked higher than **DEP-IO**, as creating an onset is highly accepted in CA phonology, this result: **ONSET >> DEP-IO**. Moreover, CA has two possibilities to deal with the two constraints ***COMPLEX$^{\mathbf{ONS}}$** and **ONSET**, segment epenthesis or deletion, though CA noticeably selects epenthesis over deletion, which indicates that the constraint counting against deletion, **MAX-IO**: Input segments must have output correspondents, must be ranked equally with ***COMPLEX$^{\mathbf{ONS}}$** (2004: 7). According to Galal (2004: 7), the ranking of constraints must be as in (15), which is evaluated in the tableau in (16):

(15) ***COMPLEX^{ONS}, ONSET, MAX-IO » DEP-IO**

(16)

stub	**ONSET**	***COMPLEX^{ONS}**	**MAX-IO**	**DEP-IO**
☞ ʔistub				*
is.tub	*!			*
stub		*!		

While for word-medial clusters, Galal (2004: 7-8) suggests using the ***COMPLEX** constraint and describes it as:

(17) Complex onsets and CCC clusters are not allowed.

Such a constraint will select the first candidate to be the optimal for the adaptation of the word ‘banknote’ [ban.ki.nut] as exemplified in the tableau (18) (Galal 2004: 8):

Here the ranking is: ***COMPLEX, ONSET, MAX-IO » DEP-IO** (Galal 2004: 8)

(18)

bank.nut	**ONSET**	***COMPLEX**	**MAX-IO**	**DEP-IO**
☞ ban.ki.nut				*
bank.nut		*!		

This ranking can deal with vowel epenthesis in complex onset cluster in CA as in loanwords ‘freezer’ and ‘stop’, but it needs to add more specific constraints to deal with two different positions of the vowels. So for the CC clusters, Galal (2004: 10) states that the position of the epenthesised vowel in such clusters depends largely on whether it is a rising or falling sonority cluster. He further explains that the epenthetic vowel is inserted externally before the CC in falling sonority clusters such as the s-obstruent clusters, while in rising ones it epenthesises internally between the CC. Galal (2004: 11) indicates that it is difficult to break the CC clusters with falling sonority, more particularly, the s-obstruent clusters, due to the sonority sequencing constraint, the **SYLLABLE CONTACT,** which is described as follows:

(17) **SYLLABLE CONTACT**: Sonority must not rise across a syllable boundary.

Galal (2004: 12) indicates that in languages where '***COMPLEX** must dominate **DEP**… the vowel is inserted at the edge unless the CC sequence has rising sonority'. Two examples are given to illustrate the two cases that are attested in CA, the two words 'clutch' and 'speech'. In the first one, 'clutch', the vowel is inserted internally hence the initial CC cluster has the rising sonority, as is demonstrated in the next tableau in (18). This is as a result of the constraint **SYLLABLE CONTACT** (2004: 12):

(18)

/ klɑtʃ/	***COMPLEX**	**SYLLABLE CONTACT**	**DEP**
ʔɑk.lɑtʃ		*!	*
☞ kɑ.lɑtʃ			*
klɑtʃ	*!		

In the case of the second word, 'speech', the CC cluster is s-obstruent that has falling sonority. Here the vowel is epenthesised at the edge and Galal (2004: 12) further explains that 'Edge epenthesis violates **NOCODA** and **ONSET**, while the dispreferred internal epenthesis actually satisfies **NOCODA**, **ONSET** and **SYLLABLE CONTACT'**. In this case the **CONTIGUITY** constraint is suitable to treat edge epenthesis, defined in (19):

(19) Constraint: Elements adjacent in the input must be adjacent in the output.

Since edge epenthesis is fulfilled following the **CONTIGUITY** constraint, the **SYLLABLE CONTACT** constraint is no longer useful here. The **CONTIGUITY** and **DEP** are ranked the same:

(20)

/sbiitʃ/	**CONTIGUITY**	**DEP**
☞ ʔis.biitʃ		*
sibiitʃ	*	*!

Concerning the ranking, **SYLLABLE CONTACT** should be ranked higher than the **CONTIGUITY** constraint. Two essential rankings are responsible for the epenthesis as follows:

(21) a**.*COMPLEX»DEP**

b. **SYLLABLE CONTACT » CONTIGUITY**

The final ranking to clarify different types of vowel epenthesis regarding the rising or falling sonority cluster is as the following:

(22) ***COMPLEX, SYLLABLE CONTACT » CONTIGUITY, DEP.**

(23) ***COMPLEX, ONSET, MAX-IO, SYLLABLE CONTACT » DEP-IO, ALIGN- σ, CONTIGUITY.**

The second issue that Galal (2004: 8) discusses is where the epenthetic vowel is inserted in word-medial CCC clusters, he assumes two possible positions for this vowel that yield either CVC.C (after the first consonant) or C.CVC. (Following the second one). In CA, the second structure is used in which syllables are aligned 'as close as possible to the right edge of the prosodic word' which means the **ALIGN-σ** is the constraint here as in (19). This constraint is close to the Generalized Alignment (McCarthy and Prince 1993; Galal 2004: 8):

(19) Align (σ, R, PrWd, R) (Mester and Padgett 1994)

Align right edge of every σ with R edge of some prosodic word.

Based on this constraint, the vowel is epenthesised between C2 and C3 in the CCC clusters in order to bring 'the syllable edge closer to alignment with the right edge of prosodic word' (Galal 2004: 8). Concerning the ranking, The **ALIGN- σ** is ranked with **DEP-IO**, and it is important in deciding the optimal output (the first candidate here as it only has three moras whereas the second one has four; Galal (2004: 9) considers the number of moras rather than syllables as the two candidates have the same number of syllables), thus the ranking for this epenthesis is as follows:

(20) ***COMPLEX, ONSET, MAX-IO,» DEP-IO, ALIGN- σ**

(21)

bank.nut	**ONSET**	***COMPLEX**	**MAX-IO**	**DEP-IO**	**ALIGN-σ** **σ1 σ2 σ3**
☞ ban.ki.nut				*	
ba.nik.nut				*	*!

Regarding the quality of the epenthetic vowel, Galal (2004) notes that there are two different kinds of inserted vowel in CA, either a vowel copy of the adjacent one or a default one which is [i]. For the harmony vowel, Galal (2004: 14) suggests the **SURFACE-IDENTITY (F)** to deal with the epenthetic vowel, he defines the constraint as in (29), to deal with the harmony between the epenthetic vowel and the adjacent one:

(29) S-IDENT(+/-back, +/-round):

Let α be a vowel in *syllable* 2 and β be any correspondent of α in *syllable*
If α is [+/-back, +/-round] then β is [+/-back, +/-round], where β is an epenthetic vowel.

Though, he suggests an alternative constraint that deals with cases where it is difficult to determine the optimal candidate, when there is more than one candidate that fulfils 'backness and roundness harmony' (2004: 15). According to Galal (2004: 15), the solution for such cases is to have additionally the constraint *[+high] * [-high], and the optimal candidate will be determined on ranking of these constraints. For instance, in the word '*group*' in the next tableau (30) (Galal 2004: 16), * [-high], is ranked higher than *[+high]:

(30)

/gruub/	S-IDENT (+/-back, +/-round):	ONSET	*COMPLEX	MAX-IO	*[-HIGH]	*[+HIGH]	DEP-IO	ALIGN-σ σ1 σ2 σ3
☞ gu.ruub						*	*	-, μμμ
goruub					*!		*	-, μμμ
giruub	*!						*	-, μμμ
garuub	*!						*	-, μμμ

For the cases where the epenthetic vowel is a default one, that is the [i], Galal (2004: 16) implies that the previous **S-IDENT** constraint needs to be controlled by a higher constraint which is the ***MULTIPLE (V.Place)** constraint, which selects the [i] as the default vowel in the s+ obstruent cluster. It is defined as in (31):

(31) V-to-V assimilation (harmony) is penalised.

Galal (2004: 16) indicates that this constraint has two roles, preventing harmony between V1 and V2, and making the default vowel [i] the epenthetic vowel in an s+ obstruent cluster. Moreover, this constraint is ranked higher than **S-IDENT**, suggesting the following ranking in (32) (Galal 2004: 17):

(32)***COMPLEX, ONSET, MAX-IO, SYLLABLE CONTACT, *MULTIPLE (V.Place) » S-IDENT (+/-back, +/-round)*[+high], [-high], DEP-IO, ALIGN-σ, CONTIGUITY.**

This is explained in the tableau in (33), for the word ‘staff’:

(33)

staf	*MULTIPLE (V.Place)	S-IDENT (+/-back, +/-round)
☞ʔis.taf		*
ʔas.taf	*!	
ʔus.taf	*!	
ʔos.taf	*!	

2.2.4.3. English loanwords in Hawaiian (Adler 2006)

Adler's (2006) study of English loanwords in Hawaiian adopted the OT framework in the analysis of the adaptation of strident fricatives and coronal stops. Details of her study are discussed in Section 2.2.2 in relation of the TCRS-LM approach. The Hawaiian language has no coronal stop /t/ and /d/, the coronal and [-sonorant] is violated as the two sonorants /n/ and /l/ are the only coronal consonants. Adler (2006) uses 'perceptual and articulatory similarity judgments to motivate the OT constraints' (Adler 2006: 1024). In the adaptation of coronal stops /t/ and /d/, Adler (2006: 1037) depends on her analysis on articulatory similarity judgment as in (34), resulting an OT constraint in (35):

(34) 'Articulatory similarity judgment: **Δ**t-p > **Δ**t-k: a change in major *articulator* is a more noticeable departure than a change in *place of articulation*'.

(35) *Ident[articulator]:* The output correspondent of input [α articulator] is also [α articulator].

Adler (2006) indicates that this constraint 'need not outrank faithfulness in place of articulation.' In order to get the right output [k] for the coronal input instead of [p] that is basically violating the two Ident constraints, consider the tableau in (36):

(36) Mapping t, d ➔k (*p)

/t/	*t	Ident[artic]	Ident[place]
a. t	*!		
b. h		*!	*
c. ʔ		*!	*
d. p		*!	*
☞e. k			*

For the adaptation of fricatives, Adler (2006: 1039) states that the constraint (**Ident [articulator]**) might help in eliminating potential outputs as for coronal, though ‘there does not seem to be definitive information which decides whether it is better to retain the manner or the articulator of the fricatives’. In fact, the data shows that ‘speakers waver between preserving the articulator of the input consonant and the manner of its articulation’ (2006: 1039). This leads to the following Similarity judgments (2006: 1039):

(37) Similarity judgments are un(der)informative

a. **Δ**s-p > **Δ**s-k: changing the articulator of a consonant is more of a deviation than changing just the place of articulation.

b. **Δ**s-k =**Δ**s-h: relative perceptibility of a manner versus articulator change?

Adler (2006: 1039) turns these judgments into OT constraints as in the following tableau in (38), in which **Ident [continuant]** and **Ident [articulator]** are unranked:

(38)

/ʃ/	*ʃ	Ident[artic]	Ident[±cont]
a. ʃ	*!		
b. p		*	*!
☞c. h		*	
☞d. k			*

Indeed, Adler (2006: 1041) indicates that the variation in the adaptation of /s/ in Hawaiian loanwords can be successfully analysed within an OT framework by using constraints that control both the deletion and change of features, for instance the Max and Ident constraints. This can be achieved by having the **Max-C [+strident]** constraint and specifying the **Indent** to change the [+strident] and rank them equally (Adler 2006: 1041). The tableau in (39) shows this variation in the adaptation of /s/ in which neither deletion nor strident feature change is preferred.

(39)

/s/	*s	Ident[±stri]	Max-C[+stri]
a. s	*!		
☞b. h		*	
☞c. k		*	
☞d.Ø			*

Additionally, Adler (2006: 1042) suggests 'having the Ident constraints outrank the relevant **Max** constraints dictates that featural change will not be used to retain the fricatives', in cases when the stridents are prevocalic in the input. This way of ranking **Markedness>>Max-C/V>>Ident[artic],Ident[±cont]>>Max-fric,Max-C/R** will preserve stridents, for instance from deletion (2006: 1042); consider the tableau in (40):

(40)

'smelly'	M	{Ident}	{MaX}
a. smeli	*!		
☞b. həmeli		*!	
☞c. kəmeli		*!	
☞d. meli			*

2.2.4.4. English loanwords in Madina Hijzai Arabic (Jarrah 2013)

To date, Jarrah (2013) is one of the most recent works in Arabic loanwords, more specifically in Hijazi Arabic, or what he called Madina Hijzai Arabic (MHA). Jarrah's (2013) study investigates the on-line adaptation of English loanwords into MHA within the OT account, where the data of the study is obtained from interviewing MHA subjects, asking them to produce the loanwords and writing as they pronounce the words, and eventually, the loanword data consists of 200 words. Jarrah (2013) notices segmental (consonants) and suprasegmental (syllable structure and stress) adaptations in MHA data. The analysis regarding the stress is not our concern here; only the segmental and syllable structure will be discussed. According to Jarrah (2013: 75-76), the segmental alterations in MHA are attested in the adaptation of the segment (consonant) that MHA lacks as native phonemes, for instance the /p/, /v/ and /tʃ/ are adapted into /b/, /f/ and /ʃ/, respectively. Examples of such adaptations are 'cup' /ko:b/, 'video' /fidju/ and 'chips' /ʃibs/ (2013: 75-76). Another aspect that Jarrah (2013) observes is the lengthening of the vowel as in 'bus' /ba:sˤ/, which occurs in cases that demand heavily stressed syllables. In fact, Jarrah (2013) describes the segmental adaptation in MHA loanword data without any analysis.

For the syllable pattern adaptations, Jarrah (2013: 73-74) finds that epenthesis is attested in the data, as onsetless syllables and consonant clusters in the onset are prohibited in MHA, since only one consonant is acceptable in the onset. Moreover, the syllable structure constraints of MHA are **ONSET** and ***COMPLEX** ones. As stated before, onsetless syllables are not allowed in MHA phonology, so epenthesis of a segment is required here and the chosen segment is the glottal stop [ʔ] in order to create an onset, as in the adaptation of 'ice cream' [ʔiski:ri:m]. An additional vowel is inserted to break the cluster in this case (2013: 74). Jarrah (2013: 74) indicates that the inserted vowel is 'in harmony with the original vowel'. For cases with complex onsets, such as 'flash' [fila:ʃ] or 'christmas' [kirismas], the epenthesis of the vowel is attested between the two consonants. Jarrah (2013: 74) further explains:

> ‘All above words are in rising sonority form. The sonority hierarchy is of a limited applicability in MHA because the number of consonants is restricted to two in the final position of the word. So, vowel epenthesis … does not follow the sonority hierarchy principle. Even when sonority is falling’ (Jarrah 2013: 74)

Based on the OT framework, Jarrah (2013: 75) indicates that the epenthesis of a segment (whether the consonant /ʔ/, or the vowel) violates faithfulness constraints, hence ‘the epenthetic segments do not have a correspondence in the input’. Following the correspondence theory (CT), the epenthetic segments are treated ‘by the interaction of **MAX-IO** with **ONSET** and **DEP-IO’** (2013: 75). The tableau for the adaptation of ‘express’ [ʔik.sib.ris] is given in (41):

(41)

/ikspres/	**ONSET**	**MAX-IO**	**DEP-IO**
☞ ʔik.sib.ris			**
iks.bires	*![15]		
ik.sibres	*!		

It can be noted here that all constraints are violated; the violation in (**DEP-IO**) is acceptable since it is a lower-ranked constraint and to satisfy the two constraints (**MAX-IO**, and **ONSET**), which are considered higher, thus the optimal candidate is definitely the first one [ʔik.sib.ris] (2013: 75). Jarrah (2013: 80) concludes that the phonological information of English loanwords in MHA is highly preserved.

[15] In Jarrah (2013: 75) original analysis, the second candidate does not violate the **ONSET** constraint instead it violates the **MAX-IO.**

2.2.4.5. English loanwords in Shona[16] (Uffmann 2014)

The epenthesis of segments, whether vowels or consonants, in loanword phonology has been widely researched; one of these works is the study of Uffmann (2014) that attempts to answer the following question: ‘What is a possible epenthetic segment?’ In fact, there are certain epenthetic segments that are very often attested cross-linguistically in loanword adaptation (Uffmanm, 2014: 1). They are the three consonants, the glottal stop [ʔ] and the two glides [w, j], whereas the schwa and [i] are the most frequent epenthetic vowels. Uffmann (2014: 1) further explains the possible reasons that highly control the types of epenthetic segments; one is regarding the restrictions on Universal Grammar (UG), that:

- Grammars are synchronically constrained by UG.
- Typically formalised as markedness restrictions: only unmarked segments qualify as potential epenthetic segments.
- Positions of classic OT (Prince and Smolensky 1993): universal set of unmarkedness constraints; marked segments are harmonically bounded by less marked segments in epenthesis. (Uffmann 2014: 1)

There are other causes like ‘cross-linguistic tendencies are the result of functional constraints on diachronic change, or changes as misperception and reanalysis’ (Uffmann 2014: 1). Uffmann (2014: 6) clarifies the epenthesis of segments; firstly, the insertion of vowels in loanwords usually occurs in languages with ‘tighter syllable structure constraints’ that are very often related to consonant clusters or special coda cases. Such cases are more likely to be adapted by inserting either a default vowel ‘one vowel which is invariably inserted across contexts’, or it depends on a neighbouring underlying vowel ‘as vowel copy or vowel harmony’, that is vocalic spreading, or lastly, it might be affected by the preceding consonant ‘consonantal assimilation’ (Uffmann 2007b: 4). In cases where the epenthetic vowel is a default vowel, it might be the schwa if these languages have schwa, or the default /i/ as in Fijian (2014: 6). Uffmann (2014: 9) links the epenthesis of default /i/ with ‘the frequency of front vowels and coronal consonants’ cross-linguistically, for instance, in

[16] Shona is a Southern Bantu language (Zimbabwe).

Shona loanwords, the epenthesis of /i/ as a default vowel in 69% of cases is 'mostly due to the frequency of front vowels and coronal consonants', and similarly in 57% of cases in Creole Sranan. Uffmann (2014: 7) indicates that the epenthesis of a default vowel is attested in loanword adaptation only as a 'last resort' strategy in cases when 'spreading from an adjacent segment fails'. Furthermore, the quality of the epenthetic vowel is highly controlled by the neighbouring segments (2014: 7). An example for Uffmann's generalisation, is his former study of vowel epenthesis in English loanwords in Shona in 2007. Uffmann (2007b: 47) obtained the data from different sources, Hannan's (1984) *Standard Shona Dictionary*, with 1200 words, and several Shona studies such as Chimhundu (1983), along with fieldwork, where he extracted the remaining data from conversations, from magazines and other written sources, resulting in 1709 forms. The epenthesis of vowels in Shona that has a strict CV-syllable pattern, can be one of the following patterns (Uffmann 2007b, 2014: 7):

- Local CV-spreading of either [coronal] or [labial]: [i] is inserted after coronal consonants while [u] is inserted after labial consonants.
- If C is a dorsal consonant, then the vowel is copied: [i] is after [i, e]; [u] after [u], and [o] after [o].
- If vowel =[a], then the epenthesis of default [i] is applied.

Uffmann (2014: 9) discusses the role of faithfulness in vowel epenthesis that advises 'avoidance to insert features that are not present in the input (avoiding **DEP (F)** violations)', which can be satisfied either by having an 'underspecified vowel like schwa', or 'sharing underlyingly present features', that is vowel harmony and consonant assimilation, moreover, 'default vowels are featurally usually less specified than other vowels'.

Uffmann (2007b: 3) states that Paradis and LaCharité (1997) consider the epenthesis of segments in loanword adaptation cross-linguistically within their approach (TCRS-LM), more precisely, the Preservation Principle. Hence this principle predicts that segmental information should be retained ‘as faithfully as possible, even at the expense of adding information (in the shape of epenthetic vowels)’, in fact, the epenthesis of segments is ‘generally considered universally marked compared to deletion’. Uffmann (2007b: 3) further explains that Paradis and Lacharité (1997) ‘do not exclude the possibility of deletions. However, they predict deletion to occur only if epenthesis is too costly, if it involves too many repairs’, which is basically the Threshold Principle in the TCRS-LM.

On the other hand, the epenthesis of consonants in loanword adaptations is due to prosodic reasons, for instance, to satisfy ‘onset requirements, word- or domain-initially (vowel-initial words) or intervocalically, to break the hiatus’ (Uffmann 2014: 9). As mentioned before, the most frequent epenthetic consonants are the glides and the glottal stop (2014: 9). Concerning the epenthesis positions of the consonants, Uffmann (2014: 10) indicates that a glottal stop is inserted at the edges, for instance, word-initially, while the glides are epenthesised between vowels (intervocalically), as in the example, Czech /idiot/ > [ʔidijot]. Indeed, Uffmann (2014: 12) concludes with the fact that the insertion of consonants ‘can largely be understood as epenthesis that maximises feature faithfulness, mediated by sonority requirements’. Glottal stops are ‘structurally unmarked, and non-sonorous’, while glides ‘result from spreading and are maximally sonorous’ (2014: 12). Moreover, the epenthesis of other consonants might be ‘via spreading or if they are underspecified in that language’ (2014: 12).

In summary, Uffmann (2014: 18) concludes with the idea that ‘the range of epenthetic segments in languages is bigger than substantive markedness accounts would predict’, and that:

- Epenthesis is nevertheless synchronically constrained.
- Major constraining factor: feature faithfulness, via the DEP(F) constraint.
- Triggers spreading or insertion of an underspecified segment.
- Purely diachronic accounts are problematic because they predict the likely but unattested. (Uffmann 2014: 18).

Table 8 outlines the studied languages, loanword data, phonological adaptation and the main findings of studies (Lee 2003; Galal 2004; Adler 2006; Jarrah 2013 and Uffmann 2014) that adopted Optimality Theory (OT) in their analysis, which have influenced the current research.

The Study	Language Studied	Loanword No.	Data Source	Investigated Phonological Patterns	Findings
Lee (2003)	English ➔ Korean	Not specified	- Dictionary of Loanwords in Korean (Pae 1981) -Other different sources, (newspapers, magazines, television).	-Illicit segments (Aspiration of plain stops, devoicing, etc) -Illicit syllabic structure	- No need to L2 specific constraints, only OT constraints can analyse the adaptation. - Markedness constraint outranks faithfulness (IDENT-IO (F) for segment adaptation).
Galal (2004)	English ➔ Cairene Arabic (CA)	Not specified	-Egyptian Arabic Dictionary (Hinds and Badawy 1986)	- Vowel epenthesis (initial & medial consonant clusters)	-The constraints *COMPLEX, ONS, SYLLABLE CONTACT, *MULTIPLE (V.Place), determine the epenthesis of vowel in CA loanwords. - In non-harmony cases, it is [i] the default epenthetic vowel.
Jarrah (2013)	English ➔ Madina Hijzai Arabic (MHA).	200	- On-line adaptations, elicited from MHA speakers.	-Illicit syllabic structure (onsetless syllables and consonant clusters)	-The epenthetic of segments is determined by the interaction of MAX-IO with ONSET and DEP-IO.
Adler (2006)	English ➔ Hawaiian	200	- Hawaiian– English dictionary (Pukui & Elbert 1979) - On-line adaptations, elicited from two Hawaiian–English bilingual speakers.	-Illicit segments (coronal stops, fricatives)	-Perceptual and articulatory similarity judgments can be used to motivate the OT constraints. - OT can effectively account variation in the adaptation of segments.
Uffmann (2014)	English ➔ Shona	1709	- Standard Shona Dictionary, (Hannan 1984) - Chimhundu's (1983) study - fieldwork	-Segments epenthesis -The consonants: [ʔ] and [w, j] -The vowels: the schwa and [i]	-Epenthesis is still synchronically constrained. - The most epenthetic segments cross-linguistically (the consonants [ʔ, w, j] & the vowels schwa & [i]) -Major constraining factor: feature faithfulness, via the DEP(F) constraint.

Table 8: Outline of (Lee 2003, Galal 2004, Adler 2006, Jarrah 2013 & Uffmann 2014) studies, data details, investigated phonological patterns and findings within OT framework.

2.3. The Theory of Constraint and Repair Strategies vs. Optimality Theory:

The two constraint-based theories, the TCRS-LM (Paradis and LaCharité 1997) and Optimality Theory (Prince and Smolensky 1993), share similarities in focusing on constraints, though the concept of serial derivation in the TCRS-LM makes it closer to the traditional rule-based theories understood from the work of Chomsky and Halle (1968) (Rose 1999: 46). Furthermore, there is another aspect that the TCRS-LM shares with the rule-based frameworks. There is no violation of constraints in the surface forms, unlike OT in which constraints can be violated in the output (Rose 1999: 46). In the TCRS-LM, the application of repair strategies leads to the phonological alterations (Rose 1999: 46). In OT, there is no repair strategy. Instead, the phonological changes are determined by the interaction between constraints. Although OT states that constraints are universal, they can still be violated. Furthermore, they are ranked by importance instead of being parameterised (Uffmann 2011). Uffmann (2011: 184) notes that constraint violation in OT could lead to 'a number of possible repairs, many of which, however, are robustly unattested. This has been dubbed the 'Too Many Repairs' problem' that within OT is difficult to solve (Uffmann 2011: 184).

Generally, Paradis and LaCharité (1993: 134) distinguish between the constraints in the two constraint-based frameworks, as they are more passive and universal and violable and ranked on language-specific settings in OT. Conversely, in the TCRS-LM the role of the constraints is more active where they construct the output form, compared to being inactive in OT (Paradis and LaCharité 1993: 134). In OT, the choice of the output from a set of candidates is taken by constraints, though they cannot determine the output, whereas in the TCRS-LM, they impact the phonological alterations (Paradis and LaCharité 1993: 134). OT indicates that languages differ only (or principally) in constraint ranking not in the formulation of constraints (Paradis and LaCharité 1993: 137). For the TCRS-LM constraints restrict universal or language-specific generalization that account for the inventory, distribution and combinations of phonological elements and structures in a language, as well as phonological alterations (Paradis and LaCharité 1993: 137). Moreover, the TCRS-LM claims that languages differ from one another by virtue of their constraint ranges (Paradis and LaCharité 1993: 137). There is a clear connection between TCRS-LM and UG in the notion of language-specific constraints, which is claimed to consist of principles (universal constraints) and parameters for phonological content and structure. Negative settings for parameters constitute negative language-specific constraints (Paradis and LaCharité 1993: 137).

The notion of constraint conflict is broader in TCRS-LM than in OT as it can be created by an element or a structure that is problematic from the point of view of two or more different constraints, while in OT it arises when two constraints make competing demands would each select a different output from GEN's candidate set (Paradis and LaCharité 1993: 139). Paradis and LaCharité (1993: 134) indicate that The TCRS-LM is one of the earliest theories to use repair strategies that are not randomly applied but within an adequate constraint-based perspective. Furthermore, this framework makes a connection between constraints and surface changes. It is the TCRS-LM, which has repair strategies that 'enforce conformity to universal and language-specific constraints' (Paradis and LaCharité 1993: 134). Both OT and TCRS-LM take the lesser of two evils approach, OT states lesser in terms of a language-specific ranking, whereas TCRS-LM depends on the phonological level hierarchy (PLH). When a given structure violated two constraints at once, the needs of the constraints bearing on the higher level in the PLH have priority over those on lower levels (Paradis and LaCharité 1993: 142). Table 9 outlines the main differences between the two theoretical approaches taken from Paradis and LaCharité (1993: 135-149).

	Optimality Theory	**TCRS-LM**
Constraint	-Universal -Positive, negative or implicational -Cannot construct, destroy or trigger any processes -Selects the output form	-Universal and language specific (formally linked to UG) - Positive, negative or implicational -Can trigger constructive or destructive processes -Determines the output form
Constraints conflict	-Two constraints can have incompatible requirements (one constraint favours selection of candidate A, Another favours candidate B)	-Two constraints can have incompatible requirements (blocking a change violates constraint A, not blocking it violates constraint B)
Solving constraints conflict	Settled by a language- specific prioritization of constraints	Averted or settled by the Phonological Level Hierarchy
Can Constraint be violated	Yes	Yes
Can constraint violations be repaired	No	Yes
Universal and language-specific tools	-Constraints -GEN	-Repair strategies -Constraints (parameters and principles) -Constraints ranking

Table 9: Outline of the differences between the TCRS-LM & OT (taken from Paradis and LaCharité 1993: 135-149)

Paradis (1996: 1) defines OT as ‘a filter-based framework’, in which she replaces constraints with ‘filters’. Hence these constraints ‘do not have access to the processes of the phonological component or the intermediate forms they generate since…filters deal with final outputs only’. According to Paradis (1996: 20), in OT, since ‘Eval is a set of universal phonological filters which evaluate the whole candidate set generated by Gen, the place where phonological processes apply’ has basically no impact on the phonological processes. Moreover, Eval has no control on the inputs, despite the fact that ‘it does have access to the segmental information contained in inputs’. She further notes how difficult it is for this framework to predict the deletion of segments. More precisely, though the

Preservation Principle and Faithfulness in the TCRS-LM and OT share similarities, they actually predict differently (Paradis 1996). The reason for this, according to Paradis (1996: 1), is that among the set of candidates, the candidate that is 'the one whose segments are all "parsed"' - which means it has the least alteration (segment deletion) and at the same time (segment insertion) (**Fill**) - is considered the optimal output. In fact, the selection of the optimal candidate is actually determined by how close this candidate is to the input, according to the Faithfulness constraints (**Parse** and **Fill** (Paradis 1996: 1).

Paradis (1996) makes a comparison between the TCRS-LM and OT, more specifically, the Preservation Principle in contrast with the Faithfulness constraints. According to Paradis (1996), although the Preservation Principle and the Faithfulness constraints, more precisely, Parse share similarities as both against segment deletion, there are different predictions. In fact, the Faithfulness constraints signify for both **Parse** and **Fill**, which is a constraint that does not allow segment insertion, unlike the **Parse** constraint (Paradis, 1996). Based on loanword adaptation data, Paradis (1996) notes how the impact of **Parse** is stronger in the adaptation of loanwords in contrast with **Fill**. This is because the rate of segment adaptation, more specifically epenthesis is usually higher than the deletion of illicit ones. Additionally, the epenthesis cases for segment in illicit clusters are much higher than of segment deletions, which implies 'that Parse segment is systematically ranked above Fill in loanword adaptation' and thus the ranking here is clearly universal (Paradis 1996: 24). In this account, Paradis (1996: 24) specifies that:

> 'There is no internal device in OT which would allow the framework to handle this generalisation on universal grounds, since constraint rankings are conceived as being inherently language-specific…only constraints themselves are universal not their ranking with respect to each other' (Paradis 1996: 24)

It is true that universal segment preservation in loanword adaptation is seen as an accident based on the OT perspective, whereas in the TCRS-LM, such a generalisation of universal favoured preservation of segments can be easily predicted by the Preservation Principle (Paradis 1996). Paradis (1996: 25) further argues that it seems to be difficult for OT markedness hierarchies to work with both constraints, **Parse** and **Fill**, and that the constraint rankings are language specific. Paradis (1996: 25) suggests that OT should take into account the Phonological Level Hierarchy, as well as the TCRS-LM principles-and-parameters, in order to have constraint ranking on a universal basis.

Another issue that has been addressed differently between the two frameworks is constraint conflict, which has been discussed by Prince and Smolensky (1993: 239) in the sense of how the TCRS-LM views constraint conflict. Prince and Smolensky (1993: 239) further discuss the issue of constraint conflict by evaluating an example that has been analysed before within the TCRS-LM (Paradis 1988) to show the distinction between the two frameworks regarding constraint conflict. Paradis (1988: 90, cited in Prince and Smolensky 1993: 239) remarks on the concept of constraint conflict in the following statement:

> 'All these facts lead me to conclude that phonological processes do not freely violate phonological constraints. Actually, violations occur when there is a constraint conflict, which must be solved in some way. I argue that this is accomplished by the PLH' (Paradis 1988: 90 cited in Prince and Smolensky 1993: 239)

Paradis (1988: 89 cited in Prince and Smolensky 1993: 234) further mentions this concept in her analysis of Fula Loanword:

> 'The constraint violation…follows from a conflict of two constraints: the obligatory Segmental Licensing Convention for skeletal slots…(no floating slot); and the constraint against continuant geminates…' (Paradis 1988: 89 cited in Prince and Smolensky 1993: 234)

The example compared between the two frameworks was gemination in Fula[17] (continuant consonants), the long segment pattern the *V:C: that attested in a stem of CVC followed by a long vowel [laaw] > [laabi] '*road*' (Paradis, 1988: 79). Paradis (1988: 89) suggests three potential strategies to repair this violation: linking the vowel /i/, filling the slot with a default segment or deleting the Skeletal slot. In fact, Paradis (1988: 89) rejects the first two solutions, and even the last one, as she explains:

> 'Therefore the spreading of the continuant consonant seems to be the last resort. It causes a minimal violation, that is a violation of a segmental type, which can be minimally repaired in changing the value of the feature' (Paradis 1988: 89).

In this account, Prince and Smolensky (1993: 239) note that the problem here for the TCRS-LM is the difficulty of determining the priority for applying the two repair strategies: skeletal deletion or feature changing that is basically controlled by the Phonological Level Hierarchy where the changing of a feature is first applied. Prince and Smolensky (1993: 233) indicate that the TCRS-LM '**'**is a derivational Phonotactics+Repair framework, in which all constraints explicitly treated as such are surface-unviolated phonotactics'. This means that there is no constraint conflict similar to OT in the TCRS-LM. This has been debated by Prince and Smolensky (1993: 239) as in the following analysis:

> 'From the TCRS perspective, it is the constraints 'floating slot' and *GEMCONS which conflict, even though in the TCRS account both are surface unviolated. In our view, such conflict arises only when the former constraint is treated as violable, PARSE^{X}, and is in fact violated in output forms' (Prince and Smolensky 1993: 239).

Prince and Smolensky (1993: 239) conclude this argument by stating that there is a difference between the two frameworks concerning constraint conflict, which in the TCRS-

[17] It is essential to mention this example in discussion of the comparison between the TCRS-LM and OT as (Paradis (1988) and Prince and Smolensky (1993)) used this example specifically in order to show the main differences between the two frameworks, more precisely constraint conflict.

LM is a matter of deciding the suitable repair strategy to solve constraint violation, which is different from the OT perspective. Prince and Smolensky further explain that (1993: 239):

> 'The Optimality Theoretic conflicts crucially involve other surface-violated constraints such as FILL^{X} and PARSE^{feat} which are not part of the constraint component of TCRS, but rather correspond to rules, in much the same way as we have seen in the previous analyses of Phonotactics+Repair accounts' (Prince and Smolensky 1993: 239).

2.4. Emergent themes: framing the present study

Much work on the phonology of loanword adaptation with some of the studies reviewed here concentrate on the analysis of syllable structure rather than investigating the segmental alterations, regardless of the theoretical approach this research follows. Ulrich's (1997) study is the only study here that adequately analyses both the segmental and syllable structure adaptation in Lama loanwords in the TCRS-LM, whereas in the OT approach, Lee's (2003) study actually addresses both aspects. The analysis of epenthesis and deletion in loanwords has attracted the attention of many linguists, as seen in the literature (Brasington 1997; Rose 1999; Galal 2004; Jarrah 2013; Uffmann 2014; and others).

The present research attempts to address phonological adaptation namely the segmental alterations and syllable structure adaptation; other suprasegmental changes will not be covered. Few studies have adopted the two frameworks, the Theory of Constraints and Repair Strategies (TCRS-LM) (Paradis and LaCharité 1997), and Optimality Theory (OT) (Prince and Smolensky 1993), except for the study of Adler (2006) of Hawaiian loanwords. Similarly, this study examines both theoretical perspectives to see which approach can best predict the phonological changes in English loanwords in UHA and not only concentrates on segmental adaptation as in Adler (2006), but also examine the syllabic one.

Studies that have adopted the TCRS-LM in their investigation of loanwords differ in their attitudes regarding this model's principles. They all agree on how the Preservation Principle predicts the adaptation cases adequately, while they vary in their attitude regarding other principles (the Minimality Principle and the Threshold Principle). An example for this is Stoltzfus's (2014) recent argument regarding the Too-Many-Solutions problem in the Minimality Principle. Most of the studies raise several issues against the Threshold Principle (Ulrich 1997; Brasington 1997; and Rose 1999), while others agree with Paradis and LaCharité (1997) on its role in predicting deletion cases in loanwords (consider Adler 2006).

Concerning the OT approach, all the reviewed studies modelled their analysis of loanword adaptations effectively using OT constraints. For segmental adaptations, the faithfulness constraint **IDENT-IO (F)** plays a crucial role in evaluating the potential outputs along with relevant markedness constraints as seen in the analysis of Lee (2003) and Adler (2006). Even the variation of illicit segments such as the adaptation of /s/ in Hawaiian loanwords, can be sufficiently evaluated within the OT constraints such as MAX and IDENT (Adler 2006). Indeed, it is the ranking of these universal constraints that can derive the evaluation of possible outputs to get the optimal one by having them dominated or equally ranked. On the other hand, for the adaptation of syllable structure, several OT constraints have been used such as **MAX-IO**, **IDENT-IO (F)** and **DEP-IO**, along with syllable specified constraints, for instance **ONSET** and ***COMPLEX**, along with other constraints such as **SYLLABLE CONTACT**, **CONTIGUITY** and ***MULTIPLE.**

Methodologically, a large number of studies of loanwords, including the ones reviewed in this chapter, have based their analysis on dictionaries, whether a dictionary of native language such as Galal (2004) and Uffmann (2014) or a dictionary of both languages (Ulrich 1997; Brasington 1997; Adler 2006), or even a specialised dictionary of loanwords (Lee, 2003). Alternatively, a small number of studies rely on the on-line adaptation in order to obtain their data, consider Adler (2006) and Jarrah (2013); as for Adler (2006), it actually incorporated both. The number of words that are used for the analysis of the loanword studies vary considerably; the corpus in some studies exceeds thousands of extracts as in the study of Paradis and LaCharité (1997) and Uffmann (2014), while in other research, the analysis of phonological adaptation depends on a few hundred (Ulrich 1997; Brasington 1997; Adler 2006; Jarrah 2013; Stoltzfus 2014 and others).

In addition to discussing relevant work in loanword phonology, this chapter concluded with a comparison between the two frameworks, TCRS-LM and OT, that will be adopted in the analysis of English loanwords into UHA, which highlights the differences between the two theoretical perspectives in many aspects, such as constraints, constraint conflict and constraint violation. There is no doubt how essential this contrast is in guiding and enhancing the analysis of the current study.

CHAPTER III

The Phonology of UHA and English

3.1. Introduction

A fundamental issue that is widely accepted in any phonological study of the adaptation of certain loanwords in a language is to comprehensively explore the phonological system of both languages involved in the adaptations, more specifically the donor and the target language. Sufficient background information about the languages of interest for the research will enable any phonological study of loanword adaptation to detect certain patterns and trace the phonological changes in the target language, which can be attributed possibly to the influence of loanwords and enhance our understanding of any patterns attested in the adaptation process. In this respect, Haugen (1950: 215) insists on this issue by indicating the fact that it is 'only a complete analysis of the sound system and the sequences in which sounds appear could give us grounds for predicting which sounds a speaker would be likely to substitute in each given case'. The beginning is describing the donor language from which a loanword is coming and a target language into which this word is borrowed. In the current study, English is the donor while UHA is the target language.

This chapter is intended as a brief introduction to UHA phonology in comparison with

English phonology. The main aim of this chapter is to give an overview of notable features and relevant aspects of UHA phonology that will help in discussing the study data presented in the following chapter (**Chapter IV**). In the first section, an overview of UHA is provided which will explore UHA dialect in general by discussing the background of the dialect and some aspect of the writing system as well (section 3.2.). In section 3.3., the segmental inventories of UHA and English are given for comparison, where description of the consonants as well as the vowels are presented in subsections, 3.3.1. and 3.3.2., accordingly. The final section extensively discusses syllable structure in both UHA and English (section 3.4). Finally, the chapter concludes with a summary demonstrating the key phonological contrasts between English and UHA provided in section 3.5.

3.2. UHA an Overview

UHA is one of the Arabian Peninsula dialects, classified by Ingham (1982) into four main groups: northeast Arabian dialects, southwest Arabian dialects, northwest Arabian dialects and finally west Arabian dialects. The west Arabian dialects represent Hijazi and the Tihama, whereas the urban centres are Mecca and Medinah (Ingham 1982). Among the Arabian Peninsula dialects, it is Hijazi Arabic that is widely used throughout the country for specific purposes, such as governmental and commercial purposes, and can be understood across the Arabian Peninsula (Margaret 1975: 6). Indeed, this dialect Hijazi can be split in two further dialects; Bedouin Hijazi Arabic (BHA) and Urban Hejazi Arabic (UHA) (Ingham 1971). Bedouin Hijazi Arabic is a more recent dialect spoken by Bedouins; still, this dialect is basically conventional dialect because it maintains certain features of Classical Arabic (McCarthy 1982). On the other hand, Urban Hijazi Arabic is the dialect of Jeddah Mecca and Madinah, which are located in the western region of Saudi Arabia, and it has been largely influenced by other dialects, such as Cairene, Jordanian, and Palestinian (Margaret 1975). This might be because Hijaz is first and foremost ‘the home of Islam and host pilgrimage traffic’, furthermore, ‘the populations of Makkah, Madinah and Jeddah have been influenced for centuries by descendants of Muslims who came for the pilgrimage and stayed’ (Banjar 2002: 20). In the light of these facts, it is analytic and ideal to select

UHA among other Arabic dialects as the target language in the study of loanword adaptations.

Since part of the study data are in a written form, it is essential to state some basic information regarding UHA orthography. UHA is one of Arabic dialects, it belongs to the west Semitic family, and follows similar writing of Semitic language. The basic features of Semitic languages writing is that consonants are the only basic symbols and they should be written in horizontal lines from right to left, and finally the linear skeleton of words should be written as a unit (Daniels 2013: 413). Generally, the consonant in Arabic are 28 letters, each letter has four different shapes according to their position in the word either initial, medial, final and independent, and they actually affected by their surroundings (Daniels 2013: 413). On the other hand, Arabic vowels can be realised in writing by <َ>, <ِ> and <ُ > which stand for /a/, /i/ and /u/, respectively, that are used either 'above or below the letter for the consonants that proceeds' (Daniels 2013: 414). There are further two more marks such a <ْ> which are used above the letter for the consonant that has no proceeding vowel, which the other mark is used for consonant length 'doubling' <ّ> (Daniels 2013: 414). Holes (2004: 89) discuss the relationship between Arabic orthography namely Modern Standard Arabic (MSA) and the phonological structures. Actually, the phonological distinctive features of MSA and alphabet are particularly 'close and consistent'. 'Orthographically, the written Arabic word is essentially a consonantal skeleton' (Holes 2004: 89). Though, many Arabic speakers consider dialectal Arabic, and UHA is not an exception, is not a written language. Perhaps, the potential reason behind this widely accepted belief is that it is not considered 'an appropriate variety of the language for writing in most contexts' (Holes 2004: 93). On the ground of this, Holes (2004: 93) further clarify this issue as follows:

> 'In modern period, text types in which dialectal Arabic is used to lend realism or in which the dialectal medium is itself an indispensable part of the message have multiplied: newspaper cartoons and political caricature, children's comics, the scripts of plays, the rendering of dialogue in prose works otherwise written in MSA,

> and first and foremost, collections of folk stories, poetry, and popular literature in general in which, very often, the point is to satirize and ridicule' (Holes 2004: 93)

Additionally, there is another fundamental observation stated by Holes (2004: 95) is that Arabic dialects differs from MSA in sense that 'the effect of the script modifications is to bring the orthography used for writing dialect into even closer correspondence with its phonology' more than in the MSA writing. Generally, in all Arabic dialectal writing, besides UHA, dialectal consonants are accurately spelled the same as their pronunciations, and this is possible in script 'that lacks short vowel marks, the salient junctural, pausal, and phonotactic features of the dialect that would be obscured by standard orthographic conventions' (Holes 2004: 95).

3.3. Phoneme Inventory

As stated before, it is necessary to clarify some main aspects of UHA phonology in contrast with English phonology prior to the analysis of loanwords phonology. This will help in understanding the potential consonantal and syllabic adaptations of English loanwords. In the first subsection, a comparison is made between the consonantal inventories while the second subsection provides a clarification of the vowel systems in both languages, UHA as well as English.

3.3.1. The Consonants

The first fundamental task is to provide a description of the consonant inventories of languages under study, explicitly UHA and English. Understanding the phonological systems of both languages, will enable the study to see which features are transferred from English to UHA, and those which are not. Starting with UHA, a consonantal inventory is provided in Table 10 as illustrated by Moussa (2013: 15), while English consonants are shown in Table 11, as described by Roach (2000: 65):

	Bilabial	Labio-dental	Alveolar	Palato-alveolar	Palatal	Velar	Glottal	Pharyngeal
Plosive	b		t tˤ d dˤ			k g	ʔ	
Fricative		f	s sˤ z zˤ	ʃ ʒ		x ɣ	h	ħ ʕ
Nasal	m		n					
Lateral			l lˤ					
Approximant	w[18]				j			
Trill			r					

Table 10: Chart of UHA Consonant Phonemes adapted from Moussa (2013: 15)

	Bilabial	Labiodental	Dental	Alveolar	Palato-alveolar	Palatal	Velar	Glottal
Plosive	p b			t d			k g	
Fricative		f v	θ ð	s z	ʃ ʒ			h
Affricate					ʧ ʤ			
Nasal				n			ŋ	
Lateral				l				
Approximant	w				r	j		

Table 11: Chart of English Consonant Phonemes (Roach 2000: 65)

The most distinguishing difference between the two consonantal inventories is the number of consonants, as UHA has a larger number of consonants than English with an overall number of 27 consonants that basically includes the plain and emphatic ones (Moussa 2013: 14). By comparing the two consonantal inventory of UHA and English in respect to the manner of articulation, it is clearly that both languages have the same divisions of manner of articulation with two main differences: UHA lacks the affricate classification

18 Technically, /w/ is a labial velar and in some classification is treated as velar approximant but in this study it will be treated as labial.

while English the trill one. On the other hand, the UHA as well as English share the same classification of place of articulation with the difference that the pharyngeal set is absent in English while in UHA the dental one.

To clarify these differences more, the UHA has three bilabials: the plosive /b/, the nasal /m/ and the approximant /w/ with the absence of plosive /p/. Additionally, it has one voiceless labiodental fricative /f/ and lacks the voiced /v/. Furthermore, it has two palato-alveolar fricatives /ʃ/ and /ʒ/ with the absence of the affricates /ʧ/ and /ʤ/. Both languages have one palatal that is the approximant /j/. The velar consonants are different in UHA and English as they both have the two plosives /k/ and /g/ with two additional fricative in UHA, namely the /x/ and /ɣ/ and another nasal /ŋ/ in English. Consider the examples of the velar fricatives /x/ and /ɣ/ given in (42) (Moussa 2013: 18):

(42)	**The consonant**	**UHA**	**Gloss**
	1. /x/	/xɑːjif/	'second'
	2. /ɣ/	/ɣɑːli/	'expensive'

Concerning the alveolar set, this classification in UHA comprises more consonants than English (12 in contrast to 6) but still there are similar consonants in both languages that are the two plosives /t/ and /d/, the two fricatives /s/ and /z/, the nasal /n/ and the lateral /l/. Besides the alveolar trill, the additional alveolar consonants in UHA are the emphatic (pharyngealised) consonants that are /tˤ/, /dˤ/, /sˤ/, /ðˤ/ and /lˤ/, which are not found in English, and defined as, 'a traditional label for certain consonants in Arabic which are pharyngealised or velarized and which contrast with other, similar, segments lacking this secondary articulation' (Trask 1996: 130). The pharyngealised lateral /lˤ/ or dark lateral (it can also transcribed as [ɫ]) is only realised in one name /aɫɫah/ 'God' (Basalamah 1990: 42). On the other hand, there are restrictions in the use of the other pharyngealised alveolar consonants, consider the example of these emphatic that English lack given in (43) (Moussa 2013: 16-17):

(43)

	The consonant	UHA	Gloss
1.	/tˤ/	/mu:tˤuʃ/	‘comb’
2.	/dˤ/	/ʕɑdˤum/	‘bone’
3.	/sˤ/	/sˤɑħin/	‘plate’
4.	/zˤ/	/bizzˤɑbt/	‘exactly’

Moreover, both languages have the same glottal fricative /h/ with one additional plosive in UHA that is the /ʔ/[19]. The additional place of articulation that UHA has is the pharyngeal consonant that includes two fricatives /ħ/ and /ʕ/. Consider the example of the consonants /ʔ/, /ħ/ and /ʕ/ that are absent in English given in (44) (Moussa 2013: 18-19):

(44)

The consonant	UHA	Gloss
1- /ʔ/	/ʔɑkil/	‘food’
2-/ħ/	/ħɑrb/	‘war’
3-/ʕ/	/ʕɑsal/	‘honey’

Furthermore, the two English dental fricatives /θ/ and /ð/ are absent in UHA consonantal inventory. However, UHA speakers pronounced these dentals in only one case, which is in the reciting of the Holy Quran (Basalamah 1990: 42). So in the UHA speakers normal speech, the /θ/ and /ð/ sounds are replaced by either /t/ or /s/ and /d/ or /z/, respectively. Some examples are given in (45) (Basalamah 1990: 42).

(45)

Sound Replacement	MSA	UHA	Gloss
/θ/ > /t/	/θaanii/	/taanii/	‘second’
> /s/	/ħadiiθ/	/ħadiis/	‘saying’
/ð/ > /d/	/ha:ða:/	/ha:da/	‘this’
> /z/	/tilmi:ð/	/tilmi:z/	‘pupil’

Furthermore, there are other outstanding phonological contrasts: UHA lacks the English /p/,

[19] The glottal stop does occur in English but not phonemic.

/ʧ/, /ŋ/ and /v/ as native phonemes. These English consonants that are absent from the UHA consonantal inventory will be the focus of the current research in analysing the adaptation of English loanwords in UHA as will be seen in the remainder of this study.

3.3.2. The Vowels

Essentially, UHA is one of the varieties of Semitic languages, which are commonly distinguished by ‘having a limited vocalic system and a rich consonantal system’ (Watson 2002: 16). In this respect, UHA vowel system consists of three pairs of short and long vowels, along with two additional diphthongs as opposed to English that has twelve vowels (tense long and lax short vowels) (Moussa 2013). Moreover, English is often described as a ‘centripetal vowel system’. This means, ‘that vowels have the tendency to move to the center of the vowel space’ unlike UHA vowels (Saadah 2011: 23). Consider Figure 3 that illustrates these vowels (Moussa 2013: 32):

	Front	**Central**	**Back**
High	**i i**ː		**u u**ː
Mid	**e**ː		**ɔ**ː
		ɑj	**ɑw**
Low	**ɑ ɑ**ː		

Figure 3: The vowel system of UHA (Moussa 2013: 32)

Furthermore, Moussa (2013: 34) gives a clear illustration of the UHA vowel, along with words that can be seen in (46):

(46)

The vowel	Properties	UHA	Gloss
1. /i/	Unrounded high front (short)	/tilɑːgi/	‘you find’
2. /iː/	Long counterpart	/ʒiːb/	‘bring Imp. Masc.’
3. /u/	Rounded high back (short)	/kunt/	‘I was’
4. /uː/	Long counterpart	/fuːl/	‘beans’
5. /ɑ/	Unrounded low front (short)	/sɑhɑm/	‘arrow’
6. /ɑː/	Long counterpart	/gɑːlt/	‘she said’
7. /eː/	Unrounded mid-high front (long)	/tˤeːr/	‘bird’
8. /ɔː/	Rounded mid-low back (long)	/nɔːm/	‘sleep N’

In fact, Moussa (2013: 34) indicates that the two vowels /eː/ and /ɔː/ are the reflex of MSA diphthongs the /ɑj/ and /ɑw/, respectively. According to the IPA, long vowels /ii/, /uu/, and /aa/, can be described as /i:/, /a:/ and /u:/ while diphthongs as /aɪ/ and /aʊ/ despite the fact that much work in Arabic phonology transcribes them this way. Concerning the occurrences of these vowels, Moussa (2013: 36) states that short vowels ‘freely occur in open and closed syllables, and they also exist in monosyllabic words’ while long vowels ‘occur mainly in open syllables, and in closed syllables of the type CVVC’. Furthermore, there is a further occurrence of long vowels ‘is in final position as in the word /ħutˤuː/ “you PL. put it”’ (Moussa 2013: 36). Since the vowels of UHA will be not the focus of the present study, the description of vowel will not discussed further.

3.4. The Syllable Structure

It is essential to clarify the differences in syllable sequences between UHA and English words before dealing with any possible problematic syllabic structures found in the adaptation of loanwords. Accordingly, the distribution of syllable sequences in UHA is actually restricted to the following forms, where C indicates consonants, V short vowels and VV long ones (Ryding 2005: 36). Table 12 presents the syllable patterns that are found in UHA (Al-Mohanna 1998: 93).

Syllable	Form	UHA[20]	Gloss
Light Syllable	CV	**ba**.ga.rah	'a cow'
Heavy Syllable	CVC	**min**	'from'
	CVV	**kaa**.tib	'a writer'
Super-heavy Syllable	CVVC	**tiin**	'figs'
	CVCC	**bint**	'a girl'

Table 12: Different Syllable Patterns in UHA.

However, there are some restrictions in the occurrences of the final pattern the super-long syllable CVVC and CVCC as they occur word-finally and in pause forms while the short CV and long CVC and CVV syllables can occur freely in any position (Moussa 2013: 40). Furthermore, it is compulsory for all syllables to have onset and nucleus vowel, they might comprise branching rhyme but not a branching onset (2013: 40). This means that non-final syllables in UHA are comprised of 'maximally three phonemes' (2013: 40).

It may be noted here that UHA has a constrained number of syllables in contrast to English. According to Roach (2000: 70), an English syllable can be a vowel like '*are',* a syllable with an onset as in '*bar'* or even a syllable with coda but no onset as '*am'*. Phonotactically, English words can begin with V, C or CC with a maximum number of CCC clusters, while in the final position, it can also have a V, C or CC with CCCC sequence (Roach 2000: 70). English phonotactics permit large numbers of syllable structures when compared to UHA. Additionally, in UHA it is not permissible for a word or even a syllable to start with a vowel and no word or syllable structure starts with a consonant cluster (Jarrah 2013).

Consonant clusters are prohibited within syllables. Only in pause form may a word end in a consonant cluster, such as *fahimt* ('I understood') (Ryding 2005: 36). A common cluster that has been studied extensively is the different realisation of the CCC sequence in Arabic dialects. Indeed, Arabic dialects (except Moroccan) tend to epenthesise a vowel to break up

[20] The examples are taken from Al-Mohanna (1998: 93)

the cluster, though variation is found in the place of the epenthetic vowel (Hellmuth 2013: 57). Thus, Arabic dialects might have either CVCC (such as Cairene) or CCVC (Iraqi) patterns (Hellmuth 2013: 57). Indeed, Kiparsky (2003) indicates that this result occurs in two groups of dialects; those with either a VC or CV pattern. Correspondingly, Broselow (1983) suggests that there is a variation in the production of the English word *children* between Cairene and Iraqi speakers (consider [ʧil.di.ren] versus [ʧi.lid.ren], respectively), even if the two dialects have the same syllable template[21]. According to Itô (1986), CVC is the syllable template for Arabic, and the direction[22] of this template are either left to right (Cairene) or right to left (Iraqi). In this regard, Al-Mohanna (2009: 1) indicates that Hijazi 'portrays instances of final reduction, demonstrated empirically in final vowel shortening and representationally in final consonant extra-syllabicity', which particularly 'supports the persistent CV parsing hypothesis'.

The syllabication of UHA syllable sequences has been discussed within the optimality-theoretic framework by Al-Mohanna (2009: 2-1) where he adopts the Markedness constraints (**ONSET**, **NUC**, **NOCODA**, ***COMPLEX,** ***M/V** and ***P/C**) and faithfulness constraints (**MAX-IO** and **DEP-IO**). Some of these constraints have been defined in **Chapter II**, while others are not (for instance **NUC**, **NOCODA**, ***M/V** and ***P/C**) that defined as:

- **NUC** all syllables must have nuclei.

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[21] Trask (1996: 346) indicates that the syllable template was initially presented by McCarthy (1979) and extended by Itô (1986). Hence, McCarthy (1981) states 'that consonants and vowels are joined with each other by a template'. It was then used by Itô (1986) to explain consonant cluster simplification and epenthesis in many languages, including Cairene Arabic and Iraqi Arabic. Templatic syllabification depends on two concepts: syllable templates and directionality. A syllable template is the structure for the optimal shape of a syllable provided by a language's grammar.

[22] 'Directionality is the parameter by which phonological property or process, such as tone or syllable formation, must be analysed as proceeding either left-to-right or right-to-left, depending on language and property. Analysts invoke a directionality parameter to handle the differences among languages' (Trask, 1996: 114).

- **NOCODA** coda consonants are prohibited.
- ***M/V** **V** may not associate to onsets or codas.
- ***P/C** **C** may not associate to peak nodes.

According to Al-Mohanna (2009: 4), the syllabification in UHA requires the higher ranking of the **ONSET**, **NUC**, ***COMPLEX, *M/V** and ***P/C** constraints above the **NOCODA** one in order to allow the occurrence of coda consonants. With the use of some moraic constraints, Al-Mohanna (2009: 4) further indicates that even though UHA has two slots in the rhyme, it is not sufficient to claim for a CVX template. Given the fact that UHA exhibits certain rules of vowel shortening as well as final-consonant extrasyllabicity essentially support the claim of a CV template as stated before in order to satisfy the constraint that syllables are maximally bimoraic (2009: 5).

3.5. Key phonological contrasts between English and UHA

While the two languages, UHA and English, reveal a number of phonological differences, their segmental inventories along with syllable structure make them ideal for a phonological comparison, and consequently a loanword adaptation research. The overlap between the consonant inventories of the two languages and the limited number of syllable sequences in the target language (UHA) will basically allow the present study to get substantial findings since these aspects widen the adaptation possibilities of English consonants and syllabic structures. In this Chapter, the segmental inventories of UHA as well as English are comprehensively discussed. It presents a full description of the vowel and consonant segments as well as the syllable structures of both languages with a view to making a comparison. Furthermore, the phonological similarities and differences between UHA and English are also displayed. Generally, there are some similarities and various differences between UHA and English. The major similarity is sharing most of the place and manner of articulations of segments despite the fact of lacking some classifications (for instance dental and affricates in UHA and glottal and pharyngeal in English). Equally, several differences between these two languages have been noticed. The main reason of these several differences is perhaps due to the fact that UHA and English from different language families. Hence UHA is one of the varieties of Semitic languages, while English is Indo-European. One of the differences is in the number of vowels: UHA has a limited number of vowels in contrast to English, which has twelve vowels. The difference between the two languages is not of special concern hence the issue of vowel adaptation is not considered. The second crucial distinction is revealed in the consonantal inventories of both languages, as UHA lacks the English /p/, /ʧ/, /ŋ/ and /v/ as phonemes, despite the fact that UHA has a larger number of consonants in contrast to English. In essence, the lack of these consonants is considered one of the crucial issues that the current study will lengthily deal with in the analysis of English loanwords in the next chapters. Building on the phonological background provided in this chapter, the following chapters of the study show how the consonantal adaptations or importation of English loanwords are typically triggered by the absence of these consonants in the native consonantal inventory of UHA. The lack of an equivalent in UHA, the English consonant is usually replaced with the closest native UHA phoneme; only in a few cases does the English consonant remain unadapted (imported).

Unlike the segmental differences, the distinctions between the syllable structures in the two languages is enormous, starting with the restricted number of allowed syllables sequences in UHA in contrast to English, to the banning of onset-less syllable and finally the disallowing of onset clusters. With only five types of permitted syllable sequences, more precisely CV, CVC, CVV, CVVC and CVCC, loanwords from English with different syllable structures will be considered illegal and demand adaptations. Furthermore, syllables with initial vowel (onset-less syllables) are not permissible in UHA phonology and is highly considered one of the principal illicit syllabic sequences besides consonant clusters. These fundamental syllabic differences between the phonology of UHA and English are the crucial cause of numerous types of syllabic adaptations found in UHA loanword adaptation. In the light of the UHA syllabic restrictions, this study will discuss how the problematic English illicit syllable structures are subject to adaptation by either the epenthesis of vowel or consonant as will be seen in the remainder of the study.

CHAPTER IV

The Present Study Data

4.1. Introduction

In this study, English loanwords that are integrated into the UHA dialect are investigated by concentrating on the phonological adaptation of consonants and syllable structures. In particular, this study examines how the TCRS-LM and Optimality Theory frameworks can predict the phonological alterations of loanwords. The UHA loanword data, therefore, was compiled from different sources; the first significant source was Abdul-Rahim (2011), a dictionary of loanwords into Arabic while the other source was Jarrah's (2013) study of English loanwords into Madinah Hijazi Arabic (MHA). Besides these two published work, the study conducted a data collection exercise that reveals some important findings regarding UHA loanword adaptation. Furthermore, the Oxford English Dictionary (OED) was consulted for the transcription of the English words. The first part of this chapter describes the main sources and how each source contributes to the recent research data and the compiling of this data along with the reasons for choosing this method for obtaining the data, and some of the problems encountered in detail. The second part of this chapter provides a descriptive and statistical analysis of the English loanwords in the UHA dataset with specific respect to consonantal changes and syllable structure adaptations. The results of this analysis will be discussed within the two theoretical frameworks (the TCRS-LM and OT) in the next chapters. Recalling the current research goals, it aims to:

1. State the different consonantal adaptations of English consonants that are absent in UHA phonology and attested in the UHA loanword data, such as voicing, devoicing, substitutions of certain consonants.
2. Find out the various phonological adaptations of illicit syllable structures in the UHA loanword dataset, by examining the epenthesis of consonants as well as vowels.
3. Analyse the attested consonantal alterations and syllabic adaptations within two phonological theories: TCRS-LM and OT.
4. Discuss the differences between the two frameworks in predicting the phonological adaptations whether at the consonantal or syllabic level in the UHA loanword dataset.

4.2. Sources of the present study data

As has been examined in the literature background, most of the previous work on loanword phonology bases the research on data collected from dictionaries of various types, especially if the work concentrated on discussing loanwords from theoretical perspectives. Some of these studies relied on dictionaries that are specifically about loanwords such as Lee's (2003) study of the phonology of loanwords in Korean, on which he based the analysis on data taken from a loanword dictionary along with other sources. Alternatively, other works might depend on the recipient language dictionaries, as in the work of Ulrich (1997) on Lama loanwords, which indicates that a corpus of 614 loanwords collected from Lama's dictionary was the basis of analysis. Equally are Uffmann's (2014) study of Shona loanwords in the Standard Shona Dictionary (Hannan 1984), and Galal's (2004) research on Cairene Arabic on the Egyptian Arabic Dictionary (Hinds and Badawy 1986). Otherwise, some linguists extracted their data from dictionaries of both the donor and the recipient language, for instance Brasington's (1997) study of Marshallese loanwords based on the Marshallese-English Dictionary (Abo et al. 1976) and Adler's (2006) study of Hawaiian loanwords on the Hawaiian-English dictionary (Pukui and Elbert 1979). Other studies use data that has been formally obtained and analysed by other linguists, such as Rose (1999) basing his analysis of syllable structure adaptations of Fula loanwords on the studies of both Lebel (1994) and Paradis and LaCharité (1997). Similarly, Uffmann (2014) relies on Chimhundu's (1983) study. Moreover, other studies carried out their own experiments in order to obtain the data by using the on-line adaptations, such as Adler (2006) on Hawaiian loanwords and Jarrah (2013) on MHA loanwords. In some studies, proper names from the donor language might be used along with the loanword list that is collected from dictionaries, for instance, the two studies of Ulrich (1997) and Dohlus (2010). Along these same lines, the UHA loanword data is similarly compiled from different published sources along with a data collection exercise; the first two significant sources are Abdul-Rahim (2011), a dictionary of loanwords into Arabic, the other one is the data collected by Jarrah (2013) adopting the on-line adaptation and lastly, the Oxford English Dictionary (OED) was used.

4.2.1. Data Source 1: Abdul-Rahim (2011)

One of the major sources for the present study is the dictionary of integrated words (loanwords) into Arabic which is the work of Abdul-Rahim (2011) entitled *Mu'jm al-Dkhil fi al-Lughah al-Arabiyyah al-Haditha wa Lahjatiha*, which is a dictionary of integrated words into MSA and its dialects (Hijazi, Saudi, Egyptian, Palestinian and Syrian) from languages such as Latin, Greek, French, English, Italian and Turkish. The dictionary includes all the loanwords that are still widely used in MSA and its dialects, along with loanwords that have never been discussed in other dictionaries. Abdul-Rahim (2011) even indicates whether the loanword is specifically used in MSA or its dialects or even in Classical Arabic. The loanwords in this dictionary are compiled from different sources, for instance published Arabic books, recent Arabic dictionaries along with other languages, media as well as obtaining data from Arabic people from various regions and dialects. The loanwords are presented in this dictionary in Arabic forms and are written in Arabic orthography. This work includes more than 1,600 loanwords in Arabic; to illustrate more, Table 13 categorises the number of loanwords in Arabic and the origin languages, whereas the final one, the 'Others' category, is used to include other languages with minor percentages of loanwords, languages such as Japanese (for instance '*tsunami* and '*karate*'), Indian (*'bohra'*, *'hindol'*), Hebrew (*'kosher'* and *'kneseth'*), Russian ('*duma*' and *'soviet'*), along with loanwords whose origins are still unknown.

Origin Language	Numbers of loanwords	The Percentage
English	**471**	**29.4%**
Turkish	403	25.18%
French	251	15.68%
Others	135	8.4%
Italian	115	7.18%
Persian	84	5.25%
Greek	73	4.5%
Latin	36	2.25%
Spanish	25	1.56%
German	10	0.6%
Total	1600	100%

Table 13: Abdul-Rahim's (2011) dictionary of loanwords

The statistics presented in Table 1, is done by the researcher in order to show the percentages of loanwords integrated from English into Arabic remains between highly significant in contrast with other languages. Based on Table 13, the English language can be clearly considered as the main source of loanwords in Arabic and its dialects in comparison with other languages, with the highest percentage of 29.4%. In light of this information, this might clearly imply the reason for selecting English as the donor language, as the largest number of loanwords in Arabic come from this language alone, and it obviously provides clear evidence why the current study focuses specifically on this language. Since the focus of this study is the investigation of loanwords that have been integrated from English into UHA, Abdul-Rahim's (2011) dictionary was searched comprehensively for loanwords from English that are used in UHA, and other English loanwords that are specifically used in other Arabic dialects were avoided. Eventually a list of 124 English words was obtained, as some repetitions of the loanwords are neglected that were found either to be the alternative pronunciation of a word in another dialect or the suffixing of the same word to create a new one. Indeed, due to the study limitations, not all these loanwords are used in the study data since many of these loanwords involve only vowel alterations with no consonantal or syllabic adaptations. Such loanwords were not included in the study data final list, so the total number of loanwords extracted from Abdul-Rahim's (2011) dictionary is 31 words.

4.2.2. Data Source 2: Jarrah (2013)

To date, the study conducted by Jarrah (2013) is the most recent work on UHA loanwords, in which he examines English loanwords in Madina Hijazi Arabic (MHA), Although Jarrah (2013) states that his study investigates English loanwords specifically in MHA, it still can be clearly considered as Urban Hijazi Arabic (UHA), since Madina is one of the Hijazi regions and different from Bedouin Hijazi Arabic (BHA). Indeed, Jarrah (2013) obtained the study data of nearly 200 words from subjects who live in Madina City, through interviews, and they were native speakers of different ages and education levels. The procedure of Jarrah's (2013) study was firstly to ask the subjects to write the loanwords on paper then pronounce them; the subjects' pronunciations were recorded and eventually transcribed for analysis. The interesting aspect about Jarrah's (2013) study is it provides the phonetic transcription of the data used, which provides the data for determining the changes at the segmental and syllable structure levels.

Jarrah (2013) investigates the loanwords using Optimality Theory (Prince and Smolensky (1993) and Rice (2006)). The study focuses on discussing the adaptation of syllable structure without analysing the segmental changes that are found in the data. It only presents some segmental alterations that were the adaptations of the two sounds /p/ and /v/ into /b/ and /f/ respectively, and the change of /ʧ/ into /ʃ/. In the discussion of syllable structure and stress assignment, the study concludes that MHA speakers tend to use the epenthesis of glottal stop [ʔ] in the adaptation of onset-less syllables and the epenthesis of vowels in the treatment of consonant clusters. Although Jarrah's (2013) study investigates the adaptation of phonological loanwords briefly, the current study examines the data via more comprehensive analysis using the TCRS-LM in contrast with the OT framework. The data of the study is another source for the UHA loanword data. This work yields 21 loanwords that are used in the UHA loanword dataset.

4.2.3. Data Source 3: The Oxford English Dictionary

The online Oxford English Dictionary (OED) was used to consult the phonetic transcription of the word. It actually presents two transcriptions, that is the British and the American versions, though it is necessary to decide one accent in order to have adequate results for analysis, so only the British transcription was considered.

4.2.4. Data Source 4: Data Collection Exercise

The data collection exercise is conducted in order to include some new data, which would allow the present study to confirm the accuracy of the other two sources. It based on a list of established loanwords, which was extracted from various Arabic dictionaries. The established loanwords were used to provide a complete picture of the adaptation processes and it has been largely used in the investigation of loanword adaptation (such as Dohlus 2010). Eventually, a list of 48 words was extracted from these dictionaries as each of these English words has sound patterns that are not compatible with UHA phonology. The reason for having a limited number of words at this stage is to make it easy for use in designed software for the data collection exercise, as each word will be tested alone and to avoid the participant from losing interest. The data collection exercise subjects were four speakers of UHA aged between 19 and 40 years who willingly participated in the exercise. With regard to the participants' qualifications, all of the four had not completed their education, as some of them had only finished their elementary school and had little knowledge of English so they did not have full access to its phonology. It was particularly difficult to find participants who have no background of English at all. Furthermore, the subjects do unskilled jobs as some of them are workers in Madinah Mall while the rest are currently unemployed. The rationale for selecting this types of informants with these characteristics is to rule out any effect that might come from college education or working highly skilled jobs that demand high English proficiency. Moreover, none of the participants has any hearing or speech production difficulties. Table 14 provides details of the UHA participants in the data collection exercise. Hence the data collection exercise involves personal contact and consequently, the subjects were not anonymous to the researcher, they were treated with anonymity and confidentiality. They also were informed that their personal details would remain anonymous and confidential. Furthermore, informed consent was obtained from the subjects before conducting the exercise for ethical purposes (Appendix 1 & 2).

The Participant	**Gender**	**Age**	**Job**	**Educational Level**
Participant 1	Male	19	Unemployed	Elementary
Participant 2	Female	39	Unemployed	Elementary (not completed)
Participant 3	Male	30	Worker	Elementary
Participant 4	Male	36	Worker	Elementary

Table 14: Details of the UHA participants in the data collection exercise

Concerning the procedure of the data collection exercise, it was designed in such a way as to avoid the potential influence of orthography since UHA is a spoken dialect. Furthermore, it was carried out using a laptop in which there is software that was designed by a specialist in computer science to implement it for the exercise. This software presents 48 pictures and questions. The task was divided into two phases (identifying 42 pictures and answering 6 questions). The data collection exercise software is presented as a way to test their knowledge and memory. The reason for this is to avoid the observer's paradox. Also, the participant has to respond to the given task orally, and eventually the software recorded their answers. The software recorded their responses before proceeding to the second screen and so on, as each screen will present one picture or question. Each participant was tested alone in a quiet environment (public place) with very little or no outside sound. All the instructions were given in Arabic to the participants, as were their responses.

The first indication of the data collection exercise to the current research is documenting the existence of the various phonological adaptations of English loanwords in UHA, which conform to the accuracy of the other study sources. By examining these phonological changes, two main adaptations were found in the results of the data collection exercise subjects, consonantal changes as well as syllabic adaptations. The results of how the UHA subjects treat the English consonants in the adaptation of loanwords are classified in Table 15. Concerning the consonantal realisations, the result of the data collection exercise as shown in the table below indicates that the various adaptations of English consonants to their close counterparts are more preferable than importing (only for the affricates) or deleting them (no cases) in UHA. The consonantal changes that English loanwords undergo were voicing (the plosive /p/), devoicing (the fricative /v/) and substitution (the affricates /ʤ/ and /ʧ/). One of the most remarkable findings of the data collection exercise is revealing the lexical variation in the adaptation of the English fricative /v/ into /f/, /b/ or /w/, which is still interesting no matter how less frequent these consonantal adaptations in UHA. Another interesting finding of the data collection exercise is showing the importation cases of the English affricates in UHA loanwords.

The consonants	Occurrences	UHA realisations (4 subjects)	Percentage
/p/	17	/b/ (68/68)	100%
/v/	14	/f/ (36/56)	64.3%
		/w/ (12/56)	21.4%
		/b/ (8/56)	14.3%
/ʤ/	6	/ʤ/ (4/24)	17%
		/ʒ/ (20/24)	83%
/ʧ/	5	/ʧ/ (4/20)	20%
		/ʃ/ (16/20)	80%
Total	42		

Table 15: The various realisations of English Consonants by UHA Speakers

The results of the data collection exercise also show different syllabic adaptation of English loanwords in UHA. The attested syllabic adaptations that were found in UHA are consonant insertion, and vowel epenthesis with no deletion. Certain English sequences that are found in the loanwords cause problems for UHA speakers and cause them to apply some strategies. These syllable sequences are onset-less syllable and onset cluster that always treated by adaptation (segments epenthesis) but not deletion by UHA speakers. In this regard, Table 16 categorised these illicit syllable sequences in respect to the attested procedure applied in their adaptation whether the insertion of consonants (the glottal stop or the glide) or vowels or consonants and vowels at the same time. Among these disallowed English sequences in UHA is the initial vowel, which is treated with the insertion of glottal stop, though it is not the only case for inserting the /ʔ/ initially. It is also spotted to break up initial consonant clusters, namely sC or sCC clusters. The final syllabic adaptation is the epenthesis of a vowel in order to break up disallowed onset clusters. UHA speakers tend to epenthesise a vowel to break up a disallowed onset cluster rather than deleting a segment. Within the syllabic adaptations, some preferences emerged: the epenthesis of a consonant, which can be identified as the most frequent change and the epenthesis of a vowel the less frequent one. Essentially, this data collection exercise has detected both the consonantal and syllabic adaptations that English loanwords undergo in UHA prior proposing any theoretical analysis in clarifying these phonological patterns.

The illicit syllable sequence	Occurrences	C Epenthesis (4 subjects)	V Epenthesis (4 subjects)	C+V Epenthesis (4 subjects)
Initial onset-less syllable	10	(40/40) 100%	(0/40) 0%	(0/40) 0%
Medial onset-less syllable	3	(12/12) 100%	(0/12) 0%	(0/12) 0%
Onset CC cluster	5	(0/20) 0%	(16/20) 8%	(4/20) 20%
Onset CCC cluster	2	(0/8) 0%	(4/8) 50%	(4/8) 50%
Total	**20**			

Table 16: The Various syllabic adaptation of English loanwords by UHA speakers

4.3. Data compilation

The present study sources Abdul-Rahim (2011) and Jarrah's (2013) study of MHA along with the data collection exercise provide a list of 100 loanwords, particularly, the distribution of the present study loanword data according to their sources is illustrated in Table 17. It was important to include Madinah Arabic sources (Jarrah 2013) in a study on UHA since that they share these words besides the fact that MHA it still can be clearly considered as Urban Hijazi Arabic (UHA), given that Madina is one of the Hijazi regions and different from Bedouin Hijazi Arabic (BHA). Furthermorwe, the data collection exercise supports the use of some of these words. Additionally, the final list of English loanwords into UHA that will be used in the analysis of this study are provided in Table 18:

Data Source	Total	Percentage
Data Collection Exercise	48	48%
Abdul-Rahim (2011)	31	31%
Jarrah (2013)	21	21%
Total	100	100%

Table 17: Classification of the study data by sources

No	Gloss	British	UHA	Source
1.	accordion (n)	/əˈkɔː.dɪ.ən/	/ʔɑkuːrdijun/	Abdul-Rahim (2011)
2.	adrenalin (n)	/əˈdrɛnəlɪn/	/ʔɑdrinili:n/	Abdul-Rahim (2011)
3.	agenda (n)	/əˈdʒɛn.də/	/ʔɑʒindɑ/	Abdul-Rahim (2011)
4.	ammonium (n)	/əˈməʊ.nɪ.əm/	/ʔɑmuːnijum/	Abdul-Rahim (2011)
5.	bronze (n)	/brɒnz/	/burunz/	Abdul-Rahim (2011)
6.	calcium(n)	/ˈkæl.sɪ.əm/	/kɑlsiːjum/	Abdul-Rahim (2011)
7.	caravan(n)	/ˈkærə**v**æn/	/kɑːrɑ**f**ɑn/	Abdul-Rahim (2011)
8.	freezer (n)	/ˈfriː.zə(r)/	/firiːzɑr/	Abdul-Rahim (2011)
9.	helium (n)	/ˈhiː.lɪ.əm/	/hiːlijum/	Abdul-Rahim (2011)
10.	hydrogen(n)	/ˈhaɪ.drə.ʤən/	/hidruʒiːn/	Abdul-Rahim (2011)
11.	ion (n)	/ˈʌɪ.ɒn/	/ʔɑjuːn/	Abdul-Rahim (2011)
12.	judo(n)	/ˈdʒuː.dəʊ/	/ʒuːdu/	Abdul-Rahim (2011)
13.	jug(n)	/ʤʌg/	/ʒɑk/	Abdul-Rahim (2011)
14.	kremlin(n)	/ˈkrɛm.lɪn/	/kirimlɪːn/	Abdul-Rahim (2011)
15.	neon (n)	/ˈniː.ɒn/	/nijun/	Abdul-Rahim (2011)
16.	nitrogen(n)	/ˈnʌɪ.trə.dʒ(ə)n/	/nitruːʒiːn/	Abdul-Rahim (2011)
17.	ozone (n)	/ˈəʊ.zəʊn/	/ʔuzuːn/	Abdul-Rahim (2011)
18.	panda (n)	/ˈpan.də/	/bɑndɑ/	Abdul-Rahim (2011)
19.	pence(n)	/pɛns/	/bins/	Abdul-Rahim (2011)
20.	phobia (n)	/ˈfəʊ.bɪ.ə/	/fuːbijɑ/	Abdul-Rahim (2011)
21.	piano (n)	/pɪˈan.əʊ/	/bijɑːnuː/	Abdul-Rahim (2011)
22.	professor (n)	/prəˈfɛsə/	/burufisuːr/	Abdul-Rahim (2011)
23.	shilling (n)	/ˈʃɪ.lɪŋ/	/ʃilin/	Abdul-Rahim (2011)
24.	squash (n)	/skwɒʃ/	/ʔiskwɑʃ/	Abdul-Rahim (2011)
25.	sterling (adj)	/ˈstɜː.lɪŋ/	/ʔistɑrliːni/	Abdul-Rahim (2011)
26.	trailer (n)	/ˈtreɪ.lə(r)/	/tirɑlɑ/	Abdul-Rahim (2011)
27.	trillion (n)	/ˈtrɪ.ljən/	/tiriljuːn/	Abdul-Rahim (2011)
28.	vaseline (n)	/ˈ**v**æsəliːn/	/**f**ɑːzliːn/	Abdul-Rahim (2011)
29.	vatican (n)	/ˈ**v**ætɪkən/	/**f**ɑːtiːkɑːn/	Abdul-Rahim (2011)
30.	veto (n)	/ˈviː.təʊ/	/fiːtuː/	Abdul-Rahim (2011)
31.	massage(n)	/ˈmasɑːdʒ/	/mɑsɑːdʒ/	Abdul-Rahim (2011)
32.	april (n)	/ˈeɪ.pr(ɪ)l/	/ʔibriːl/	Jarrah (2013)
33.	aspirin (n)	/ˈæs.pɪrɪn/	/ʔisbiriːn/	Jarrah (2013)
34.	bacteria (n)	/bækˈtɪə.rɪ.ə/	/bʌktirija/	Jarrah (2013)
35.	battery(n)	/ˈbæt.ər.ɪ/	/batarja/	Jarrah (2013)
36.	block (v)	/blɒk/	/buluk/	Jarrah (2013)
37.	break (n)	/breɪk/	/birɜːk/	Jarrah (2013)
38.	cafeteria (n)	/kæ.fəˈ.tɪə.rɪ.ə/	/kʌfatirija/	Jarrah (2013)
39.	christmas(n)	/ˈkrɪs.məs/	/kirismas/	Jarrah (2013)
40.	clutch(n)	/klʌʧ/	/kælʌʧ/	Jarrah (2013)
41.	cream (n)	/kriːm/	/kiriːm/	Jarrah (2013)
42.	flash (n)	/flæʃ/	/filaːʃ/	Jarrah (2013)
43.	fresh (adj)	/frɛʃ/	/firiʃ/	Jarrah (2013)
44.	lamp (n)	/læmp/	/lʌmba/	Jarrah (2013)
45.	plastic (n)	/ˈplas.tɪk/	/bilaːstic/	Jarrah (2013)
46.	shampoo (n)	/ʃæmˈpuː/	/ʃʌmbo/	Jarrah (2013)
47.	skater (n)	/ˈskeɪ.tə(r)/	/ʔisikietʌr/	Jarrah (2013)
48.	street (n)	/striːt/	/ʔistireet/	Jarrah (2013)
49.	vanilla (n)	/vəˈnɪlə/	/fanila/	Jarrah (2013)
50.	vase (n)	/vɑːz/	/fɑːzɑ/	Jarrah (2013)

51.	villa (n)	/ˈvɪlə/	/filla/	Jarrah (2013)
52.	virus (n)	/ˈvʌɪ.rəs/	/firuːs/	Jarrah (2013)
53.	aerial (n)	/ˈɛː.rɪəl/	/ʔɑːr.jɑːl/	Data Collection Exercise
54.	album (n)	/ˈal.bəm/	/ʔalbuːm/	Data Collection Exercise
55.	anemia (n)	/əˈniː.mɪ.ə/	/ʔɑniːmijɑ/	Data Collection Exercise
56.	asphalt (n)	/ˈæs.fælt/	/ʔɑsfilt/	Data Collection Exercise
57.	atlas (n)	/ˈæt.ləs/	/ʔɑtˤlɑs/	Data Collection Exercise
58.	avocado (n)	/æ.vəʊˈkɑː.dəʊ/	/ʔɑfuːkɑːduː/	Data Collection Exercise
59.	brooch (n)	/brəʊʧ/	/buruːʃ/	Data Collection Exercise
60.	captain (n)	/ˈkæp.tɪn/	/kɑːbtin/	Data Collection Exercise
61.	chat (n)	/ʧæt/	/ʃɑːt/	Data Collection Exercise
62.	chips (n)	/ʧɪps/	/ʃibs/	Data Collection Exercise
63.	computer (n)	/kəmˈpjuː.tə/	/kumbjuːtɑr/	Data Collection Exercise
64.	cover (n)	/ˈkʌv.ə(r)/	/kɑ.fɑr/	Data Collection Exercise
65.	cup (n)	/kʌp/	/kuːb/	Data Collection Exercise
66.	express (adj)	/ɛkˈsprɛs/	/ʔɪksibris/	Data Collection Exercise
67.	helicopter (n)	/ˈhɛlɪkɒptə(r)/	/hilikobtʌr/	Data Collection Exercise
68.	ice cream (n)	/ˈʌɪs ˌkriːm /	/ʔiskiriːm/	Data Collection Exercise
69.	inch (n)	/ɪnʧ/	/ʔinʃ/	Data Collection Exercise
70.	jacket (n)	/ˈʤæ.kɪt/	/ʒakjiːt/	Data Collection Exercise
71.	jeans (n)	/ʤiːnz/	/ʒinz/	Data Collection Exercise
72.	jelly (n)	/ˈdʒɛlɪ/	/ʒiːli/	Data Collection Exercise
73.	jumbo (n)	/ˈʤʌm.bəʊ/	/ʒɑmbuː/	Data Collection Exercise
74.	ketchup (n)	/ˈkɛʧ.ʌp/	/kɑːʧɑb/	Data Collection Exercise
75.	lava (n)	/ˈlɑː.və/	/lɑːbɑ/	Data Collection Exercise
76.	message (n)	/ˈmɛ.sɪʤ/	/mɑssiʤ/	Data Collection Exercise
77.	nervous (n)	/ˈnəː.vəs/	/nɑrfɑzɑ/	Data Collection Exercise
78.	overall (n)	/ˈəʊ.və.rɔːl/	/ʔɑfruːl/	Data Collection Exercise
79.	packet (n)	/ˈpækɪt/	/bɑːkɑt/	Data Collection Exercise
80.	parachute (n)	/ˈparəʃuːt/	/bɑːrɑʃuːt/	Data Collection Exercise
81.	petrol (n)	/ˈpɛt.r(ə)l/	/bit.ruːl/	Data Collection Exercise
82.	police (n)	/pəˈlis/	/boliːs/	Data Collection Exercise
83.	poster (n)	/ˈpəʊstə(r)/	/buːstɑr/	Data Collection Exercise
84.	powder (n)	/ˈpaʊ.də/	/bɔːdræ/	Data Collection Exercise
85.	projector (n)	/prəˈdʒɛk.tə/	/buruːʒiktur/	Data Collection Exercise
86.	protein (n)	/ˈprəʊ.tiːn/	/brutiːn/	Data Collection Exercise
87.	receiver (n)	/rɪˈsiː.və/	/risiːfʌr/	Data Collection Exercise
88.	reverse (v)	/rɪˈvəːs/	/rɑwɑs/	Data Collection Exercise
89.	save (v)	/seɪv/	/sɑːf/	Data Collection Exercise
90.	shovel (n)	/ˈʃʌv.(ə)l/	/ʃɑ.wɑl/	Data Collection Exercise
91.	sodium (n)	/ˈsəʊ.dɪ.əm/	/sˤuːdijum/	Data Collection Exercise
92.	soya (n)	/ˈsɔɪ.ə/	/sˤuːjɑː/	Data Collection Exercise
93.	spray (n)	/spreɪ/	/ʔisbirɑː/	Data Collection Exercise
94.	sticker (n)	/ˈstɪ.kə(r)/	/ʔistikɑr/	Data Collection Exercise
95.	telescope (n)	/ˈtɛlɪskəʊp/	/tiliskoːb/	Data Collection Exercise
96.	vacuum-brake (n)	/ˈvæk.jʊəm breɪk/	/bɑːkim/	Data Collection Exercise
97.	van (n)	/væn/	/fɑːn/	Data Collection Exercise
98.	varnish (n)	/ˈvɑː.nɪʃ/	/wɑːrniːʃ/	Data Collection Exercise
99.	visa (n)	/ˈviː.zə/	/fiːzɑː/	Data Collection Exercise
100	volt (n)	/vɒlt/	/fuːltˤ/	Data Collection Exercise

Table 18: The Final list of English loanwords in UHA

4.4. Descriptive and statistical analysis of the data

As this study aims to explore the consonantal and syllable structure adaptation within two theoretical frameworks that are the TCRS-LM and OT, it is essential to provide a descriptive and statistical analysis of UHA loanword dataset with respect to these alterations. The results will be analysed in the following chapters. After examining the study dataset, the data provides strong evidence that English loanwords have been adapted segmentally and phonotactically into UHA. For the sake of clarity, the discussion and analysis of these adaptations will be distributed into two main sections. The first section will focus on the consonantal adaptation, whereas the second will deal with syllable structure adaptations.

4.4.1. Consonantal adaptation

The study data reveals different adaptations in English consonants in UHA loanwords. Table 19 presents all the consonant alterations that are found in the dataset. Based on the data, the adaptation always found in English consonants that the UHA consonantal inventory lacks as native phonemes (such as /p/, /v/, /ʤ/, /ʧ / and /ŋ/).

Category	English Phoneme	UHA realisations
Plosive	/p/	[b]
Fricative	/v/	[f] [b] [w]
Affricates	/ʤ/ /ʧ/	[ʤ] [ʒ] [ʧ] [ʃ]
Nasal	/ŋ/	[n]

Table 19: Outline of the UHA realisations of English consonants

The two inventories of UHA and English are provided in **Chapter III** for further comparison. The UHA inventory lacks the voiced fricative /v/, the voiceless plosive /p/, velar nasal /ŋ/ and the two affricates /ʧ/ and /ʤ/, despite the fact that its segmental inventory has more consonants in contrast to English. Statistically, Table 20 presents a classification of each English /p/, /v/, /ʧ/, /ʤ/ and the /ŋ/, along with overall frequencies and percentages of their occurrences in the UHA loanword dataset, and shows in details the various realisations of these consonants. Interestingly, The UHA loanword data shows a clear diversity in the selection of the correspondence segments, and each of these segments will be discussed individually with the relative examples from the UHA loanword dataset.

The consonants	Occurrences	Adaptations	Percentage
/p/	26	/b/ 26 cases	100%
/v/	22	/f/ 17 cases	77%
		/w/ 3 cases	14%
		/b/ 2 cases	9%
/ŋ/	2	/n/ 2 cases	100%
/ʤ/	12	/ʒ/ 10 cases	83%
/ʧ /	6	/ʃ/ 4 cases	67%
Total	59		

Table 20: The Various realisations of English Consonants in UHA loanword data

The most widely attested segmental adaptation in UHA loanword data is the voicing of consonants, which is mainly the modification of the sound from a voiceless to a voiced segment. This phonological change is emerged in the adaptation of obstruent consonants that UHA inventory lacks as in the systematic adaptation of the labial plosive /p/ into its voiceless equivalent the /b/. Consider the examples of this adaptation given in (47):

(47) The voicing of /p/: English /p/ ➔ UHA /b/

Gloss		English	UHA
1.	‘panda’	/ˈ**p**an.də/	/**b**ɑndɑ/
2.	‘parachute’	/ˈ**p**arəʃuːt/	/**b**ɑːrɑʃuːt/
3.	‘captain’	/ˈkæ**p**.tɪn/	/kɑː**b**tin/
4.	‘chips’	/ʧɪ**p**s/	/ʃi**b**s/
5.	‘cup’	/kʌ**p**/	/kuː**b**/
6.	‘telescope’	/ˈtɛlɪskəʊ**p**/	/tiliskoː**b**/

Conversely, there is another phonological alteration that is related to laryngeal feature that is the devoicing of consonants, in which the sound is change from voiced into voiceless. Similarly, this segmental change is only found in the adaptation of obstruent consonants, for instance in the adaptation of the labiodental fricative /v/ into its voiceless equivalent the /f/ in the majority of UHA loanwords that contain this segment, more particularly, in 77% of the cases, examples of this adaptation into /f/ are provided in (48):

(48) The devoicing of /v/: English /v/ ➔ UHA /f/

Gloss		English	UHA
1.	‘van’	/**v**æn/	/**f**ɑːn/
2.	‘visa’	/ˈ**v**iː.zə/	/**f**iːzɑː/
3.	‘avocado’	/æ.**v**əʊˈkɑː.dəʊ/	/ʔɑ**f**uːkɑːduː/
4.	‘cover’	/ˈkʌ**v**.ə(r)/	/kɑ**f**ɑr/
5.	‘nervous’	/ˈnəː.**v**əs/	/nɑr**f**ɑzɑ/
6.	‘save’	/seɪ**v**/	/sɑː**f**/

Besides the voicing and the devoicing of obstruent consonants, there is another segmental change that is the modification of place of articulation of the segments; this is observed in the adaptation of the nasal /ŋ/. This velar nasal is adapted by changing the velar into alveolar as it become the alveolar nasal /n/. The adaptation of the velar nasal /ŋ/ into the alveolar /n/ is found in all the cases that contains this segment, consider the examples in (49):

(49) The adaptation of /ŋ/: English /ŋ/ ➔ UHA /n/

Gloss		**English**	**UHA**
1.	‘shilling’	/ˈʃɪ.lɪ**ŋ**/	/ʃili**n**/
2.	‘sterling’	/ˈstɜː.lɪ**ŋ**/	/ʔistɑrliː**n**i/

A final observation in the adaptation of segments found in UHA loanword data, which involve modification of the manner feature is the adaptation of the two English affricates /ʤ/ and /ʧ/ into the fricatives /ʒ/ and /ʃ/, respectively. In fact, the two affricates when they are adapted are systematically changed into respectively the fricative consonants /ʒ/ and /ʃ/, as shown in the examples for this adaptation presented in (50) and (51), accordingly:

(50) The adaptation of /ʧ/: English **/ʧ/** ➔ UHA /ʃ/

Gloss		**English**	**UHA**
1.	‘chips’	/**ʧ**ɪps/	/**ʃ**ibs/
2.	‘chat’	/**ʧ**æt/	/**ʃ**ɑːt/
3.	‘brooch’	/brəʊ**ʧ**/	/buruː**ʃ**/
4.	‘inch’	/ɪn**ʧ**/	/ʔin**ʃ**/

(51) The adaptation of /ʤ/: English /ʤ/ ➔ UHA /ʒ/

Gloss		**English**	**UHA**
1.	‘jug’	/**dʒ**ʌg/	/**ʒ**ɑk/
2.	‘jeans’	/**dʒ**iːnz/	/**ʒ**inz/
3.	‘jumbo’	/ˈ**dʒ**ʌm.bəʊ/	/**ʒ**ɑmbuː/
4.	‘agenda’	/əˈ**dʒ**ɛn.də/	/ʔɑ**ʒ**indɑ/
5.	‘projector’	/prəˈ**dʒ**ɛk.tə/	/buruː**ʒ**iktur/
6.	‘nitrogen’	/ˈnʌɪ.trə.**dʒ**(ə)n/	/nitruː**ʒ**iːn/

Besides these types of modification of manner feature, there is another type in which fricative is changed into stop that is the adaptation of the fricative /v/ into the stop /b/ in relatively few cases, in just 9% of the cases, the examples of this change in (52) is actually the only cases where this adaptation is attested:

(52) The adaptation of /v/: English /v/ ➔ UHA /b/

Gloss		English	UHA
1.	'vacuum-brake'	/ˈ**v**æk.jʊəm breɪk/	/**b**ɑːkim/
2.	'lava'	/ˈlɑː.**v**ə/	/lɑː**b**ɑ/

Indeed, the fricative /v/ is additionally adapted into the approximant /w/ in only 14%, as this adaptation involve change from obstruent into continuant, consider the examples of this adaptation in (53) as it the only cases in UHA loanword data:

(53) The adaptation of /v/: English /v/ ➔ UHA /w/

Gloss		English	UHA
1.	'varnish'	/ˈ**v**ɑː.nɪʃ/	/**w**ɑːrniːʃ/
2.	'reverse'	/rɨˈ**v**əːs/	/rɑ**w**ɑs/
3.	'shovel'	/ˈʃʌ**v**.(ə)l/	/ʃɑ**w**ɑl/

4.4.2. Syllable structure adaptation

Similar to the segmental changes, it is significant to state the general phonotactic adaptations that have been discovered in the UHA loanwords dataset. By examining the data, it might be possible to get a clear overview of the general adaptation that English loanwords have undergone in UHA, in order to conform to its phonotactics and syllable structure constraints. Particularly, three basic adaptations are found in the UHA loanword data, the epenthesis of consonants or vowels or lastly the epenethesis of consonants and vowels. Each one is examined separately with relevant examples from the data.

The illicit syllable sequence	Occurrences	C Epenthesis	V Epenthesis	C+V Epenthesis
Initial onset-less syllable	19	(19) 100%	(0) 0%	(0) 0%
Medial onset-less syllable	14	(14) 100%	(0) 0%	(0) 0%
Onset CC cluster	21	(18) 86%	(0) 0%	(3) 14%
Onset CCC cluster	3	(0) 0%	(1) 33%	(2) 67%
Total	**57**			

Table 21: The Various syllabic adaptation of English loanwords in UHA dataset

In Table 21, four types of illegal syllable sequences are shown, along with a number of their occurrences and the adaptation strategies (epenthesis of consonant, vowel or vowel and consonant) that are observed in UHA loanword data. Throughout the UHA loanword dataset, the epenthesis of segments (consonants and vowels) has been always applied to adapt problematic syllable structure into UHA instead of deletion. As demonstrated in Table 19, the epenthesis of consonant is much higher in contrast with the epenthesis of vowel. Additionally, consonant epenthesis, the glottal stop and the glides are found to be the only inserted consonants in adapting illicit syllable patterns in UHA loanword dataset. Concerning the epenthesis of the /ʔ/, it is mainly attested in adapting initial onset-less syllable patterns. This type of syllable pattern is one of the illegal structures in UHA language. It indicates that UHA selects to epenthesise a consonant (the glottal stop) instead of deleting the initial vowel in adapting onset-less syllable structure; consider the examples of this insertion in (54):

(54) The epenthesis of /ʔ/ before initial onset-less syllable patterns

Gloss	**English**	**UHA**
1. ‘ice cream’	/ˈ**ʌɪ**s ˌkriːm /	/**ʔ**iskiriːm/
2. ‘agenda’	/**ə**ˈdʒɛn.də/	/**ʔ**ɑʒindɑ/
3. ‘atlas’	/ˈ**æt**.ləs/	/**ʔ**ɑtˤlɑs/
4. ‘aerial’	/ˈ**ɛː.r**ɪəl/	/**ʔ**ɑːr.jɑːl/

5. ‘avocado’	/**æ**.vəʊˈkɑː.dəʊ/	/**ʔ**ɑfuːkɑːduː/
6. ‘inch’	/**ɪntʃ**/	/**ʔ**inʃ/

Besides the epenthesis of the glottal stop, there is another insertion of consonants in UHA loanword data that is insertion of the glide /j/. The palatal approximant /j/ is always inserted intervocalically before onset-less syllable, consider the examples given in (55) for this case of the /j/ epenthesis in UHA loanword dataset:

(55) The epenthesis of the glide /j/ intervocalically

Gloss	English	UHA
1. ‘helium’	/ˈhiː.lɪ.**əm**/	/hiːli**jum**/
2. ‘phobia’	/ˈfəʊ.bɪ.**ə**/	/fuːbi**jɑ**/
3. ‘cafeteria’	/kæ.fəˈ.tɪə.rɪ.**ə**/	/kʌfatiri**ja**/
4. ‘bacteria’	/bækˈtɪə.rɪ.**ə**/	/bʌktiri**ja**/
5. ‘sodium’	/ˈsəʊ.dɪ.**əm**/	/sˤuːdi**jum**/
6. ‘neon’	/ˈniː.**ɒn**/	/ni**jun**/

The second type of epenthesis is the insertion of vowels in order to syllabify illicit consonant clusters in UHA phonology. The first illegal consonant cluster is the onset cluster of CC type when it comes word initially. The position of the vowel in this consonant cluster depends fundamentally on the type of consonants that the cluster is comprised of, in which the vowel is either inserted internally or externally. The first type of vowel epenthesis is internally. That means after the first consonant, more specifically when the first consonant is either one of the following obstruent stops [p, t, k, b] or the fricative [f] while the second one is one of the sonorant liquids [l, r], consider the examples of this insertion given in (56), as they demonstrate different types of CC clusters:

(56) Internal epenthesis of V in initial CC clusters

Gloss		English	UHA
1.	‘trailer’	/ˈ**tr**eɪ.lə(r)/	/tirɑlɑ/
2.	‘fresh’	/**fr**ɛʃ/	/firiʃ/
3.	‘flash’	/**fl**æʃ/	/filaːʃ/
4.	‘kremlin’	/ˈ**kr**ɛm.lɪn/	/kirimlɪːn/
5.	‘break’	/**br**eɪk/	/birɜːk/
6.	‘block’	/**bl**ɒk/	/buluk/
7.	‘professor’	/**pr**əˈfɛsə/	/burufisuːr/
8.	‘clutch’	/**kl**ʌʧ/	/kælʌʧ/
9.	‘plastic’	/ˈ**pl**as.tɪk/	/bilaːstic/

Interestingly, not all initial consonant clusters are adapted by internal epenthesis of the vowel; there are some cases in which the vowel is inserted externally, more precisely, when the cluster is a combination of the obstruent fricative the /s/ as the first consonant and the obstruent stop the /t/ and /k/. In fact, with the newly inserted vowel, the initial syllable still need a further epenthesis as this insertion of the vowel create a new onset-less syllable which is illicit in UHA phonology and demand the epenthesis of the glottal stop, consider the cases presented in (57) which are the only instances for this special epenthesis:

(57) The external epenthesis of the vowel before initial CC clusters

Gloss		English	UHA
1.	‘skater’	/ˈ**sk**eɪ.tə(r)/	/**ʔis**ikietʌr/
2.	‘sterling’	/ˈ**st**ɜː.lɪŋ/	/**ʔis**tɑrliːni/
3.	‘sticker’	/ˈ**st**ɪ.kə(r)/	/**ʔis**tikɑr/

Similarly, initial CCC clusters that are composed of the obstruent fricative the /s/ with the obstruent stop either the /t/ or /p/ and the sonorants /r/ are also adapted with external epenthesis of the vowel and a glottal stop before the newly inserted initial vowel, consider the examples given in (58) that are the only cases for this condition of epenthesis:

(58) The external epenthesis of V in initial CCC clusters

Gloss		English	UHA
1.	'street'	/**str**iːt/	/**ʔis**tireet/
2.	'spray'	/**spr**eɪ/	/**ʔis**birɑː/

Concerning the quality of the inserted vowel, it is found in UHA loanwords that the epenthetic vowel is largely determined by the neighboring vowel. In fact, the copying of the adjacent underlying vowel, generally the following vowel in UHA loanword dataset is essentially attested in the case when the following vowel is either one of the following (/i/, /ɛ/, /ɪ/, /ɒ/, /əʊ/ or /eɪ/) in input, which correspond to /i/, /ɪ/ or /u/ in UHA. Consider the examples of this vowel harmony for the neighboring /i/ presented in (59), while the instances in (60) are for the vocalic spreading of the /u/:

(59) The vowel harmony of the /i/

Gloss		**English**	**UHA**
1.	'fresh'	/frɛʃ/	/f**i**riʃ/
2.	'trillion'	/ˈtrɪ.ljən/	/t**i**riljuːn/
3.	'express'	/ɛkˈsprɛs/	/ʔɪks**i**bris/
4.	'sticker'	/ˈstɪ.kə(r)/	/ʔ**i**stikɑr/
5.	'spray'	/spreɪ/	/ʔ**i**sbirɑː/
6.	'cream'	/kriːm/	/k**i**riːm/

(60) The vowel harmony of the /u/

Gloss		**English**	**UHA**
1.	'bronze'	/brɒnz/	/b**u**runz/
2.	'professor'	/prəˈfɛsə/	/b**u**rufisuːr/
3.	'block'	/blɒk/	/b**u**luk/

4. ‘brooch’	/brəʊʧ/	/b**u**ruːʃ/
5. ‘projector’	/prəˈdʒɛk.tə/	/b**u**ruːʒiktur/
6. ‘protein’	/ˈprəʊ.tiːn/	/b**u**rutiːn/

Nevertheless, not all the cases of vowel epenthesis in UHA loanword data are vocalic spreading of the neighboring vowel. There are cases in which the inserted vowel is the default /i/ which is noticed in the cases demonstrated in (61):

(61) The epenthesis of the default vowel /i/

Gloss	**English**	**UHA**
1. ‘trailer’	/ˈtreɪ.lə(r)/	/t**i**rɑlɑ/
2. ‘break’	/breɪk/	/b**i**rɜːk/
3. ‘flash’	/flæʃ/	/f**i**laːʃ/
4. ‘plastic’	/ˈplas.tɪk/	/b**i**laːstic/

4.5. Concluding remarks

The present study is intended to shed light on the potential adaptation of English loanwords into UHA. As seen in the obtained data from the data collection exercise and the two published sources, Abdul-Rahim’s (2011) dictionary of loanwords and Jarrah’s (2013) recent study on English loanwords into MHA, there is a clear evidence indicating that phonological adaptations of UHA loanwords data do exist. By examining these phonological changes, two main adaptations are found, consonantal and syllabic adaptations. It is possible here to state several generalisations regarding English loanwords in UHA, before analysing these findings within the TCRS-LM and OT in the following chapters. Concerning the consonantal adaptation, the dataset indicates that various adaptations of English consonants are particularly attested for those that the UHA consonantal inventory lacks as native phonemes, such as voicing (the plosive /p/), devoicing (the fricative /v/) and substitution (the affricates /ʤ/ and /ʧ/). The UHA loanword data revealed that the modification of laryngeal features either the voicing or devoicing of consonants is only noticed in the adaptation of obstruent consonants. Additionally, there are other alterations that might occur to either the manner, for instance the adaptation of affricates into fricatives or the place feature such as the change from velar nasal into alveolar consonants. A significant observation has been discovered in the lexical variantion in the adaptation of /v/ into /f/, /b/ or /w/, in UHA loanword data. Additionally, another interesting finding of the data collection exercise is showing the importation cases of the English affricates in UHA loanwords.

Furthermore, the UHA loanword data shows different syllable structure adaptations. The attested changes are the epenthesis of consonant or vowel. Certain English sequences are illegal in UHA, these syllable sequences include initial and medial onset-less syllable, initial and medial onset clusters. Within syllabic adaptations, some preferences emerged: before initial CC and CCC clusters, the epenthesis of a vowel is the most frequent. The most inserted consonant is the glottal stop followed by the palatal glide /j/. The epenthesis of the glottal stop is only observed in the adaptation of initial onset-less syllables. Other consonant epenthesis, is the insertion of the glide /j/ which is mostly used intervocalically in the adaptation of medial onset-less syllable. Vowel epenthesis is basically applied in the adaptation of consonant clusters when it occurs initially or medially. Regarding the adaptation of initial consonant clusters, a vowel is largely inserted internally, though in a few cases the epenthesis occurs externally, more specifically, when the cluster consists of the obstruent fricative the /s/, followed by obstruent stops in case of CC and sonorants in case of CCC clusters, though the initial inserted vowel demands the additional epenthesis of the glottal stop. In medial consonant clusters, the vowel is inserted internally after the first consonant in medial CC clusters.

Evidence from the UHA loanword data reveals that the choice of epenthetic vowel is largely depends on a full copy of a adjacent vowel (following one), that is typically the vocalic spreading of either the /i/ in most of the cases or the /u/. the vocalic spreading of the following vowel in UHA loanword dataset is essentially attested in the case when the following vowel is either one of the following (/i/, /ɛ/, /ɪ/, /əʊ/, or /ɒ/) n input, which correspond to /i/, /ɪ/ or /u/ in UHA. Unlike vowel harmony, the epenthesis of default vowel that is the /i/ is rarely observed in UHA loanword data. These are the main findings that the UHA loanword dataset revealed and surely need an explicit theoretical exploration adopting the theoretical frameworks that widely used in the analysis of loanword adaptation.

CHAPTER V

English Loanwords in UHA: The TCRS-LM Account

5.1. Introduction

This chapter aims to investigate the phonological adaptation of English loanwords into UHA from the perspective of the Theory of Constraints and Repair Strategies Loanword Model (TCRS-LM) proposed by Paradis and LaCharité (1997). It focuses on the analysis of both the consonantal and the syllabic adaptations in the TCRS-LM that are found in the UHA loanword data. The essential aspect of the argument is to determine whether or not the TCRS-LM is capable of predicting the phonological adaptations, whether at the consonantal or syllable structure level, in the UHA loanword data. This involves the evaluation of the TCRS-LM principles and examines the usage of these principles in accounting for the consonantal and syllabic changes. This study shows that TCRS-LM fails to accurately predict various aspects of the phonological adaptations of English loanwords into UHA, specifically: the Minimality Principle will fail to account for the consonantal changes in UHA loanwords while other TCRS-LM principles specifically the Preservation and the Threshold Principles fail on the syllabic one.

The structure of this chapter as follows: Section 5.2 is devoted to the analysis of the phonological adaptations of the UHA loanword data within the TCRS-LM. Section 5.2.1 provides the adopted phonological representation assumptions. Section 5.2.2 deals with the consonantal adaptations and importation, whereas Section 5.2.3 deals with the analysis of the syllabic adaptations. Section 5.3 provides a discussion, which summarises the important findings and main generalisations drawn from the phonological analysis of UHA loanword adaptation using TCRS-LM in line with the existing literature adopting the same theoretical approach. At the end, this chapter concludes with a summary presented in Section 5.4.

5.2. The TCRS-LM and the UHA loanword

After establishing the consonantal and syllabic adaptations that are found in UHA loanwords in **Chapter IV**, it is essential firstly to recall the basic principles of the TCRS-LM on which the analysis of UHA loanword will be based. This will be followed by the assumptions concerning the adopted phonological representations on which the phonological analysis will depend. This will permit examining and accounting for the main consonantal and syllabic adaptations that are attested in the UHA loanword data. The following is a list of the governing principles of the TCRS-LM (Paradis and LaCharité 1997), which will guide the analysis of the UHA loanword dataset in this chapter:

- **The 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’ (Paradis and LaCharité 1997: 386).

- **The Phonological Level Hierarchy (PLH):**

  ‘Metrical level > syllabic level > skeletal level > root node > feature with a dependent > feature without a dependent’ (Paradis and LaCharité 1997: 386).

Crucially, in the analysis of UHA loanword adaptation two levels in the PLH are of special concern, namely the ‘feature without dependent’ level for the consonantal adaptation where the syllabic one it is ‘the skeletal level’. In fact Paradis and LaCharité (1997: 404) treat the Place, Larngeal and [continuant] equally ranked by the PLH and at the same level ‘features without dependent’. Similarly, the same treatment applied to the other two features [sonorant] and [consonantal] since they both do not have dependents, ‘in this sense, [consonantal] and [sonorant] are no different from other terminal features’ (Paradis and LaCharité 1997: 404). Furthermore, it might be worth noting that the two components of the Minimality Principle work together since Paradis and LaCharité (1997) didn’t state any priority given to one component over the other.

- **The Preservation Principle:**

  ‘Segmental information is maximally preserved within the limits of the Threshold Principle’ (1997: 385).

- **The Precedence Convention:**

  ‘In a situation involving two or more violated constraints, priority is given to that constraint referring to the highest phonological level of the PLH’ (1997: 386).

- **The Threshold 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’ (1997: 385).

5.2.1. Phonological representations

In their work proposing the TCRS-LM, Paradis and LaCharité (1997: 403) based their analysis of French loanwords in Fula, on ‘a fairly standard model of feature geometry’ (Kenstowicz 1994: 146), based essentially on McCarthy (1988). Later, Paradis and LaCharite (2001) used a representation that largely influenced by Lahiri and Evers (1991) and Rose (1996) and recently adopted by Stoltzfus (2014). On balance, it is essential for the current research to follow a similar feature geometry model (Paradis and LaCharite 2001, Rose 1996 and Stoltzfus 2014) since it is a further development of McCarthy's (1988) and has additional distinctions. Another fundamental reason is that it is important to remain faithful to former loanword adaptation studies adopting the same theoretical framework prior indicating any potential judements regarding the adequacy of the TCRS-LM, as it must be plausibly based on the same ground. Figure 4 shows the partial feature geometry model in which only the features relevant to the analysis of UHA loanwords are considered. Based on this feature geometry model, the underlying form is comprised of a Root node that is linked to the terminal features [±nasal], [±continuant] and [±sonorant], a Laryngeal node, that is linked to the terminal feature [±voice] and a Place node with the specific node Oral dominates the Labial, Coronal and Dorsal. The Coronal dominates the terminal feature [±anterior].

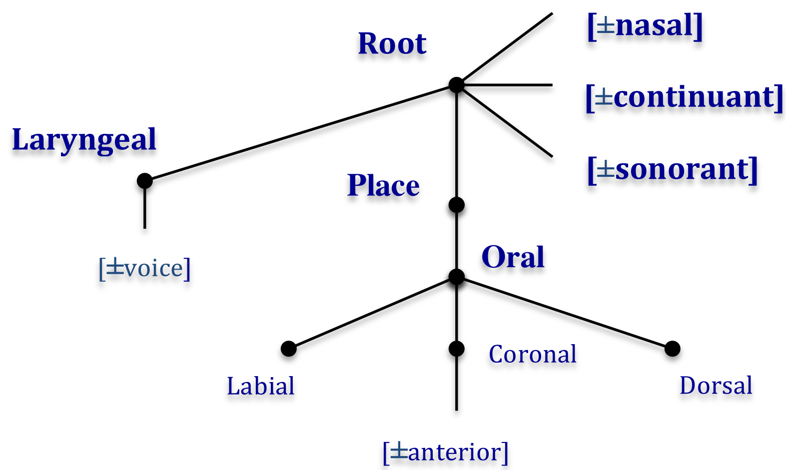

Figure 4: The Partial Feature Geometry Model (adopted from Stoltzfus 2014).

Furthermore, two assumptions are of special concern in this theortical framework, the first one is assuming that the phonological representation is underspecified in which the underlying form can be incomplete according to Paradis and LaCharité (1997). The second important assumption is that Paradis and LaCharité (1997: 403), and later Ulrich (1997) assume radical underspecification (Archangeli 1984), otherwise, 'features might be privative' (Ulrich 1997: 420). The assumption of radical underspecifion 'prevents redundant information from co-occurring at the underlying level' (Paradis and LaCharité 1997: 404). This indicates that 'unmarked features are not represented in a phoneme's underlying representation' (Stoltzfus 2014: 46). Essentially, the necessity of this assumption in the TCRS-LM can be seen in determining the minimal repair strategies among other available possibilities. In this regard, Ulrich (1997, 420) states that the significant of this assumption can be seen at the featural level to differentiate between insertion and deletion. Ulrich (1997, 420) further explains:

> 'it is necessary that only marked feature values be present in the underlying representations. A change from marked to unmarked can be seen as deletion of the marked value, followed by the insertion of the unmarked value by redundancy rules. A change from unmarked to marked, on the other hand, can be seen as insertion of the marked value. Just as the Preservation Principle prefers epenthesis to deletion at the segmental level, it prefers insertion (change to a marked value) to deletion (change to an unmarked feature value) at the featureal level' (Ulrich (1997, 420)

Besides, it will help in dealing with many crucial issues in analysing loanword adaptation such as determining the most preferred epenthetic conosnants as will be seen in the course of analysis. In this respect, this study will assume that this representation is radically under-specified (following Paradis and LaCharité 1997; Ulrich 1997 and Stoltzfus 2014).

5.2.2. Consonantal adaptation and importation

As stated in **Chapter IV**, Abdul-Rahim's (2011) dictionary of loanwords and Jarrah's (2013) study revealed several relevant ill-formed segments. These data alone, however, were not enough to reach meaningful conclusions regarding certain cases, for instance the lexical variation of /v/ adaptation. The targeted consonantal segments that will be discussed within the TCRS-LM are the two English affricates /ʤ/ and /ʧ/, the voiceless stop /p/, the nasal /ŋ/ and lastly the fricative /v/ that the UHA inventory lacks as native phonemes. The adaptations of these consonantal segments are remarkably consistent for some consonants, while others exhibit substantial variation, with infrequent importation, but no deletion in the UHA loanword dataset. Table 22 presents the consonantal adaptations that will be discussed in this section:

Category	English Phoneme	UHA Realisation
Plosive	/p/	[b]
Nasal	/ŋ/	[n]
Affricates	/ʤ/ /ʧ/	[ʤ] [ʒ] [ʧ] [ʃ]
Fricative	/v/	[f] [b] [w]

Table 22: Outline of some of UHA segmental realisations of English consonants

For the sake of making the analysis of the adaptations of these illicit consonants in UHA loanwords more comprehensible, it is necessary to provide first the underlying form of each one in English according to the feature geometry model stated before. This will help in examining the illegal combination of phonological features in UHA phonology and certainly detecting the problem. Some of the features will be absent in the underlying form of certain conosonants as a result of the radical underspecification assumption. For instance, the unmarked variants of binary features such as [-voice] or [-continuant] will not be represented instead the [+voice] or [+continuant] will be. To begin with, the English voiceless plosive /p/ as the feature representation of this consonant is given in Figure 5. It can be noted that the consonantal inventory of both English and UHA contain /b, m, w/, but while English also has /p/ UHA lacks this. In this regard, the Place node with the Oral cavity node is specified with [Labial]. There is neither need to include the Laryngeal node of the English /p/ since this labial is an obustrant is always voiceless nor the Root node [-continuant] due to the radical under-speceifcation assumption. Based on this underlying form of /p/, the illicit combination of these features presented in Figure 5, can be seen in the absence of the combination of [Labial], [-continuant[23]] without [+voice] in UHA phonology.

23 According to Paradis and LaCharité (1997: 404), 'the radical underspecification prevents redundant information from co-occurring at the underlying level, not elsewhere'.

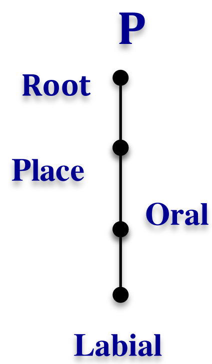

Figure 5: The Phonological Representation of English /p/

The next illicit consonant is the /ŋ/. The underlying phonological structure of this nasal is presented in Figure 6. Hence the consonantal inventory of UHA has only the two nasals /m, n/, with the absence of English /ŋ/, the Place node with the Oral cavity node in the underlying form of this consonant should be specified with [Dorsal]. Moreover, the Root node is specified with [+nasal] feature. Since this feature representation is assumed radically underspecified there is no need to specify the Laryngeal node given the fact that nasal are always voiced. Thus, the combination of phonological features [+nasal] and [Dorsal] is not permitted in UHA phonology.

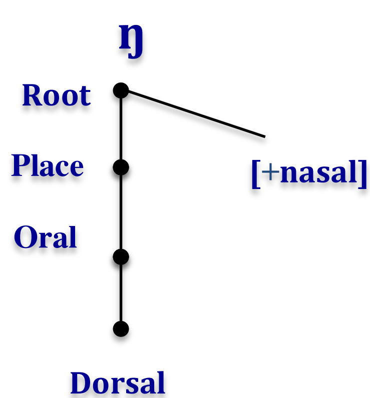

Figure 6: The Phonological Representation of English /ŋ/

The consonantal inventory of UHA lacks the two affricates /ʤ/ and /ʧ/. The feature representation of the affricate /ʤ/ is presented in Figure 7. Firstly, the Laryngeal features, the /ʤ/ is specified with [+voice] and there is no need to specify the Root node in the representation of the affricate /ʤ/ with [-continuant[24]] due to the radical underspecification assumption. In addition to Root and Laryngeal nodes, the Place node with its Oral cavity is specified with [Coronal]. Moreover, the [Coronal] Place node is further specified with [-anterior] place feature as it is a marked feature for coronal. Therefore, the combination of phonological features, namely [-anterior] without [+continuant] is not allowed in UHA.

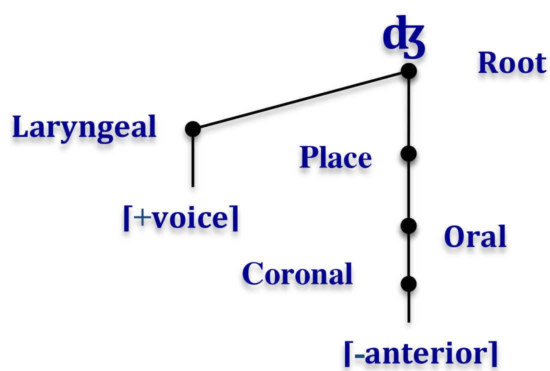

Figure 7: The Phonological Representation of English /ʤ/

Addionally, the feature representation for the other affricate /ʧ/ is presented in Figure 8. Firstly, the Place node with its Oral cavity is specified with [Coronal] in the underlying form of the affricate /ʧ/. Moreover, the [Coronal] Place node is further specified with [-anterior] place feature. Thus, the combination of phonological features, [-anterior] without [+continuant] is not permitted in UHA.

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[24] The manner feature of the two affricates is [-continuant], furthermore, there is no need to distinguish between coronal and [-anterior], because this combination of feature never refer to a plosive, given that the combination of features [-continuant] and [-anterior] is absent in UHA and in English this combination only applied to affricates not plosives that UHA lacks.

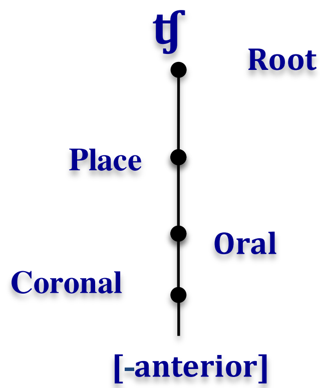

Figure 8: The Phonological Representation of English /ʧ/

The last illicit consonant is the English labiodental /v/, which is not part of the UHA consonantal inventory although it has the /f/. The phonological representation of this labiodental is given in Figure 9. It can be clearly seen that the Laryngeal node in the representation of /v/ is specified with [+voice] feature while the Root node with [+continuant]. In addition to [+voice] Laryngeal and [+continuant] Root nodes, the Place node with its Oral cavity is specified with [Labial]. In sum, this phonological representation shows the illicit combination of [+voice], [+continuant] and [Labial] features in UHA phonology that causes the absence of the /v/ from its inventory.

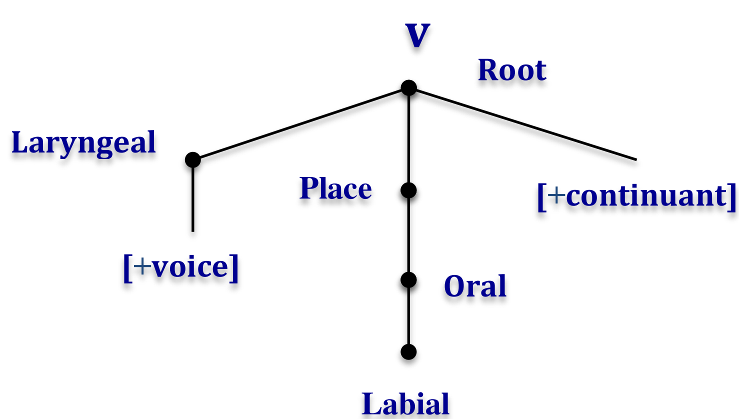

Figure 9: The Phonological Representation of English /v/

5.2.2.1. The bilabial /p/

According to the TCRS-LM, the lack of the bilabial /p/ in UHA consonantal inventory is 'attributed to a negative parameter setting, that is, a partly language-specific constraint, that rules out particular feature combinations' (Paradis and LaCharité 1997: 399). In this regard, the negative setting which is responsible for the absence of voiceless bilabial /p/ is demonstrated in (62):

(62)

Parameter		
[Labial] [-continuant][25] without [+voice]	**English**	Yes
	UHA	No (p) **(constraint)**

The constraint above is violated when any English loanword containing the voiceless bilabial /p/ is integrated into UHA. Thus, this violation might be solved either by importation of the /p/ and becoming part of the UHA peripheral inventory, adaptation to its closest phonological equivalent in the UHA core consonantal inventory or deletion. Indeed, this voiceless bilabial prefers to be adapted to its voiced correspondent /b/ rather than to be imported or deleted. Consider the examples in (63) that demonstrate the systematic adaptation of the /p/ into /b/ in the UHA loanword dataset:

(63)

The Change	**Occurrence**	**English**	**UHA**	**Gloss**
/p/ >/b/	Initially	/**p**ɛns/	/**b**ins/	'pence'
	Medially	/ˈkæ**p**tɪn/	/kɑː**b**tin/	'captain'
	Finally	/ˈtɛlɪskəʊ**p**/	/tiliskoː**b**/	'telescope'

Based on the underlying form given in Figure 2, and the constraint in (1), the combination ([Labial], [-continuant] without [+voice]) is not permitted but the combinations ([Labial], [-continuant] and [+voice]) and ([Labial], [+continuant] without [+voice]) are in UHA. Following the TCRS-LM's principle, any English loanword containing this voiceless labial

[25] The [-continuant] feature is assumed to be unmarked in the underlyining form.

is ilicit in UHA and thus violates the constraint (62). Given the constraint in (62) and the illicit combination in Figure 2, the Minimality Principle predicts that the violation of this segmental constraint must be repaired at the lowest phonological level to which this constraint refers. The lowest phonological level is determind by the Phonological Level Hierarchy (PLH) which is at 'the feature without dependent' level in the case of the /p/. In this respect, the Minimality Principle predicts that repair strategy must occur at this level. Essentially, this principle suggests two possible repair strategies targeting 'the feature without dependent as well as involving as few steps as possible as follows:

1. The insertion of terminal feature [+voice], yielding /b/
2. The insertion of terminal feature [+continuant], resulting /f/

Both are considered minor features and equally valued (minimal) involving one steps (the insertion of the new feature to fill missing one) with no significant distinction between these strategies according to the Minimality Principle as well as PLH. In fact, the two predicted strategies by this principle for the adaptation of /p/ are not both attested in UHA loanword adaptation. Only the voicing of this voiceless bilabial /p/ is found in the dataset where the Laryngeal terminal feature [+voice] is inserted. It should be noted that the occurrence of one repair strategy from the range of possibilities proposed by the Minimality Principle is not an indication of any violation against the principle's components. Instead it is an indication of the inability of this principle of accurately predicting the exact adaptation found in the UHA loanword adaptation. This means that this principle provides a range of potential strategies some of them not attested at all without suggesting any preference is given to one among other alternatives.

The other principle, the Preservation Principle, on the other hand, predicts that 'segmental information is maximally preserved' that is seen in the adaptation of this illicit consonant (/p/> /b/) instead of deletion. It also conforms to the other principle, which is the Threshold Principle, in which no deletion occurs and the adaptation does not exceed two steps. From the perspective of the Preservation Principle, insertion of marked feature is favoured over deletion at the featural level. Nevertheless, this insertion of marked feature is seen in both the attested adaptation (/p/ > /b/) as well as the unattested strategy (/p/ > /f/) predicted by the Minimality Principle, given that both repair strategies demands only insertion of new features without any loss of featural information (delinking). Similarly, this indicates that the Preservation Principle also doesn't give any preference regarding one strategy over the other.

Likewise, the same applied to the unattested strategy suggested by the Minimality Principle indicating that the Threshold Principle also doesn't imply one favoured strategy. In sum, the TCRS-LM's principles permit the attested adaptation (/p/> /b/), moreover, they also permit unattested adaptations and do not predict which one will occur. Consider Figure 10 that shows the adaptation (/p/> /b/) in UHA loanword adaptation in which the insertion of feature [+voice] is represented by a dotted line.

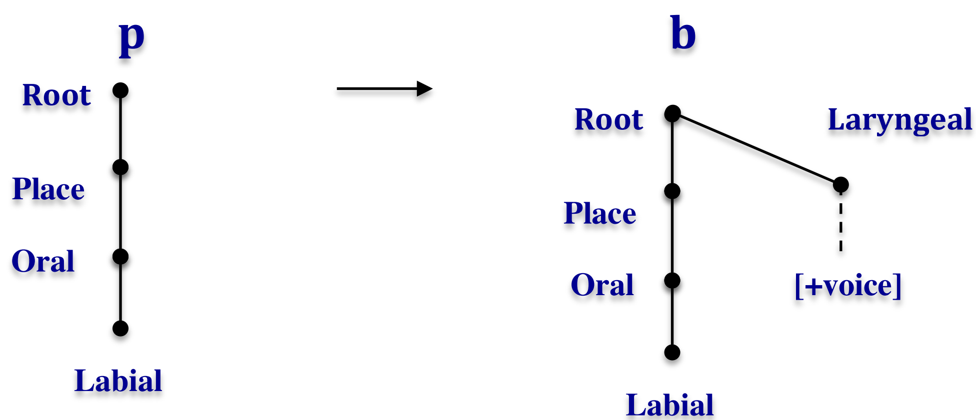

Figure 10: Adaptation of English /p/ into UHA /b /

<u>5.2.2.2. The nasal /ŋ/</u>

The absence of this nasal from the UHA inventory basically creates the negative parameter settings illustrated in the constraint given in (64):

(64)

Parameter		
[Dorsal] ~ [+nasal]	**English**	Yes
	UHA	No (ŋ) **(constraint)**

As a consequence, English loanwords with the nasal /ŋ/ violate the constraint in (64) and have three solutions in order to solve this violation, either importation, adaptation into its closet correspondent in UHA, or deletion, although only adaptation to /n/ is an attested strategy in the UHA loanword dataset, with no cases of importation or deletion. In this regard, the examples in (65) demonstrate the systematic adaptation of the English nasal /ŋ/ into /n/ in the UHA loanwords dataset in which this nasal occurs word finally:

(65)

The Change	Occurrence	English	UHA	Gloss
/ŋ/ >/n/	Finally	/ˈstɜː.lɪ**ŋ**/	/ʔistɑrliː**n**i/	‘sterling’
		/ˈʃɪ.lɪ**ŋ**/	/ʃili**n**/	‘shilling’

To explain more, the underlying phonological representations of the nasal /ŋ/ given in Figure 3 along with the constraint in (64) indicate that the combination ([+nasal] and [Dorsal]) is prohibited, but not the combinations ([+nasal] and [Coronal]) or ([+nasal] and [Labial]) in UHA. Similarly, the Minimality Principle indicates that this violation should be repaired at the lowest level referred to by the constraint in (64) and demanding as few steps as possible, and targeting the Place of articulation as determined by the PLH. Based on the constraint in (64) and the illegal combination in Figure 3, the Minimality Principle as well as PLH propose the two possible repair strategies affecting the Place of articulation and demanding two steps as follows:

1. The insertion of [Coronal] over the delinking of [Dorsal], yielding /n/
2. The insertion of [Labial] over the delinking of [Dorsal], yielding /m/

In fact, the targeting of manner feature [+nasal], resulting /g/ or /k/ are not minmal as they involve additional steps besides the delinking of [+nasal] (for instance to yield the /g/ the deletion of [+nasal], [+continuant], [+sonorant] and insertion of [+voice] are required). Nevertheless, the radical under-specification assumption indicates that [±voice] is not specified for nasals that entails the unattested /g/ is disfavoured as would have to add [+voice] feature in order to differentiate it from /k/ as well as changing the [nasal]. Essentially, the two predicted strategies by the Minimality Principle are equally valued as they both requiring two steps and affecting the same phonological level. Both the Minimality Principle and PLH gives no preference to one of these strategies over the other. Actually, only one strategy is found in UHA loanword dataset that is the adaptation (/ŋ/ > /n/) that involves the delinking of [Dorsal] and the insertion of [Coronal] while the insertion of [Labial] resulting the /m/ of this nasal is not attested. In sum, the Minimality Principle as well as the PLH applied to the adaptation (/ŋ/ > /n/) but not favoured since there is another predicted minimal repair strategy (unattested).

Given that the nasal /ŋ/ is adapted not deleted applied both principles the Preservation and Threshold. Furthermore, the Preservation Principle demands the maintaining of phonological features within the limit of the other principle, the Threshold Principle, and in the case of /ŋ/, this is satisfied in all the predicted strategies by the Minimality Principle. Both proposed stratiges involves deletion as well as insertion of featural information. This implies that the Preservation and Threshold Principles are not violated, they applied to the adaptation (/ŋ/ > /n/) but not favoured. Similar to the adaptation of /p/, the main issue regarding the TCRS-LM Principles in the case of /ŋ/, is that not predicting the exact, more precisely, the attested repair strategy among possible ones instead they propose the potential strategies and leave the choice to be determined by the language. Figure 11 illustrates the adaptation (/ŋ/ > /n/) in UHA loanword adaptation where the delinking of [Dorsal] is represented by a barred line and the insertion of [Coronal] a dotted line.

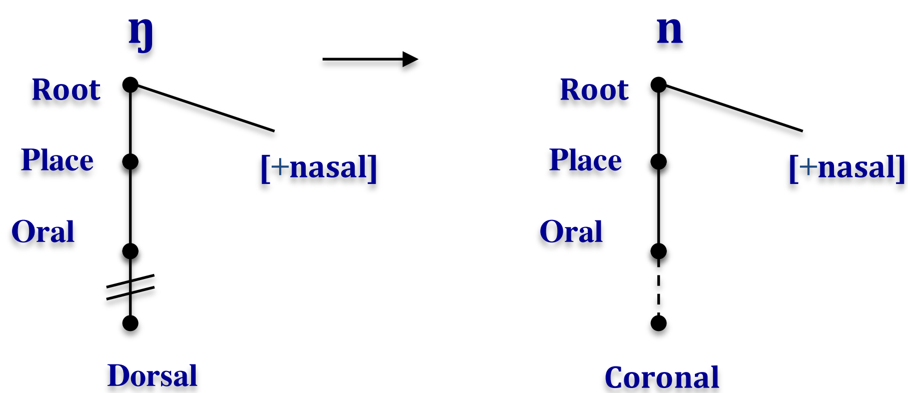

Figure 11: Adaptation of English /ŋ/ into UHA /n/

5.2.2.3. The affricates /ʤ/ and /ʧ/

The consonantal inventory of UHA lacks the two affricates /ʤ/ and /ʧ/. According to the TCRS-LM, the absence of /ʤ/ and /ʧ/ in the UHA inventory creates 'a negative parameter setting' (Paradis and LaCharité 1997: 399). The absence of these affricates is a result of the constraint presented in (66):

(66)

Parameter		
[-anterior] without [+continuant]	**English**	Yes
	UHA	no (ʧ) and (ʤ) **(constraint)**

English loanwords that contain the /ʤ/ or /ʧ/, are either adapted systematically into their correspondents /ʒ/ and /ʃ/, respectively or imported. The examples given in (67) show this consistent adaptation.

(67)

The Change	Occurrence	English	UHA	Gloss
/ʤ/ >/ʒ/	Initially	/ˈ**dʒ**uː.dəʊ/	/**ʒ**uːdu/	'judo'
	Medially	/prəˈ**dʒ**ɛk.tə/	/buruː**ʒ**iktur/	'projector'
/ʧ/ >/ʃ/	Initially	/**ʧ**ɪps/	/**ʃ**ibs/	'chips'
	Finally	/ɪn**ʧ**/	/ʔin**ʃ**/	'inch'
		/brəʊ**ʧ**/	/buruː**ʃ**/	'brooch'

Nevertheless, not all the cases of English loanwords with both affricates apply this systematic adaptation (/ʤ/>/ʒ/ and /ʧ/>/ʃ/). There were infrequent importations (but no deletion) of both affricates attested in the data collection exercise. The cases where these two affricates were imported are presented in (68):

(68)

The Segment	English	UHA	Gloss
/ʤ/	/ˈme.sɪ**ʤ**/	/mɑssi**ʤ**/	'message'
	/ˈmasɑː**dʒ**/	/mɑsɑː**dʒ**/	'massage'
/ʧ /	/ˈkɛ**ʧ**.ʌp/	/kɑː**ʧ**ɑb/	'ketchup'
	/klʌ**ʧ**/	/kælʌ**ʧ**/	'clutch'

Following the TCRS-LM, this indicates that both affricates /ʤ/ and /ʧ/ are largely adapted into their phonologically closest equivalents /ʒ/ and /ʃ/, respectively, but rarely imported and added as peripheral phonemes to UHA's peripheral consonantal inventory as /ʤ/ and /ʧ/. Firstly, the two affricates /ʤ/ and /ʧ/ are mapped onto peripheral /ʤ/ and /ʧ/ even if this is infrequent. For the importation of English /ʤ/ and /ʧ/ to occur resulting in peripheral /ʤ/ and /ʧ/ in UHA, it is important to recall the feature representation of both affricates given in Figure 4. The feature combinations ([+voice] and [Coronal] [-anterior]) as well as ([-voice] and [Coronal] [-anterior]) are absent in UHA phonology that corresponds to the underlying forms of /ʤ/ and /ʧ/, respectively, while the feature combinations ([+voice], [Coronal] [-

anterior], and [+continuant]) as well as ([-voice], [Coronal] [-anterior], and [+continuant]) do exist in UHA phonology that represent the /ʒ/ and /ʃ/, accordingly. This indicates that the illicit combinations can be permitted only if the [+continuant] feature is there. The co-occurrence of [+continuant] feature in both illicit combinations yields the phonological representation of UHA peripheral /ʤ/ and /ʧ/. Thus, the importation of English /ʤ/ and /ʧ/ in UHA requires the addition of [+continuant] to distinguish between peripheral /ʤ/ and /ʧ/ and native /ʒ/ and /ʃ/ in the UHA peripheral inventory.

To account for the adaptation of the two English affricates in UHA loanwords (/ʤ/ >/ʒ/ and /ʧ/> /ʃ/) within the TCRS-LM, as exemplified in Figures 4 and 5, for both adaptations. Given the underlying forms in Figure 4, and the constraint in (1), the combinations ([+voice], [Coronal] [-anterior] without [+continuant]) as well as ([Coronal] [-anterior] without [+continuant]) is illicit in UHA. On the other hand, the feature combinations ([+voice], [Coronal] [-anterior], and [+continuant]) as well as ([Coronal] [-anterior], and [+continuant]) are permitted in UHA phonology that represent the /ʒ/ and /ʃ/, accordingly. Additionally, other similar feature combinations ([+voice], [Coronal], and [-continuant]) and ([Coronal], and [-continuant]) are also legal in UHA phonology that correspond to the /d/, and /t/, respectively. The co-occurrence of [-anterior] with [-continuant] is not allowed in UHA but [-anterior] with [+continuant] is. In this respect, the Minimality Principle indicates that the violation of the constraint given in (66) should be repaired at the lowest level referred to that is the feature without dependent level as determined by the PLH and requiring as few steps as possible and On balance, the Minimality Principle along with PLH predict the following strategies:

1. The insertion of terminal feature [+continuant] **(/ʤ/ > /ʒ/)** or **(/ʧ/ > /ʃ/).**
2. The delinking of terminal feature [-anterior] **(/ʤ/ > /d/)** or **(/ʧ/ > /t/).**

The two proposed strategies in the adaptation of the two affricates /ʤ/ and /ʧ/ are considered minimal as they applied at the same phonological level (equally valued) and demanding only one step either insertion or delinking with no pereference is given to one strategy over the other according to the Minimality Principle and the PLH. In UHA loanword dataset, only one strategy (/ʤ/ >/ʒ/ and /ʧ/> /ʃ/) is attested where the manner feature [+continuant] is inserted. The main issue with the Minimality Principle is that offering more than one minimal adaptation possible for a given illicit consonant available in UHA. Whether, for instance, the affricate /ʤ/ is adapted into /ʒ/ or /d/ is not considered a violation of the Minimality Principle as well as the PLH rather than failure of this principle of adequately predicting the attested adaptation in UHA loanword adaptation.

Furthermore, the adaptation options (/ʤ/ >/ʒ/ and /ʧ/> /ʃ/) conform to the prediction of the Threshold Principle since they do not exceed the limit of this principle (achieved in one step) and no deletion has occurred. Nonetheless, the other unattested adaptation options (/ʤ/ >/d/ and /ʧ/> /t/) is also conform to this principle. Crucially, the preference between the two proposed strategies by the Minimality Principle as well as the PLH is determined by the other principle the Preservation Principle. The adaptation options (/ʤ/ >/ʒ/ and /ʧ/> /ʃ/) is favoured rather than the (/ʤ/ >/d/ and /ʧ/> /t/) since this principle entails that the insertion of marked feature is favoured over deletion at the featural level. Therefore, the TCRS-LM predicts that English affricates will be adapted as /ʤ/ >/ʒ/ and /ʧ/> /ʃ/ as are attested in the UHA loanwords dataset according to the Preservation Principle. Figures (12) and (13) provide representations of this preferred strategy in which the manner feature [+continuant] is inserted in the adaptation of /ʤ/ and /ʧ/.

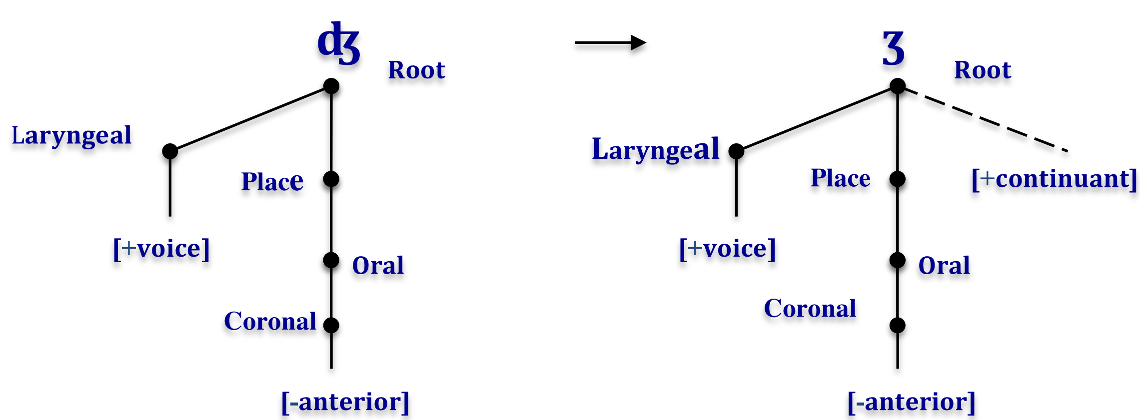

Figure 12: Adaptation of English /ʤ/ into UHA /ʒ/

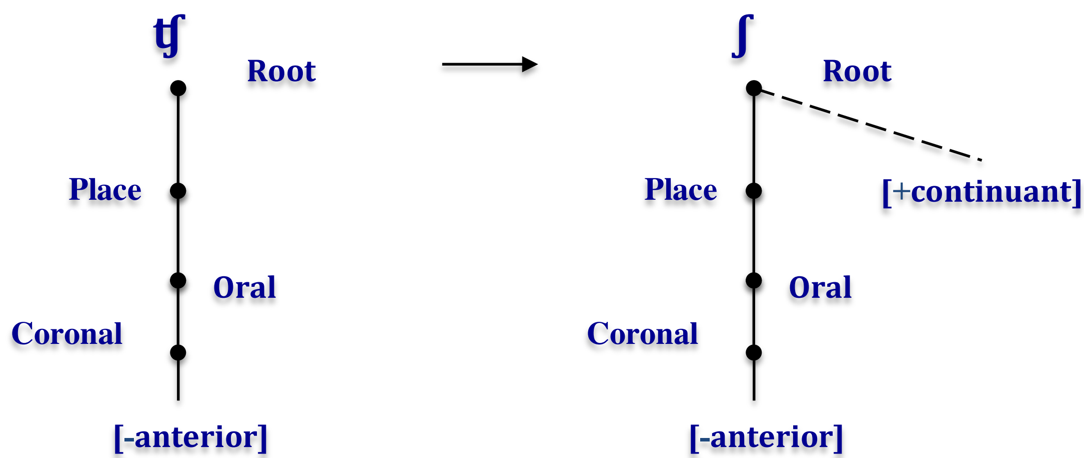

Figure 13: Adaptation of English /ʧ/ into UHA /ʃ/

5.2.2.4. The fricative /v/

The English labiodental /v/ might be imported, adapted to its closest phonological equivalent or deleted, though this segment always favours adaptation over the other two strategies. Unlike the previous adaptations, there is significant lexical variation in the adaptation of the English labiodental /v/. Consider the examples provided in (69) which demonstrate the various lexiacal adaptations of /v/ attested in UHA loanwords:

(69)

The Change	**Occurrence**	**English**	**UHA**	**Gloss**
/v/ >/f/	Initially	/ˈ**v**iːzə/	/**f**iːzɑː/	‘visa’
	Medially	/rɪˈsiː.**v**ə/	/risiː**f**ʌr/	‘receiver’
	Finally	/seɪ**v**/	/sɑː**f**/	‘save’
/v/ into /w/	Initially	/ˈ**v**ɑː.nɪʃ/	/**w**ɑːrniːʃ/	‘varnish’
	Medially	/ˈʃʌ**v.**(ə)l/	/ʃɑ**w**ɑl/	‘shovel’
		/rɪˈ**v**əːs/	/rɑ**w**ɑs/	‘reverse’
/v/ into /b/	Initially	/ˈ**v**ækjʊəm breɪk/	/**b**ɑːkim/	‘vacuum-brake’
	Medially	/ˈlɑː.**v**ə/	/lɑː**b**ɑ/	‘lava’

According to the examples in (69), the English /v/ is not systematically adapted into its voiceless labiodental /f/, it is infrequently replaced with the approximant /w/ in some cases (only three), or with the bilabial stop /b/ in others (two cases). To begin with, it is necessary to present the setting that is responsible for the absence of this labiodental is represented by the constraint given in (70):

(70)

Parameter		
[+continuant] [+voice] without [+sonorant]	**English**	Yes
	UHA	No (v) **(constraint)**

In order to clarify the variation in this adaptation more within the TCRS-LM, it is essential to recall the underlying form provided in Figure 2, and the constraint in (70). It can be clearly seen that the combination ([+voice], [+continuant] without [+sonorant]) is not allowed in UHA but the combinations ([+continuant] without [+sonorant])), ([+voice], [+continuant] and [+sonorant]) or ([+voice], [-continuant] without [+sonorant])) are. Based on the TCRS-LM's principle, the first component of the Minimality Principle predicts that the violation of this segmental constraint should be repaired at the lowest phonological level to which this violation refers according to the PLH while the second one emphasises on the number of steps to be as few steps as possible. Given the constraint in (1) and the illicit combination in Figure 2, this principle and PLH propose three possible repair strategies targeting only the features specified by the constriant and at the feature without dependent level as the following:

1. The insertion of terminal feature [+sonorant], yielding /w/
2. The delinking of terminal feature [+voice], yielding /f/
3. The delinking of terminal feature [+continuant], yielding /b/

All the predicted repair strategies by the Minimality Principle along with the PLH are minimal as they equally valued and achieved in one step[26]. Firstly, the minimal suggested repair strategy the insertion (of [+sonorant]) since the Laryngeal feature [+voice] can co-occur with [+continuant] only in one case with the existence of [+sonorant] within the representation resulting the /w/ in UHA. Another possible strategies indicate the delinking of Laryngeal [+voice] feature in order to yield the /f/ in UHA or the delinking of manner feature [+continuant] yielding /b/. Essentially, the three suggested strategies is possible and satisfies both the Minimality Principle and PLH as no violation occurred and equally valued. In fact all these possibilities are attested strategies in the adaptation of /v/ in UHA loanword dataset but unfortunately not preferred in the way predicted by the Minimality Principle and PLH. In the UHA loanword dataset, the devoicing of the /v/ is found to be the most frequent adaptation (/v/ > /f/), followed by the weakening (/v/ > /w/), while the strengthening of this labiodental is the least frequent ones (/v/ > /b/)[27].

Essentially, it is not the Minimality Principle or the PLH that decide the most preferred adaptation option among these possibilities it is the Preservation Principle. According to Paradis and LaCharité (1997), the Preservation Principle entails that the repair strategy that involves insertion of new segmental information is preferred rather than a strategy demands loss of phonological informations. In this respect, this principle give privilege to the first adaptation (/v/ > /w/) (the insertion of [+sonorant]) over the other two adaptations (/v/ > /f/) and (/v/ > /b/) as both entails loss of segmental information. Even though, this preference is predicted by the Preservation Principle it is not attested in the adaptation of /v/ in UHA loanword dataset.

Considering these adaptations according to the other TCRS-LM principles, the weakening of /v/ (/v/ > /w/), satisfies the prediction of the other principle, the Preservation Principle as

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26 The TCRS-LM with radical underspecification assumption consider the number of steps in the delinking of [+voice] or [+continuant] is one.followed by the insertion of redundant features [-voice] or [-continuant], accordingly features is one due to a default rule as 'the least marked consonants in languages being occlusives' (Stoltzfus 2014: 50).

27 It should be noted that numbers are not large, it might be significant nearly 80% are /f/, while the /b/ and /w/ are five cases altogether may not be considered significant.

this principle entails the retaining of phonological features within the limit of the other principle, the Threshold Principle. This is fully applied in the adaptation of /v/ > /w/ since all segmental features are maintained Moreover, it doesn't involve any loss of feature (only [+sonorant] insertion). Furthermore, the Threshold Principle is also fully achieved since this consonant is adapted (/v/ > /w) not deleted, besides, this adaptation doesn't exceed its limit (demanding one step). Therefore, the adaptation (/v/ > /w/) agrees with the predictions of TCRS-LM principles, the Preservation, Minimality and Threshold Principles. Figure 14 illustrates this adaptation (/v/ > /w/):

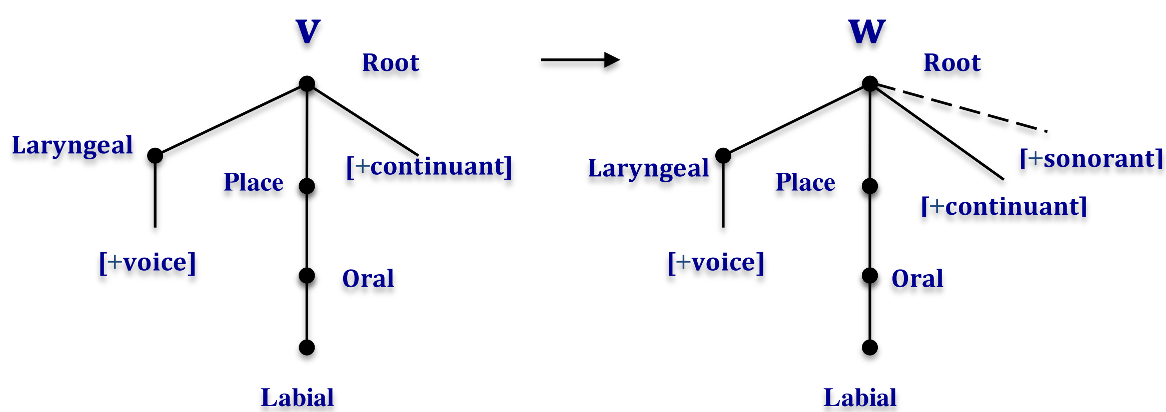

Figure 14: Adaptation of English /v/ into UHA /w/

The next one is the devoicing of /v/. This adaptation (/v/ > /f/) is minimal as it only requires one step in order to be adapted into /f/ in UHA and is applied at the lowest phonological level that is feature without dependent and no deletion occurs to this labiodental consonant, which conforms perfectly with the Threshold as well as the Preservation Principles as it doesn't violate any of them. Figure 15 demonstrates the adaptation of English /v/ into UHA /f/.

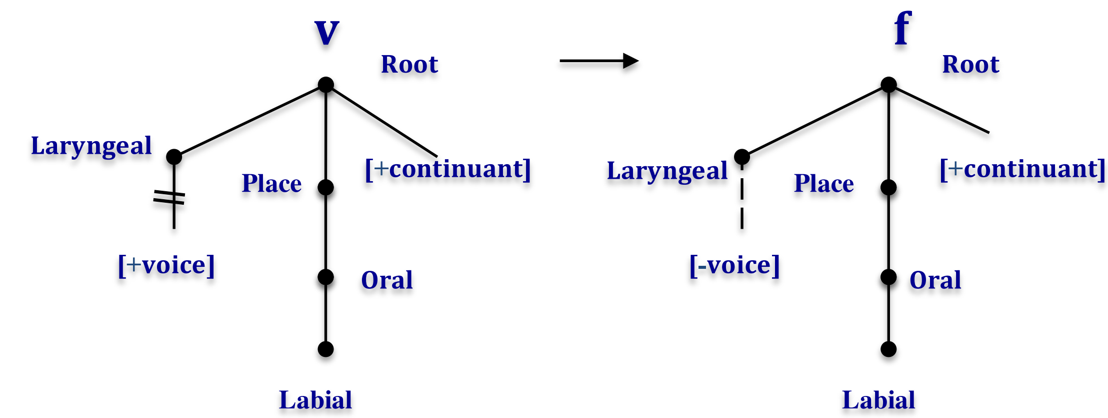

Figure 15: Adaptation of English /v/ into UHA /f/

Lastly, to clarify the least frequent adaptation /v/ into /b/ within the other the TCRS-LM principles, the feature representation of this alteration is given in Figure 16. In this case, the delinking of [+continuant] demands one step for this adaptation to take place. Following the TCRS-LM principles, the maintaining of other phonological features conforms to the Preservation Principle. Besides, the Threshold Principle is also applied since the adaptation takes place within its limit (involving one step). Thus, the adaptation also (/v/ > /b/) conforms to all the predictions suggested by the TCRS-LM principles.

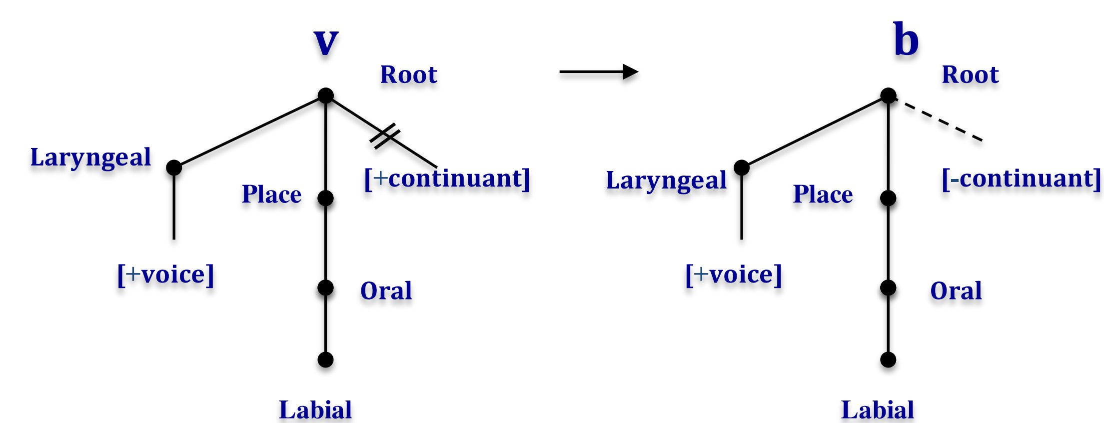

Figure 16: Adaptation of English /v/ into UHA /b/

According to the TCRS-LM, the Preservation Principle predicts the maintenance of phonological feature without exceeding the limit of the Threshold Principle. Both the Preservation and Threshold principles allow for ill formed consonantal segments to be adapted with fewer repair strategies involved (only two, otherwise deletion must be applied to that segment). This is basically fulfilled in all the different adaptations of /v/ that are attested suggested by the Minimality Principle in UHA loanword. Each of these adaptations involves one step. Regardless of the phonological environment, the devoicing of the English /v/ into /f/ is not systematic, as it adapted into /b/ in some cases and /w/ in others but not into /z/. By examining all the English loanwords that contain the /v/, it is found that there is no correlation between the phonological environment and the adaptation of /v/ into /w/ or /b/, as both adaptations are actually attested in similar environments, namely initially and medially, as demonstrated in the examples given in (69). Indeed, the fricative /v/ violates the constraint given in (70), though the TCRS-LM makes different predictions regarding which repair strategy is supposed to be most favoured one. It is true that it accounts for each adaptation attested in UHA loanword adaptation, but there is another significant issue need to be solved according to this theoretical framework. Based on the TCRS-LM principles' prediction, the adaptation (/v/ > /w/) should be the most frequent ones in contrast with other alternatives (/v/ > /f/ or /b/).

The reason for this preference is that, as stated before, the weakening of this labiodental is the most minimal adaptation as it doesn't involve any loss of segmental information (insertion [+sonorant]). Followed by the other adaptations (/v/ > /f/) and (/v/ > /b/). This is what the TCRS-LM principles predict but not the case in UHA loanword dataset, the devoicing of the /v/ is found to be the most frequent adaptation, followed by the weakening, while the strengthening of this labiodental is the least frequent ones. Indeed, this is the main issue raised in the adaptation of /v/ that is all the suggested repair strategies can be fully explained, but not predicted as the TCRS-LM principles suggest false preference is given to one repair over the other. Thus, the choice between these various adaptations of the /v/ is not determined by the TCRS-LM principles.

5.2.3. Syllabic adaptation

As stated in **Chapter III**, the syllable structure in UHA is different from English, which has a wide range of sequences. Besides the fact that it only has five syllable patterns, it is not permissible for a word or even a syllable to start with a vowel, and no word or syllable structure starts with a consonant cluster (Jarrah 2013). The syllable sequences in UHA are short CV, long CVC or CVV, or even super-long CVVC or CVCC. In this regard, it is expected that an English loanword with initial vowels or consonants clusters is prohibited and therefore repaired either by epenthesis (consonants or vowels) or deletion. This section will deal first with the epenthesis of consonants and vowels followed by the discussion of unpredicted adaptation by TCRS-LM in UHA loanwords.

5.2.3.1. Consonant epenthesis

In UHA loanword dataset, onset-less syllable is found to be the first illicit syllable pattern and always prefer the epenthesis of consonants instead of deletion. Based on the UHA loanword dataset, two consonants are specifically used to repair this type of syllable sequence, namely the glottal stop and the glide /j/. Concerning the epenthesis of the voiceless stop, the /ʔ/, it is always attested in adapting initial onset-less syllable patterns and in all cases that have initial vowel syllable structure the glottal stop is systematically, thus inserted adding an onset to the syllable of that word. Consider the examples of this insertion in (71):

(71) The epenthesis of /ʔ/ before initial onset-less syllable patterns:

English	**UHA**	**Gloss**
/**ə**ˈdʒɛn.də/	/**ʔ**ɑʒindɑ/	‘agenda’
/ˈ**ʌɪ**.ɒn/	/**ʔ**ɑjuːn/	‘ion’
/ˈ**əʊ**.zəʊn/	/**ʔ**uzuːn/	‘ozone’
/ˈ**al**.bəm/	/**ʔal**buːm/	‘album’
/ˈ**æt**.ləs/	/**ʔɑtˤ**lɑs/	‘atlas’
/ɪnʧ/	**/ʔinʃ/**	‘inch’

Besides the epenthesis of the glottal stop, there is another insertion of consonants spotted in UHA loanwords, which is insertion of the glide /j/. In fact, the epenthesis of the glide /j/ is not as common as the epenthesis of the glottal stop; it is rarely applied. By observing these cases, the glide, namely, the palatal approximant /j/ is inserted intervocalically in the adaptation of onset-less syllable when it occurs medially. Consider the examples given in (72) that demonstrate some cases for this epenthesis:

(72) The epenthesis of glide /j/ before onset-less syllable intervocalically:

	English	UHA	Gloss
1.	/ˈfəʊ.bɪ.**ə**/	/fuːbi**jɑ**/	‘phobia’
2.	/ˈsɔɪ.**ə**/	/sˤuː**jɑ**ː/	‘soya’
3.	/ˈhiː.lɪ.**əm**/	/hiːli**j**um/	‘helium’
4.	/ˈniː.**ɒn**/	/ni**j**un/	‘neon’
5.	/ˈkæl.sɪ.**əm**/	/kɑlsiː**j**um/	‘calcium’
6.	/bækˈtɪə.rɪ.**ə**/	/bʌktiri**j**a/	‘bacteria’

The adaptation of this illicit syllable sequence can be explained under the TCRS-LM. Since UHA does not allow an onset-less syllable, which can be expressed by a negative setting of the following parameter illustrated in (73):

(73)

Parameter	English	UHA
Onset-less syllable?	Yes	No **(constraint)**

Based on the Minimality Principle as well as the PLH, the violation of this constraint should be repaired at the lowest phonological level to which the given constraint in (73) refers. Apparently, the lowest phonological level to which this constraint refers is the skeletal level[28], which indicates that the Minimality Principle predicts that this violated syllabic constraint should be repaired at that level, suggesting two possible strategies, specifically either by the epenthesis of a consonant, creating a new onset to this syllable (demanding two steps), or by deletion of the initial vowel (requiring one step). Since the two suggested strategies are equally valued based on the first component of the Minimality Principle as well as the PLH, the second component of this principle indicates that this syllabic violation should be repaired by the deletion of the initial vowel instead of epenthesis of consonant. The reason for such preference is due to the number of steps involved in the adaptations (demanding one step over two steps).

In fact, this is not the case for the other principle – the Preservation Principle – since it generally favours epenthesis over deletion in which it predicts the retained initial vowel. Furthermore, the epenthesis of the consonant is not only favoured by the Preservation Principle, it is also preferred by the Threshold Principle since there is no violation of the limit of the Threshold Principle (indicating no need to delete the initial vowel even if it economically favoured), as this structure needs only two steps: the insertion of onset and then the epenthesis of a consonant in the onset. This can be illustrated in Figure (17):

VC	→	1) Onset Insertion			→	2) Segment Epenthesis			
		O	N			O	N		
		X	X	X		X	X	X	
			V	C		**C**	V	C	

Figure 17: Epenthesis of consonant before onset-less syllable in UHA loanword

[28] In Paradis and LaCharité (1997) and Ulrich (1997) such repairs are treated as happening at the skeletal level rather than the syllabic level, although no examples are provided of repairs that should be addressed at the syllabic level.

In the case of UHA loanwords, only one strategy is attested which is the epenthesis of the consonant. There were no cases of non-adaptation in which the initial vowel is maintained in this 'ill-formed syllable'[29] or deletion. In sum, the epenthesis of consonant in repairing onset-less syllable is not violating any of the TCRS-LM principles as they fully explained this strategy but not predicted. The main concern might be raised regarding the epenthesis of consonant, which is that the choice of the glottal stop is the only preferred epenthetic consonant to repair initial onset-less syllable, hence there is no correlation between the glottal stop and the initial vowel. Nevertheless, the proposed analysis under the TCRS-LM approach, deals only with one issue regarding the epenthesis of consonant in adapting onset-less syllable that is the reason behind this insertion, without implying the reason for selecting the laryngeal (glottal stop) among other consonants such as obstruent, nasal, lateral, rhotic or even semi vowel, as the preferred consonant and constantly inserted in all the cases of initial onset-less syllable in UHA loanword dataset. It is true that generally the epenthesis of the glottal stop is not restricted to UHA loanwords but is largely attested cross-linguistically in loanword adaptation (Uffmanm 2014: 1). Correspondingly, the TCRS-LM principles do not suggest any predictions regarding the other type of consonant epenthesis, more specifically the epenthesis of the glide /j/ intervocalic onset-less syllable. As stated before, the proposed TCRS-LM analysis can be applied to the epenthesis of glide in onset-less syllable intervocalically, but it doesn't propose any suggestions regarding the selections of the glide /j/ among other consonants as the best epenthetic consonant in such cases. Nevertheless, the feature geometry aspect of this theoretical framework does predict that since it can be accounted in term of feature spreading. Hence the spreading of feature from the previous vowel will result the insertion of the glide /j/ after high vowel while when it word initially there is no spreading (lack of any marked feature) yield the insertion of default consonant (glottal stop). Consequently, the incapability of the TCRS-LM principles in accurately account for the selection of the epenthetic consonant in order to repair onset-less syllable can be considered as a further evidence of the failure of this theoretical approach in clarifying certain phonological patterns found in UHA loanword adaptation.

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[29] Paradis and LaCharité (1997: 405) described a problematic syllable structure as an'ill-formed syllable'.

5.2.3.2. Vowel epenthesis

The syllable sequences in UHA phonology are restricted to one of the following patterns: CV, CVC, CVV, CVVC or CVCC, while onset clusters are disallowed. In this respect, it is expected that all English loanwords with onset clusters are not permitted in UHA and therefore will be repaired either by consonant deletion or vowel insertion, though the epenthesis of a vowel (and in certain cases the epenthesis of vowel and consonant) is the highly preferred strategy attested in UHA loanwords. To clarify the epenthesis of vowels in UHA loanwords under the TCRS-LM, it is necessary to examine each condition separately, starting with vowel epenthesis to break onset clusters; consider the examples for this condition as demonstrated in (74). In these examples, the onset clusters comprise obstruent stops [p, t, k, b] or the fricative [f] as the first consonant, while the second one is one of the sonorant liquids [l, r]:

(74) The epenthesis of vowel in initial CC clusters

Gloss	**English**	**UHA**
1. ‘trailer’	/ˈ**tr**eɪ.lə(r)/	/t**i**rɑlɑ/
2. ‘fresh’	/**fr**ɛʃ/	/f**i**riʃ/
3. ‘flash’	/**fl**æʃ/	/f**i**laːʃ/
4. ‘kremlin’	/ˈ**kr**ɛm.lɪn/	/k**i**rimlɪːn/
5. ‘break’	/**br**eɪk/	/b**i**rɜːk/
6. ‘block’	/**bl**ɒk/	/b**u**luk/
7. ‘plastic’	/ˈ**pl**as.tɪk/	/b**i**laːstic/
8. ‘professor’	/**pr**əˈfɛsə/	/b**u**rufisuːr/
9. ‘clutch’	/**kl**ʌtʃ/	/k**æ**lʌtʃ/

Fundamentally, the adaptation of onset clusters can be clarified within the TCRS-LM, given the fact that this illicit syllable structure is not permitted in UHA, it can be illustrated in the parameter settings given in (75):

(75)

Parameter	English	UHA
branching onset?	Yes	No **(constraint)**

Similarly, the violation of the constraint given in (75) must be repaired at the lowest phonological level to which this constraint is refer to, which is the skeletal level following the Minimality Principle as well as the PLH, indicating that the violated syllabic constraint (onset branching) must be repaired at that level (the skeletal level). In this respect, the Minimality Principle suggests two repair strategies in order to adapt onset clusters: either consonant deletion (one step) or nucleus insertion (N), which leads to vowel epenthesis (two steps). Similarly, the two proposed strategies are equally valued according to the PLH and the first component of the Minimality Principle, but not by the second component of this principle as it favoured consonant deletion over vowel epenthesis in order to repair this syllabic violation. This is because consonant deletion is apparently considered the minimal repair strategy over vowel epenthesis (one step required instead of two). Indeed, the Minimality Principle predicts the occurrence of consonant deletion instead of vowel epenthesis.

Conversely, maintaining consonants and favouring epenthesis over deletion conforms to the Preservation Principle's predictions as this principle entails the maximal retaining of segmental information within the limits of the other principle, the Threshold Principle. Since the epenthesis of the vowel in onset clusters is achieved in only two steps: first, nucleus insertion and then filling the inserted nucleus with the epenthetic vowel, it conforms to the Threshold Principle predictions as there is no violation of its limit. The final observation is that there was no case of non-adaptation of onset clusters in which the initial consonants are retained or deleted attested in the UHA loanword dataset. Figure (18) shows a representation of the adaptation of the onset cluster, where **α** generally represents a vowel place node, and in this representation it is assumed to be vocalic spreading (vowel harmony for the adjacent vowel).

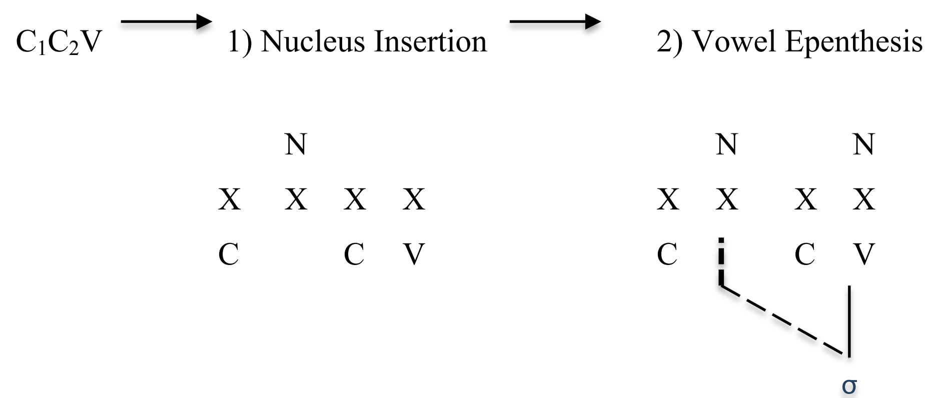

Figure 18: The epenthesis of vowel in onset clusters in UHA loanword

Apparently, there is one remaining fundamental issue need to be solved regarding the epenthesis of vowel in repairing the violation of the syllabic constraint (onset branching). This issue is concerning the determining of the quality of the epenthetic vowel in adapting the onset cluster. Based on TCRS-LM, there is no indication for predicting the quality of epenthetic vowel as in Paradis and LaCharité (1997: 406) this issue is not addressed. Consequently, the TCRS-LM framework is unable to precisely account for the selection of the epenthetic vowel in order to repair onset cluster, which indicates additional evidence of the failure of this theoretical approach in illustrating certain phonological issues in UHA loanword adaptation. In sum, the proposed TCRS-LM analysis predicted by its principles in dealing with onset cluster account to some extent for the epenthesis of vowel with exception to the Minimality Principle, other principles are more adequate in suggesting the attested strategies in UHA loanword dataset.

<u>**5.2.3.3. Unpredicted adaptation**</u>

The last issue that needs to be covered in UHA loanwords is that the unpredicted adaptations of illicit consonants and syllable structure demanding three or more steps, none undergoes deletion. Consider the examples in (76) demonstrating the first condition of the unpredicted adaptations:

(76) The adaptation of voiceless bilabial and onset cluster CC

Gloss		English	UHA
1.	‘professor’	/**pr**əˈ.fɛs.ə/	/**bur**ufisuːr/
2.	‘projector’	/**pr**əˈ.dʒɛk.tə/	/**bur**uːʒiktur/
3.	‘protein’	/ˈ**pr**əʊ.tiːn/	/**bur**utiːn/
4.	‘plastic’	/ˈ**pl**as.tɪk/	/**bil**aːstic/
5.	‘april’	/ˈeɪ.**pr**(ɪ)l/	/ʔi**b.r**iːl/
6.	‘express’	/ɛkˈ**spr**ɛs/	/ʔɪk**sib**ris/

Essentially, the first condition is the adaptation that demands more than two steps in which two violated constraints found in the syllable, segmental and syllabic. For instance the first syllable of the English loanword ‘professor’ violates two constraints, namely the segmental and syllabic ones. The segmental constraint is voiceless bilabial /p/ whereas the syllabic is onset cluster. In this situation, the Precedence Convention is activated suggesting that the syllabic constraints (onset branching) have priority over segmental ones (/p/). This indicates that the illicit syllabic constraint must be repaired first. With the neglecting of the segmental constraint /p/, the onset cluster is treated as stated before, adapted by the insertion of nucleus followed by vowel epenthesis. This is the suggested strategy by the TCRS-LM principles with exception of the Minimality Principle that prefers the loss of a consonant instead of vowel epenthesis as it is minimal. The main issue here is that the adapting of this syllabic constraint (onset branching) besides the adapting of the illicit segment /p/ is basically too costly (following the Threshold Principle)[30] despite the fact that it is against the Preservation Principle. To clarify this more, the adaptation process for the English loanword ‘professor’ without the deletion of illicit consonant demands the following:

[30] Even though the Threshold Principle as stated in Paradis and LaCharité (1997: 385) says ‘within a given constraint domain’ their treatment of Fula assumes that repairs in both domains combine to exceed the threshold.

1. The insertion of a nucleus (breaking the illicit onset cluster)
2. The spreading of vowel to fill the nucleus with segmental material
3. The adaptation of the illicit segment /p/

This adaptation appears to involve three steps, which is prohibited according to the Threshold Principle. In such case, the TCRS-LM predicts the deletion of the illicit segment /p/ as it is considered minimal according to the violated syllabic constraint but not segmental constraint. The syllabic constraint that contains this segmental constraint has priority (the Precedence Convention) as it applies at the segmental level (the PLH). Thus, TCRS-LM principles consider the deletion of the voiceless bilabial is the best strategy to repair both violations since it repairs both violated constraints in one step, which is the loss of segment. However, there is no deletion of the illicit /p/ in any of these cases in UHA loanword dataset. Instead, the violated constraints are repaired by both strategies, epenthesis of vowel, yielding the insertion of a nucleus, to break the illicit onset cluster, then vowel epenthesis in order to provide the newly inserted nucleus with segment and, lastly, the voicing of /p/. These are the attested steps in the adaptation of these loanwords, which are certainly against the prediction of the TCRS-LM principles. Hence too many repair strategies are applied rather than the loss of the illicit segment and totally exceeding the limit of the Threshold Principle.

(77) The adaptation of voiceless bilabial and onset cluster CCC

Gloss	**English**	**UHA**
1. ‘s**p**ray’	/**spr**eɪ/	/ʔisbirɜː/

The next condition is the adaptation of onset cluster CCC and voiceless bilabial /p/ within this cluster, provided in (77). Similar to the previous condition, these cases contain two violated constraints, the segmental that is the voiceless bilabial /p/, and the syllabic one, which is onset branching. The distinction between the two conditions is that the selected strategies to repair the violations, none of these strategies are predicted by the TCRS-LM principles. To clarify more, the Precedence Convention predicts that the syllabic constraints (onset branching) must be repaired before segmental ones (/p/). Given the fact that the adaptation process for the ‘spray’ without the deletion of illicit consonant (/p/) requires three steps exceeding the limit of the Threshold Principle. On balance, the TCRS-LM predicts the deletion of /p/ for the same reason stated earlier. Therefore, TCRS-LM principles indicate that the deletion of the voiceless bilabial is the best strategy to repair both violations given the fact that it repairs both violated constraints in one step. Hence the predicted strategy is the deletion of the illicit segment, which is the /p/ that repairs both violated constraints in one step. Even if the deletion of the /p/ is selected in the adaptation of these cases, it does not remove the syllabic constraint completely since a CC cluster is still not allowed in UHA. The attested strategies in these cases in UHA loanword dataset as follows:

1. The insertion of onset
2. The epenthesis of consonant in the onset (glottal stop)
3. The insertion of a nucleus (breaking the illicit onset cluster)
4. The spreading of vowel to fill the nucleus with segmental material
5. The adaptation of the illicit segment (voicing of /p/)

These are the attested steps in the adaptation of these loanwords and unpredicted entirely the TCRS-LM principles, more specifically the Threshold Principle. No deletion occurred, all the consonants of the onset clusters are preserved and exceeding the limit of this principle. The reason for applying multiple repair strategies in adapting these loanwords is due to sonority sequence as the onset cluster with falling sonority so it more resistant to any internal vowel epenthesis, only external because the resistance of the sequence of consonant against any break up (sCC).

The last condition of unpredicted adaptation is found in the adaptation of one violated syllabic cluster that is onset branching demanding too many repair strategies, with no deletion. In certain cases of onset cluster containing the obstruent fricative the /s/ as the first consonant and the obstruent stop the /t/ and /k/ and some cases the sonorants /w/, /l/ or /r/ as the third consonant adapted by the epenthesis of the default vowel /i/ as well as the consonant (the glottal stop), consider the examples of this condition given in (78). This can be explained as this condition of onset cluster requires external epenthesis of the vowel due to sonority sequence (falling sonority), indicating that internal vowel epenthesis to break this case of onset clusters is not permitted. Instead, the vowel is inserted externally before the cluster. The external epenthesis of the vowel creates an onset-less syllable that is apparently another violated syllabic constraint, which in turn triggers the epenthesis of the glottal stop. The epenthesis of the default vowel /i/ involves two steps, namely the insertion of a nucleus, to break the illicit onset cluster, followed by vowel epenthesis in order to provide the newly inserted nucleus with a segment. On the other hand, the second epenthesis, which is the insertion of the consonant, further requires two steps: the insertion of onset followed by the epenthesis of glottal stop in this onset. This indicates that attested strategies in the adaptation of these onset clusters exceed the limit of the Threshold Principle. Too many steps to repair only one violated constraint are against the predictions of the Preservation and Minimality Principles as well.

(78) The epenthesis of vowel and consonant before onset clusters

Gloss	English	UHA
1. ‘skater’	/ˈ**sk**eɪtə(r)/	/ʔ**i**sikietʌr/
2. ‘sterling’	/ˈ**st**ɜːlɪŋ/	/ʔ**i**stɑrliːni/
3. ‘sticker’	/ˈ**st**ɪkə(r)/	/ʔ**i**stikɑr/
4. ‘street’	/**str**iːt/	/ʔ**i**stireet/

In sum, these are condition that undergone adaptations of UHA loanwords unpredicted by the TCRS-LM principles. Each of the first two conditions involves segmental as well as syllabic constraint violations repaired by epenthesis and segmental adaptations with no loss of any segment demanding too many steps, while in the second condition only one violated syllabic constraint with too many insertions of vowel and consonant without any loss of segments. Indeed, these unpredicted cases of adaptation show how the TCRS-LM principles fail to predict the selected strategies in the adaptation of these loanwords, and more importantly gives further evidence against this theoretical framework.

5.3. Discussion

The first theoretical model used in investigating the UHA loanword is the TCRS-LM Proposed by Paradis and LaCharité (1997), which is specifically designed to account for loanword adaptation. As stated in **Chapter II**, many studies in loanword adaptation adopt this theoretical framework in analysing numerous phonological patterns attested whether at the segmental or syllabic level (such as Ulrich 1997, Brasington 1997, Rose 1999, Adler 2006 and Stoltzfus 2014).). Likewise, the current adopts this theoretical model in analysing UHA loanword adaptation. Concerning the consonantal adaptations, the UHA loanword dataset indicates that various adaptations of English consonants are preferable to importation or deletion. Within the principles of the TCRS-LM (Paradis and LaCharité, 1997), the choice of adapting ill-formed segments (more precisely, the English consonants) rather that deleting them favours the Preservation Principle predictions. Nevertheless, this principle indicates that the deletion of consonant will be rare instead of non cases at all as seen in the UHA loanword dataset. Besides, the maximal consonantal preservation of the English consonants is governed by another principle, namely, the Threshold Principle. Hence the Threshold Principle demands that the number of steps in any consonantal repair in order to preserve the ill-formed consonant should not exceed two; otherwise, deletion will occur to that ill-formed consonant. This is actually what we find in the UHA loanword dataset, since no cases of consonant deletion are attested, only adaptation, which satisfies the Threshold Principle in which all of the consonantal repair strategies of English consonants are done within only two steps, no more.

Furthermore, Consonantal adaptation not only provides strong evidence regarding both principles, the Preservation as well as the Threshold, in which 'segmental information is maximally preserved' (Paradis and LaCharité, 1997: 384); it also conforms to the other principle, particularly, the Minimality Principle, in which any adaptation should involve as few steps of repair strategies as possible. In fact, this has been attested in the UHA loanword dataset, as the consonantal adaptations of ill-formed English consonants are minimal (demanding either one or two steps) and more likely to target the same level 'feature without dependent' either Laryngeal, Place nodes or [continuant].

The main issue with the TCRS-LM's principles especially the Minimality Principle concerning the consonantal adaptation is that they permit the attested adaptation (as in the adaptation of /p/, /ŋ/ and /v/), moreover, they also permit unattested adaptations and do not predict which one will occur with exception to the adaptation of English affricates. Proposing too many repair strategies (the Minimality Principle) and some of them are unattested has been considered a problem not only for the UHA loanword adaptation but also for other studies in loanword adaptation adopting the same theortical framework (such as Ulrich 1997). In the light of this, Stoltzfus (2014: 10) specifies that research within the TCRS-LM normally 'invoke cultural or sociolinguistic reason' in order to provide an exlplanation regarding the choice of adaptation among other possibilities to be considered the minimal one. Essentially, Paradis and LaCharité (1997: 404-405) tackle this issue by suggesting that in case where there are more than one minimal adaptations available for dealing with an illicit segment the determining of the most favoured adapation among other available options is controlled by the other principle the Preservation Principle that differentiate between the insertion and deletion of segmental information at the featural level. This possible sultion holds true in the case of predicting the attested adaptation of the English affricates (/ʤ/ >/ʒ/ and /ʧ/> /ʃ/) instead of the other availale minimal option (/ʤ/ >/d/ and /ʧ/> /t/) but not for the other consonants (/p/ and/ŋ/). In this regard, Stoltzfus (2014: 10) further indicates that:

'Despite the lack of precision present in TC in precisely predicting the choice of

> adaptation strategy when it comes to features, the present ability of the TC framework to eliminate most unlikely adaptation strategies currently does a much better job at dealing with the Too-Many-Solutions problem than does the OT framework, the framework adopted by Steriade and Miao. The Too-Many-Solutions problem is a much larger issue in OT where it has been dealt with more widely' (Stoltzfus 2014: 11)

Another observation worth noting in the UHA loanword dataset is the lexical variation in the adaptation of the English /v/, unlike the systematic adaptation of the /p/ into its voiced equivalent /b/, this English labiodental /v/ is not only adapted to its voiceless correspondent /f/, it infrequently changes into the approximant /w/ in some cases, or the bilabial stop /b/ in others. Cross linguistically, the voiced labiodental /v/ is exceptional among other consonants in not only exhibiting lexical variation in English loanword adaptation in UHA; it also does so in other languages in loanword adaptation, for instance, English loanwords in Hawaiian (Adler 2006), French loanwords in Fula (Paradis and LaCharité 1997), English loanword in Cantonese (Dohlus 2010) and French loanwords in Mororcan Arabic (Stoltzfus 2014). In this regard, Paradis and LaCharité (1997: 401) suggests possible reasons for variation as similar situations found in Fula, that:

> 'Variation in loanword adaptation can sometimes be caused by distorting extra-phonological factors such as analogy, time, the influence of orthography, the fact that a word was borrowed through an intermediate language, etc.'

The variation in the adaptation of /v/ in Fula is further explained by Paradis and LaCharité (1997: 405) according to their theoretical framework as:

> 'The TCRS Loanword Model maintains that irregularity of adaptation during the period of low community bilingualism is due to the fact that 1) there is sometimes **more than one 'minimal' repair for a given foreign phoneme**, and 2) among these minimal repairs none has become a social convention yet. In this perspective, we suggest that variation in the adaptation of *v* here is at least partly due to the fact

> that there is more than one minimal repair available, and that there was a stage during which the adaptation of *v* into *w* had not become completely conventionalized' (Paradis and LaCharité, 1997: 405; my emphasis)

The proposed analysis given by the TCRS-LM principles, explain fully each adaptations of the /v/, furthermore, predict that the adaptation (/v/ > /w/) will be the most frequent ones in contrast with other attested alternatives (/v/ > /f/ or /b/) in UHA loanword adaptation. The reason for this suggested preference is that as identified before, is that the weakening of this labiodental is the most minimal adaptation since it requires feature insertion [+sonorant] instead of deletion. Alternatively, the other two strategies are equally valued according to the Minimality Principle and the PLH (targeting the same level feature without dependent and entailing loss of featural information). Nevertheless, the UHA loanword dataset reveals different frequency than the predicted by the TCRS-LM as the devoicing of the /v/ is found to be the most frequent adaptation, followed by the weakening, while the strengthening of this labiodental is the least frequent one. Cross-linguistically, 'Cantonese exhibits weakning exclusively, Lama exhibits devocing exclusively, and Fula exhibits all three strategies but prefers weakning' (Ulrich 1997: 441). Ulrich (1997: 438) indicates that this matter is basically related to the PLH as all features are treated at the same level 'feature without dependent', and one possible solution requires a modification of the PLH in which features such as [continuant] can be ranked higher than the [anterior]. Ulrich (1997: 438) further states 'such a formulation of the PLH was put forth by Paradis and Lebel (1994: 78)' as the following:

'Metrical > syllabic > skeletal > root node > articulators > root node features > articulator features' (Paradis and Lebel 1994: 78 cited in Ulrich 1997: 438)'

The suggested formulation of the PLH successfully accounts for the Lama data as well as deciding between the two minimal adaptation options for the /p/ and the preference for the /v/ variations but not for other consonantal adaptation. In sum, the TCRS-LM principles attempt to account for the lexical variation in the adaptation of the English /v/, but fails in suggesting the preference of the adaptation as attested in UHA. Essentially, the choice between the various adaptations of the /v/ is not determined by the TCRS-LM principles. In similar situations from the literature, the adaptation of English fricative /s/ in Hawaiian loanwords, Adler (2006) indicates that TCRS-LM predicts variation for the /s/ but none of them is attested (/s/ > /n/ or /l/). Adler (2006) observed another issue in two of the strategies predicted by this model are actually equally valued in the feature geometry, namely the mapping to [k] and [p]. Additionally, Adler (2006: 1044) refers this failure to the attempt in predicting 'input–output mappings without reference to the perceptual effect of a given change', for instance, 'sonority, nasality or stridency will have a disproportionate perceptual effect, and something a simple feature-counting system is unable to capture'. Concerning the equally valued strategies predicted by the TCRS-LM, Ulrich (1997: 459) suggests that 'this variation indicates that the non-unique predictions of the TCRS are actually the correct predictions'. He further explains 'predicting a unique repair for the violations of any of these constraints would fail to handle the cross-linguistic data'.

The importation (non-adaptation) of English affricates in UHA loanwords can be explained under the TCRS-LM, as the UHA phonology is divided into two components: core and periphery, in which the periphery is limited to partially adapted and fully non-adapted loan items. This can clarify the non-adaptation of the affricate in the four English loanwords 'clutch', 'ketchup', 'massage' and 'message' as they become part of the UHA peripheral phonology when the consonantal mappings /ʧ/ > /ʧ/ and /ʤ/ > /ʤ/ occur, resulting in /kælʌ**ʧ**/, /kɑːʧɑb/, /mɑsɑː**ʤ**/ and /mɑssi**ʤ**/. According to the TCRS-LM, the presence of the two affricate consonants in the UHA peripheral phonology entails an expansion in the feature system in this dialect (the addition of contrastive [-continuant] and [-anterior] features).

Concerning the adaptation of syllabic structures in UHA loanwords, two main syllabic constraint violations are found, namely onset-less syllable and branching onset. Following the TCRS-LM, segmental epenthesis, whether consonant or vowel, is the largely preferred strategy over deletion in repairing these violated syllabic constraints, as predicted by the

Preservation Principle. Onset-less syllable is the first violated syllabic constraint that is mostly repaired by the epenthesis of consonant, resulting in the insertion of onset and followed by the epenthesis of consonant in this onset, either the glottal stop (initially) or the glide /j/ (intervocalically). This is the attested strategy in repairing this violation. The epenthesis of the consonant in repairing the onset-less syllable entirely conforms with the TCRS-LM's principles, in which all the segments are retained (the Preservation Principle), the repair is minimal and at the lowest phonological level to which this constraint refers, that is the skeletal level (the Minimality Principle) no deletion occurs (the Threshold Principle), as this illicit sequence needs only two steps: the insertion of onset and then the epenthesis of a consonant in the onset. Nonetheless, the second component of the Minimality Principle prefer the deletion of vowel instead of consonant epenthesis based on the number of steps involved in the adaptation process (one step instead of two).

Indeed, the proposed analysis provided by the TCRS-LM principles clarifies only the reason behind epenthesis of consonant in adapting onset-less syllable without determining which consonants to be inserted, for instance the reason behind selecting the laryngeal (glottal stop) initially as well as the glide /j/ intervocalically among other consonants (obstruent, nasal, lateral, rhotic or even semi vowel), as the preferred consonant and continuously inserted in such positions of onset-less syllable in UHA loanword dataset. Thus, this is a further evidence of the incapability of the TCRS-LM principles in adequately account for the selection of the epenthetic consonant but the feature geometry aspect of this theoretical framework does in order to repair onset-less syllable in UHA loanword adaptation.

Branching onset is found to be the second violated syllabic constraint in UHA loanwords which is mainly repaired by the epenthesis of vowel or vowel and consonant in the same time. More specifically, the onset cluster is repaired by only vowel epenthesis in cases of CC cluster, while in sCC cluster (falling sonority), the repair strategies involve the epenthesis of vowel along with the consonant (the glottal stop). The TCRS-LM's principles predict that the violation against the CC onset clusters must be repaired with the epenthesis of vowel, which the attested strategies in UHA loanword. The highly selected strategy is made at the lowest phonological (the skeletal) level (the Minimality Principle), involving (two steps) nucleus insertion and vowel epenthesis, with no deletion (the Preservation and Threshold Principles). However, the second component of the Minimality Principle also here prefer the deletion of consonant over vowel epenthesis as it required as few steps as possible (one step instead of two).

On the other hand, the sCC onset cluster has one violated syllabic constraint that is onset branching is repaired by multiple strategies involving the external epenthesis of the vowel /i/ (two steps; nucleus insertion and vowel epenthesis) due to sonority sequence, triggering additional epenthesis of the glottal stop (another two steps; onset insertion and consonant epenthesis) with no deletion. Apparently, this exceeds the limit of the Threshold Principle and goes against the predictions of the TCRS-LM's principles for repairing one violated syllabic constraint. Furthermore, the TCRS-LM framework is incapable to accurately account for the selection of the epenthetic vowel in order to repair onset cluster, as in Paradis and LaCharité (1997: 406), states that 'whether one of the two strategies – spreading of a surrounding vowel versus insertion of a default vowel – is more economical or whether precedence of one strategy over the other hinges on parametrisation is not settled yet'. It also signified by Uffmann (2007b: 12) that Paradis (1996) and Paradis and LaCharité (1997) 'do not discuss the choice of the epenthetic vowel' in their analyses. Thus, this indicates additional evidence of the failure of this theoretical approach in exemplifying certain phonological issues in UHA loanword adaptation.

The final observation in UHA loanwords is the adaptation of cases with violated segmental and syllabic constraints requiring too many strategies to be repaired and none of them is deletion. This can be seen in the adaptation of the voiceless bilabial /p/ and onset cluster. In such cases, the TCRS-LM principles fail to account for the attested strategies in repairing these violations since the vowel is inserted to break the onset cluster whereas the /p/ is voiced. No preference is given to one violated constraint over the other (against the Precedence Convention); no deletion occurred and preservation exceeds two steps (against the Preservation and Threshold Principles) and there are too many steps to repair both violated constraints (against the Minimality Principle). Overall, these cases show strong evidence of how the TCRS-LM principles are incapable of accounting for the attested repair strategies in UHA loanword adaptation.

Generally, the analysis of UHA loanword adaptation within the TCRS-LM has shown many points that, to some extent, support the results of the existing literature on loanword adaptation adopting this model. To begin with, this study entirely supports Adler's (2006: 4) claim that one of the most noticeable advantages of TCRS-LM 'is that it provides straightforward and explicitly testable principles which guides the adaptation process'. Across the discussed literature in **Chapter II**, many loanword adaptation studies argued against the Threshold Principle, for instance Ulrich (1997) and Rose (1999). In Ulrich's (1997: 460) study, segment deletion is absolutely not determined by the Threshold Principle, suggesting that Paradis and LaCharité (1997) put this principle 'as a hypothesis, admitting that the actual threshold may have to be parameterised'. He further indicates that 'whether a language has a threshold at all should be parameterised, with Lama lacking a threshold entirely'.

Equally, Rose (1999: 50) raises many issues against the Threshold Principle, starting with the claim embodied in this principle that 'phonology must "know" the number of steps required for an adaptation before it selects the right strategy' asking does the phonology 'really apply such abstract evaluations in order to determine which strategy (e.g. segmental adaptation versus deletion) should be favoured?' Secondly, is the fact that this principle views phonology as 'a component of the grammar that is able to count' in which 'preservation versus deletion of segmental material is based on the sum of the derivational steps involved in a given adaptation'. From such a perspective 'it is logical to expect that inputs containing malformations at both the segmental and syllabic levels require a great number of steps to be adapted'. Nevertheless, it does not indicate that the number of required steps 'is really the *cause* of the segmental deletions observed' (Rose 1999: 50-51).

Indeed, Rose (1999: 53) suggests ‘to eliminate the Threshold Principle from the theory as a device for determining segmental deletions’ denying the idea ‘that a limit on the number of derivational steps is the fundamental cause of segmental deletion in loanword adaptation’. Rose (1999: 53) further states that ‘a theory based solely on a mechanism such as arithmetic counting for encoding complexity seems inadequate for defining the computational limit on segmental preservation in loanword adaptation’. Unlike these considerations against the Threshold Principle, Adler (2006: 1025) supports this principle in predicting correctly the deletion of a segment in cases with what it called “double-malformation” for instance ‘ones with both featural and syllabic violations are often not retained’ in the adaptation of English loanwords into Hawaiian. Indeed, some of the arguments against the Threshold Principle presented in the studies by Ulrich (1997) as well as Rose (1999) are considered true in UHA loanword adaptation though many considerations against the other principle, the Minimality Principle should be addressed.

5.4. Concluding remarks

TCRS-LM and feature geometry theory are used together in order to provide a comprehensible clarification of both the consonantal and syllabic adaptation of English loanwords into UHA. In this chapter, the consonantal as well as repair strategies that are controlled by the phonological principles (TCRS-LM), proposed by Paradis and LaCharité (1997), definitely work on the underlying representation of the foreign input. The repair strategies are made to the feature-geometric tree of the source sound and structure that is English. In sum, the TCRS-LM principles, to some extent, make correct predictions regarding the adaptation of segmental constraints in most of the cases while in the syllabic one it exhibits conflicting predictions. Starting with the Preservation Principle, it succeeded in predicting that adaptation will be largely favoured over deletion, and the deletion will be rarely applied (no deletion cases in the UHA loanword dataset).

The second principle that is the Minimality Principle is not entirely activated since some selected strategies are certainly not minimal. The Precedence Convention is never followed since no preference is found in selecting one constraint to be repaired among conflicting violated constraints. The last principle that is the Threshold Principle fails in accounting for too many preferred attested strategies in UHA loanwords. To conclude, the TCRS-LM is not a sufficient theoretical framework for suggesting the exact prediction regarding the consonantal as well as the syllabic adaptation in UHA loanwords. The TCRS-LM principle that entirely fails in accounting for these changes are the Minimality Principle in the case of consonantal adaptations while in the case of the syllabic ones both the Preservation as well as the Threshold principles, while other principles are, to some extent, more adequate in attempting to provide an explanation of the segmental and syllabic adaptations. It seems that in the case of UHA loanword adaptation the Threshold Principle is weaker than for instance Fula (Paradis and LaCharité 1997) or Lama (Ulrich 1997) and that can be possibly explained by some sort of ranking of these principles in order to account for different languages and that what is Optimality Theory is about as it indicates the universality of these constraints and ranking them in special order for different languages and can account for different results in loanword adaptation as will be seen in the next chapte

CHAPTER VI

English Loanwords in UHA: The OT Approach

6.1. Introduction

Analysing the observed consonantal and syllabic adaptation in UHA loanwords under The Theory of Constraints and Repair Strategies Loanword Model (TCRS-LM) introduced by Paradis and LaCharité (1997) in the previous chapter (Chapter V), leads to the conclusion that the TCRS-LM is incapable of accounting for all the attested phonological adaptations in UHA loanword dataset. Several evidence indicates the failure of the TCRS-LM principles, starting with the selection of the preferred epenthetic consonants in onset-less syllable that is handled by the feature geometry aspect of this framework, to the failure of its predictions in the adaptation of initial onset clusters sCC requiring multiple strategies, involving the epenthesis of vowel and consonant, which certainly exceed the limit of the Threshold Principle and go against the predictions of this model's principles, and lastly the failure of accounting the adaptation of cases with two violated constraints segmental and syllabic ones requiring too many strategies to be repaired and none of them is deletion. Clearly, it is essential to turn to another theoretical alternative that can effectively account for all the attested phonological adaptation in UHA loan phonology. Indeed, the widely used theoretical approach in discussing not only loanword adaptation but also other phonological issues cross-linguistically is Optimality Theory (OT). Therefore, the aim of this chapter is to analyse the phonological adaptation of English loanwords into UHA from the perspective of optimality theory proposed by Prince and Smolensky (1993). It will concentrate on the discussion of both the consonantal and syllabic adaptations in OT that are found in UHA loanword dataset. The crucial aspect of the argument is to evaluate Optimality Theory's capacity to explain all the predicted phonological adaptations, whether at the consonantal or syllabic level. The main claim is that OT is capable of predicting the phonological adaptations of English loanwords into UHA, especially with the use of numerous OT faithfulness as well as markedness constraints. This will consequently lead to the conclusion that Optimality Theory in contrast with the TCRS-LM is the most adequate theoretical approach in providing an explanation of all the segmental and syllabic changes attested in UHA loanword dataset.

This chapter proceeds as follows. Section 6.2 is devoted to the outline of the concerned Optimality Theory constraints that will be explicitly used in the analysis. The adaptation and importation of consonants are discussed in the subsections 6.2.1 and 6.2.2, respectively. Section 6.2.3 deals with the analysis of the syllabic adaptations that includes the discussion of the epenthesis of consonant and vowel. Section 6.3 provides a discussion which summarises the important findings and main generalisations drawn from the phonological analysis of UHA loanword adaptation using OT in line with the existing literature adopting the same theoretical approach. At the end, this chapter concludes with a summary provided in Section 6.4.

6.2. Optimality Theory and UHA Loanword

This section provides a brief introduction to Optimality Theory and shows how different phonological adaptations of UHA loanwords are modeled in this framework, such as consonantal adaptations and importations, vowel and consonant epenthesis, through the interaction between different constraints. Due to the limitations of observed phonological adaptations in UHA loanword dataset, only the constraints concerned in the analysis of UHA loanword adaptations will be presented and defined. In this theoretical approach, Prince and Smolensky (1993) focus on constraints rather on rules, more generally adopting an output-based perspective of phonology instead of an input-based one. Three essential aspects describe these constraints, universality, violability and ranking. The discussion of how the ranking of different constraints in OT leads to the selection of the optimal candidate among other potential candidates is provided in details in the theoretical background of this study (**Chapter II**). Before evaluating the phonological adaptation of UHA loanwords within OT, it is necessary to outline and described the relevant constraints in the analysis. In OT, there are two main types of constraints, markedness and faithfulness constraints. Faithfulness constraints require the preservation of the input in which the output undergoes no changes, while the markedness constraints, on the other hand, require that output forms should be maximally unmarked. The conflict between these two types of constraint can be resolved by the ranking of constraints specifically in respect to each other in order to anticipate the preferred output among alternatives.

The faithfulness constraints used in the UHA loanword analysis are that of Correspondence Theory, from McCarthy and Prince (1995), which states more clearly the correspondence or the relation between input and output (IO correspondence). Basically, correspondence is defined by McCarthy and Prince (1995: 262) as follows:

(79) **Correspondence**

Given two strings S_1 and S_2, correspondence is a relation $\mathcal{R}$ from the elements of S_1 to those of S_2. Elements $\alpha \in S_1$ and $\beta \in S_2$ are referred to as correspondents of one another when $\alpha \mathcal{R} \beta$.

The three main correspondence constraints that will be used in the analysis, are detailed in the following, that all relate to the input-output relation (McCarthy and Prince 1995: 264):

(80) The **MAX-IO** constraint:

Every segment of the input has a correspondence in the output. (Deletion is not allowed)

(81) The **DEP-IO** constraint:

Every segment of the output has a correspondence in the input. (Epenthesis is not allowed)

(82) The **IDENT-IO (F)** constraint:

Output correspondents of an input $[_{\gamma}F]$ segment are also $[_{\gamma}F]$. (Change is not allowed)

The reason for choosing these faithfulness constraints will become clearer in the course of the discussion of the UHA loanword adaptations. Other correspondence constraints will not be of importance for the argument presented and they will not be considered. Faithfulness constraints are balanced by markedness constraints, constraints that penalise universally marked structures. A number of relevant markedness constraints will be proposed as the argument develops, and the list of such constraints will be fully defined in the course of analysis. Some of the markedness constraints will be of special concern, more specifically the syllable structure constraints. Prince and Smolensky (1993: 85) have identified some of the fundamental constraints that 'define the preferred shape of syllables', the ones of greatest importance for the analysis are the **ONSET** and ***COMPLEX**^{ONSET} constraints, that are defined as:

(83) The **ONSET** constraint: Syllables must have an onset.

(84) The ***COMPLEX**^{ONSET} constraint: Complex onsets are not allowed.

The first markedness constraint will be of special concern because it demands syllables to have onsets that means syllables without onsets are not allowed according to this constraint. This will be clearer especially in the discussion of consonant epenthesis in UHA loanword adaptations. The other markedness constraint, ***COMPLEX^{ONSET}** constraint disallows consonant clusters in onsets positions. In sum, the next OT analysis will deal with the consonantal as well as syllabic adaptation of UHA loanwords and evaluate these phonological changes with the use of appropriate constraints.

6.2.1. Consonantal Adaptation

The OT analysis of UHA loanword adaptations will start first with the consonantal adaptations, namely the alterations of the two English affricates /ʤ/ and /ʧ/, the voiceless stop /p/, the nasal /ŋ/ and lastly the fricative /v/ that the UHA inventory lacks as native phonemes. This section will begin with the systematic adaptations attested in the integration of the first illicit four consonants in UHA loanword dataset, followed by the argument regarding the lexical variation spotted in the adaptation of the fricative /v/.

6.2.1.1. The voiceless bilabial /p/

Recalling the UHA consonantal inventory, it can be noted that it shares similar bilabial consonants with English /b, m /, with only one distinction that is the absence of voiceless bilabial /p/ in UHA. In the adaptation of English loanwords in UHA, this voiceless bilabial /p/ is consistently voiced into its closest counterpart the /b/ as seen in the UHA loanword dataset, consider the examples in (85) that demonstrates this adaptation (/p/ > /b/) in variant occurrences of /p/ in the word:

(85)

The Change	Occurrence	English	UHA	Gloss
/p/ > /b/	Initially	/ˈ**p**andə/	/**b**ɑndɑ/	‘panda’
	Medially	/ʃæmˈ**p**uː/	/ʃʌm**b**o/	‘shampoo’
	Finally	/kʌ**p**/	/kuː**b**/	‘cup’

The examples presented in (85) can be evaluated within OT with no need of the input specification by constraint interaction. Two constraints are employed in the adaptation (/p/ > /b/), the first is the markedness constraint ***p** while the other is the correspondence faithfulness constraint is **IDENT-IO [±voice]**. Hence the markedness ***p** is an inviolate constraint in UHA phonology, this means that this constraint must be ranked higher than the faithfulness one, consider the tableau in (86) that represents the adaptation of the English loanword 'panda' into /bɑndɑ/ in UHA:

(86) The voicing of voiceless bilabial /p/

'panda'	***p**	**IDENT-IO [±voice]**
[31]pɑndɑ	*!	
☞bɑndɑ		*

The input 'panda' begins with the voiceless bilabial /p/; this is an illegal consonantal segment in UHA, generally, there are three potential patterns in order to deal with this illegal consonant in loanword adaptation, either importation, adaptation into its closest equivalent found in UHA consonantal inventory or lastly deletion. In the case of the English loanword 'panda' deletion of /p/ is ruled out since it will lead to create illicit syllable (onset-less syllable). This yields two possible candidates[32], [pɑndɑ] in which the /p/ is imported (no change occur), and [bɑndɑ] which has voicing of /p/ (the voicing of [p], yields the adaptation into [b]). Hence the constraint ***p** outranks the **IDENT-IO [±voice],** the candidate [bɑndɑ] will emerge as optimal, as demonstrated in the tableau in (86): The first candidate violates ***p** because the voiceless bilabial /p/ remains non-adapted while the candidate [bɑndɑ], however, does not violate ***p.** It violates **IDENT-IO [±voice]**, though as this faithfulness constraint is relatively low-ranked, the violation is acceptable. Violation of

[31] The vowel adaptations in UHA loanword has been left aside for the sake to keep the argument of consonantal and syllabic adaptations simple.

[32] Other possible candidate such as [tɑndɑ] is not discussed here but is eventually rule out with the final ranking of constraints that accounts for consonantal adaptation as a result of the violation of the constraint **IDENT-IO [place].** The same can be said with the other potential candidate [fɑndɑ] as it rejected due to the violation of the **IDENT-IO [±continuant].**

higher-ranked ***p** on the other hand is fatal. In OT terms, the ranking that is responsible for the voicing of the voiceless bilabial /p/ in UHA loanword is demonstrated in (87):

(87) ***p >> IDENT-IO [±voice].**

6.2.1.2. The Nasal /ŋ/

Nasal consonants in UHA inventory are restricted to the two /m, n/, with the absence of English /ŋ/. The lack of this nasal from UHA creates problems in the adaptation of English loanwords that contain the /ŋ/. In this respect, this nasal is systematically adapted into /n/ as shown in (88) demonstrating two cases in which this nasal occurs word finally:

(88)

The Change	Occurrence	English	UHA	Gloss
/ŋ/ >/n/	Finally	/ˈstɜː.lɪ**ŋ**/	/ʔistɑrliː**n**i/	‘sterling’
	Finally	/ˈʃɪlɪ**ŋ**/[33]	/ʃili**n**/	‘shilling’

Similar to the adaptation of the voiceless bilabial /p/, the adaptation of this nasal can be evaluated within OT by the interaction between the markedness constraint ***ŋ** and the faithfulness constraint **IDENT-IO [place].** The markedness ***ŋ** must outrank the faithfulness one since the ***ŋ** cannot be violated in UHA phonology, this interaction is illustrated in tableau (89) that exemplify the adaptation of the English loanword ‘shilling’ into /ʃilin/ in UHA:

(89) The mapping of the nasal /ŋ/ into /n/

‘shilling’	***ŋ**	**IDENT-IO [place]**
☞ ʃilin		*
ʃiliŋ	*!	

[33] Arguably, one might say that due to the existence of the /g/ in the spelling of the English loanword ‘‘shilling’, historically this is a case of velar assimilation instead of /ŋ/ adaptation as it is not a phonemic distinction in that environment, a simple answer for such claim is that this is not a diachronic study it is a synchronic one.

The input ‘shilling’ contains the illegal nasal /ŋ/; there are three potential strategies in order to deal with this illegal consonant in UHA loanword adaptation, either importation, adaptation into its closest equivalent found in UHA consonantal inventory or finally deletion. There are no attested cases of /ŋ/ deletion in UHA, this yields two potential candidates[34], [ʃiliŋ] in which the /ŋ/ is imported (no change occurs), and [ʃilin] which has the adaptation of /ŋ/ into /n/. Thus the constraint ***ŋ** ranks higher than the **IDENT -IO [place]**, the candidate [ʃilin] will be the optimal, as shown in tableau (89): The second candidate violate ***ŋ** because the nasal /ŋ/ remains non-adapted while the first candidate [ʃilin], however, does not violate ***ŋ**. It violates **IDENT-IO [place],** though as this faithfulness constraint is relatively low-ranked, the violation is acceptable. Violation of higher-ranked constraint ***ŋ** on the other hand is fatal. In OT terms, the ranking that is responsible for the adaptation of the nasal /ŋ/ into /n/ in UHA loanword is illustrated in (90):

(90) ***ŋ >> IDENT-IO [place].**

6.2.1.3. The Affricates /ʤ/ and /ʧ/

The UHA consonantal inventory lacks entirely the English affricates /ʤ/ and /ʧ/. English loanwords that contain the /ʤ/ or /ʧ/, are either adapted systematically into their correspondents /ʒ/ and /ʃ/, respectively or imported. The examples given in (91) demonstrate the consistent adaptation. Otherwise, they are infrequently imported in certain cases and details about their importations are given in the next section.

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[34] One might arguethat other possible candidate such as [ʃilim] may not favoured as [n] is closer to [ŋ] than [m] is. Indeed, this is a case that clearly shows that OT does not naturally allow to completely predict the actual surface realisation, unless one might allow for much more subtle constraint definitions, specifying degrees of similarity in the place of articulation. The TCRS model does allow this, although only via the use of feature geometry.

(91)

The Change	Occurrence	English	UHA	Gloss
/ʤ/ >/ʒ/	Initially	/**ʤ**iːnz/	/**ʒ**inz/	'jeans'
	Medially	/əˈ**dʒ**ɛn.də/	/ʔɑ**ʒ**indɑ/	'agenda'
/ʧ/ >/ʃ/	Initially	/**ʧ**æt/	/**ʃ**ɑːt/	'chat'
	Medially	/**ʧ**ɪps/	/**ʃ**ibs/	'chips'
	Finally	/brəʊ**ʧ**/	/buruː**ʃ**/	'brooch'

To discuss the adaptation of the affricates /ʤ/ and /ʧ/ into the fricatives /ʒ/ and /ʃ/ within OT terms, consider the English loanword 'jeans' that contains the illegal consonant /ʤ/ in UHA phonology. According to OT, the adaptation of the /ʤ/ into /ʒ/ is as a result of the interaction between the markedness constraint ***ʤ** and the faithfulness constraint is **IDENT-IO [±continuant].** Since the markedness ***ʤ** is an inviolable constraint in UHA phonology, it indicates that this constraint must be ranked higher than the faithfulness one. Consider the tableau in (92) that represents the adaptation of the English loanword 'jeans into /ʒinz/ in UHA:

(92) The mapping of non-anterior affricate /ʤ/ into /ʒ/

'jeans'	*ʤ	IDENT-IO [±continuant]
ʤinz	*!	
☞ ʒinz		*

The input 'jeans' starts with the non-anterior affricate /ʤ/; this is illegal consonant in UHA. As there are no attested cases of /ʤ/ deletion in UHA loanword dataset, this yields two potential candidates, [ʤinz] in which the /ʤ/ is imported (no change occurs), and [ʒinz] in which the /ʤ/ is adapted into /ʒ/. Consequently the constraint ***ʤ** outranks the **IDENT-IO [±continuant],** the candidate [ʒinz] will emerge as optimal, as demonstrated in tableau (92): The first candidate violates ***ʤ** because the affricate /ʤ/ remains unchanged while the candidate [ʒinz], however, does not violate ***ʤ**. It violates **IDENT-IO [±continuant],** though as this faithfulness constraint is relatively low-ranked, the violation is acceptable at the cost of satisfying the higher-ranked constraint ***ʤ**, and any violation of this constraint is fatal. In OT terms, the ranking that is responsible for the adaptation of the affricate /ʤ/ into the fricative /ʒ/ in UHA loanword is: ***ʤ >> IDENT-IO [±continuant].** This explanation can be simply applied to the adaptation of the other affricate /ʧ/.

6.2.1.4. The Fricative /v/

In UHA consonantal inventory, labiodental is limited to one consonant, namely the /f/ with the absence of the English /v/. When this voiced labiodental is found in an English loanword, it might be imported, adapted to its closest phonological equivalent or deleted. In fact, the adaptation of this voiced labiodental is the only attested pattern with no cases of importation or deletion. Unlike the constant adaptations of /p/, /ʧ/ and / ʤ/, there is substantial lexical variation in the adaptation of this voiced labiodental. The examples given in (93) demonstrate the different attested adaptations of /v/ in UHA loanwords:

(93) **The Change**	**Occurrence**	**English**	**UHA**	**Gloss**
/v/ >/f/	Initially	/**v**æn/	/**f**ɑːn/	‘van’
	Medially	/ˈkʌ**v**.ə(r)/	/kɑ**f**ɑr/	‘cover’
	Finally	/seɪ**v**/	/səː**f**/	‘save’
/v/ into /w/	Initially	/ˈ**v**ɑːnɪʃ/	/**w**ɑːrniːʃ/	‘varnish’
	Medially	/ˈʃʌ**v**(ə)l/	/ʃɑ**w**ɑl/	‘shovel’
		/rɪˈ**v**əːs/	/rɑ**w**ɑs/	‘reverse’
/v/ into /b/	Initially	/ˈ**v**ækjʊəm breɪk/	/**b**ɑːkim/	‘vacuum-brake’
	Medially	/ˈlɑː**v**ə/	/lɑː**b**ɑ/	‘lava’

Essentially, the devoicing of the English labiodental /v/ can be explained within an OT account, through the interaction between the markedness constraint ***v** and the faithfulness constraint **IDENT-IO [±voice].** Given the fact that the markedness constraint ***v** can not be violated in UHA phonology, it must be ranked higher than the faithfulness **IDENT-IO [±voice],** this can be demonstrated in tableau (94) that exemplify the adaptation of the English loanword ‘van’ into /fɑːn/ in UHA:

(94) The devoicing of voiced labiodental /v/

‘van’	*v	IDENT-IO [±voice]
vɑ:n	*!	
☞ fɑ:n		*

The two candidates [vɑ:n] and [fɑ:n] display options for the adaptation of /v/, [vɑ:n] in which the /v/ is non-adapted, and [fɑ:n] where has devoicing of /v/. The first candidate [vɑ:n] is not optimal since it violates the markedness constraint ***v**; while the second candidate [fɑ:n] with the devoicing of /v/ is the best choice. Violation of **IDENT-IO [±voice]** is thus not fatal. Hence the constraint ***v** outranks the **IDENT-IO [±voice],** the candidate [fɑ:n] will emerge as optimal. The ranking ***v >> IDENT-IO [±voice]** can thus explain the devoicing of /v/. Similarly, the tableaux (95) and (96) exemplified the mapping of the /v/ into /b/ and the weakening of this consonant into sonorant /w/, accordingly. Concerning the ranking for the adaptation (/v/ > /b/) is ***v >> IDENT-IO [±continuant],** while the other adaptation (/v/ > /w/) is ***v >> IDENT-IO [±sonorant].**

(95) The mapping of voiced labiodental /v/ into /b/

‘lava’	*v	IDENT-IO [±continuant]
☞ lɑ:bɑ		*
ˈlɑ:vɑ	*!	

(96) The weakening of voiced labiodental /v/

‘varnish’	*v	IDENT-IO [±sonorant]
ˈvɑ:rni:ʃ	*!	
☞ wɑ:rni:ʃ		*

There is one problem with these tableaux. The ranking can only account for a single adaptation alone, while others are not considered. This indicates that the variability of the adaptation of this voiced labiodental /v/ are not accounted for. Thus, the following tableau given in (97) suggests a proper solution for this matter by re-ranking the same OT constraints used before, and instead of evaluating each adaptation separately, they just need to go under one evaluation. Indeed, the new proposed ranking that can effectively account for this variation requires the markedness constraint ***v** above all the other faithfulness constraints, since there is no case of importation of this consonant. Furthermore, these faithfulness constraints should be non-dominant and equally ranked. This will satisfy the need to have more than one optimal output by allowing more candidates to be optimal. Concerning the candidates in this evaluation, all the attested consonants in this variation, namely the /f/, /b/ and /w/ are available as options. This model can appropriately predict all the various adaptation of the voiced labiodental /v/ hence it allows to have more optimal candidate available. In sum, the OT framework enables us to predict the occurrence of all of these possibilities but it unfortunately doesn't allow predicting which one will occur in which words nor which one will occur most frequently.

(97) The variation of voiced labiodental /v/

/v/	*v	IDENT-IO [±sonorant]	IDENT-IO [±continuant]	IDENT-IO [±voice]
V	*!			
☞ f				*
☞ w		*		
☞ b			*	

In the proposed OT analysis to account for the adaptation of the consonants /p/ and /ŋ/, where the constraints are violated by the actual outputs might look simple and straightforward. Nevertheless, given the fact that these constraints are ranked equally and not inn relation to each other might allow other possible outputs. Actually, it is important to consider why other consonants don't have lexical variation like the /v/, given the lack of ranking of **IDENT-IO (F)** constraints. There are two possibilties:

1. Suggesting more detailed constraints to account for possible outputs for /p/, /ŋ/ and /v/:

IDENT-IO [voice] except for /p/ and /v/: Output should have same value for voice as input.

IDENT-IO [place] except for /ŋ/: Output should have same value for place as input.

For the case of the affricates /ʤ/ and /ʧ/, there is no need to consider other possiblites, the /t/ and /d/ because they violate **IDENT-IO [place]** as well as **IDENT-IO [±continuant]**

2. Actually other variants are possible, just not attested either because the dataset is too small or because of other socio-linguistic or historical factors as some of the variations might come to UHA at a time when constraints are ranked differently.

6.2.2. Consonantal Importation

In UHA loanword, there are few cases of consonantal importation where the segment remains unchanged. Essentially, the non-adaptation of English consonants /ʤ/ and /ʧ/ are the attested importation cases that can be demonstrated in (98):

(98)	**The Segment**	**English**	**UHA**	**Gloss**
	/ʤ/	/ˈmesɪ**ʤ**/	/mɑssi**ʤ**/	‘message’
		/ˈmasɑːd**ʒ**/	/mɑsɑː**dʒ**/	‘massage’
	/ʧ/	/ˈke**ʧ**əp/	/kɑː**ʧ**ɑb/	‘ketchup’
		/klʌ**ʧ**/	/kælʌ**ʧ**/	‘clutch’

In order to account for consonantal importations in UHA loanwords using OT terms, it is necessary to thoroughly examine these examples to detect any unique patterns. For the importation of the first fricative /ʤ/, it seems that this consonant remains non-adapted when it occurs word finally. This implies that this affricate is imported when it occurs in coda positions in UHA loanword adaptation. The former markedness constraint that deal the adaptation of the affricate /ʤ/ the ***ʤ** need to de more specific in order to deal with both conditions (adaptation and importation) without any contradictions. So the new specific markedness constraint ***ʤ-onset** is more adequate in UHA loan phonology rather that the ***ʤ,** which can be defined as in (99):

(99) ***ʤ-onset**: no ʤ is allowed except in coda in UHA.

In sum, the former ranking for the adaptation as well as importation of /ʤ/ can be described as ***ʤ-onset >> IDENT-IO [±continuant].** For the importing of other affricate /ʧ/ in the English loanwords 'clutch' and 'ketchup', apparently, it seems that this affricate is preserved when it occur after low vowels, otherwise it is adapted. Similar to the importation of the /ʤ/, the formally proposed markedness constraint ***ʧ** needs to be more specific in order to deal with all the case of adaptation and importation. Thus, the new markedness constraint is ***ʧ-non low** instead of the former one ***ʧ**, that can be described as in (100):

(100) ***ʧ-non low**: no ʧ is allowed except after low vowel in UHA.

In sum, the previous proposed ranking for the adaptation as well as importation of /ʧ/ can be described as ***ʧ-non low >> IDENT-IO [±continuant]**. This way it can explicitly account for all the cases attested in UHA loanword dataset. Indeed, the OT approach provides numerous constraints and these constraints are universal and ranking these constraints is language specific setting. The proposed optimality-theoretic analysis indicates the capacity of this theoretical framework in accounting for all the consonantal adaptations as well as importations attested in UHA loanword adaptation.

6.2.2. Syllabic Adaptation

Recalling some aspects of UHA syllable structure that has been stated before in Chapter III, it can be clearly seen that it has a limited number of syllables, as it has only five syllable patterns. Furthermore, it is not allowed for a syllable to start with a vowel, and no word or syllable structure can start with a consonant cluster (Jarrah 2013). Bearing these fundamental aspects in mind, two types of syllable sequences need to be adapted in UHA loan phonology, more specifically, onset-less syllable as well as consonant clusters. It has been discovered in UHA loanword dataset that epenthesis whether of consonants or vowels is generally the most preferred procedure in order to deal with these illicit syllable sequences over deletion and importation. This section will deal first with the adaptation of onset-less syllable by the epenthesis of consonants, namely the glottal stop and the glides, followed by the adaptation of consonant clusters by the insertion of vowels and the discussion of the quality of the epenthetic vowel followed under an optimality-theoretic analysis, suggesting in each case the appropriate faithfulness and markedness constraints along with the best ranking suitable for UHA loan phonology.

6.2.2.1. Consonant Epenthesis

The first illicit syllable sequence found in UHA loanword dataset is onset-less syllable. This type of syllable is illegal in UHA phonology and requires a procedure to deal with this illicit syllable structure. Two potential procedures are widely applied cross-linguistically, either the epenthesis of consonant in order to satisfy an onset requirement or deletion of this vowel, though only the first procedure is attested in UHA loanword dataset. Based on UHA loanword dataset, the epenthesis of glottal stop and the glide /j/ are widely used to resolve the onset-less syllable, though this epenthesis is highly determined by the position of this illicit syllable in the loanword. The epenthesis of glottal stop is commonly spotted in the dataset word-initially to satisfy onset requirement, but never intervocalically. Consider the examples for this condition as exemplified in (101):

(101) The epenthesis of glottal stop before onset-less syllable word-initially:

English	UHA	Gloss
1. /**ə**ˈdʒɛn.də/	/**ʔɑ**ʒindɑ/	‘agenda’
2. /ˈ**ʌɪ**.ɒn/	/**ʔɑ**juːn/	‘ion’

3.	/ˈ**əʊ**.zəʊn/	/**ʔu**zuːn/	‘ozone’
4.	/ˈ**al**.bəm/	/**ʔal**buːm/	‘album’
5.	/ˈ**æt**.ləs/	/**ʔɑtˤ**lɑs/	‘atlas’
6.	**/ɪnʧ**/	/**ʔinʃ**/	‘inch’

Alternatively, onset-less syllable is not restricted to one position in UHA loanword dataset, namely word-initially; instead it is observed word-medially, more precisely intervocalically. In such positions, glottal stop is not the preferred epenthetic consonant to satisfy onset requirement. The glide /j/, on the other hand, is most appropriate consonant to be inserted in these positions. The examples presented in (102), illustrate some cases of the epenthesis of the glide /j/ intervocalically attested in UHA loanword dataset:

(102) The epenthesis of glide /j/ before onset-less syllable intervocalically:

	English	**UHA**	**Gloss**
1.	/ˈfəʊ.bɪ.**ə**/	/fuːbi**jɑ**/	‘phobia’
2.	/ˈsɔɪ.**ə**/	/sˤuː**jɑ**ː/	‘soya’
3.	/ˈhiː.lɪ.**əm**/	/hiːli**jum**/	‘helium’
4.	/ˈniː.**ɒn**/	/ni**jun**/	‘neon’
5.	/ˈkæl.sɪ.**əm**/	/kɑlsiː**jum**/	‘calcium’
6.	/bækˈtɪə.rɪ.**ə**/	/bʌktiri**ja**/	‘bacteria’

By examining these examples, two fundamental concerns need to be solved. The first one is regarding the preference of selecting the laryngeal consonant (the glottal stop) and the glide (/j/) as the best epenthetic consonant among other segments to satisfy onset requirement. Secondly, the reason behind the restriction of inserting the glottal stop in initial onset-less syllable while intervocalic onset-less syllable the glide /j/ is inserted. Building on Uffmann’s (2007a: 458) proposal that mainly indicates ‘the choice of the epenthetic consonant depends on its prosodic position and on prominence contrast’. This proposal generally emphasises that the epenthesis of glottal stop is used to maximise the contrast to the following vowel, while for the case of the glides on the other hand is used to minimise the contrast to the adjacent vowel (either the following or preceding one) (Uffmann: 2007a). In this respect, it is the environment in which this epenthetic consonant whether glottal stop or the glide occurs entirely determines the selection of this consonant. Under OT terms, it is necessary to use constraints that should deal with both issues, more precisely the specific occurrence of the epenthetic consonant whether initially or intervocalically as well as the relative prominence of this epenthetic consonant. This can be solved by the use of Prince and Smolensky (1993)[35] theory of Prominence Alignment where two different prominence scales have been defined, the first one is related to the prominence of different syllable occurrences, whereas the second one is associated with the prominence of the individual segment, it should be noted that the prominence used here means the sonority of a segment. According to Prince and Smolensky (1993: 149), the first scale differentiates between peaks (generally nuclei) and margins (onsets and codas), while the second scale identifying the prominence of individual segments according to the sonority scale, indicating that vowels are the most prominent segments, followed by rhotics, laterals, nasals, obstruents and finally laryngeals. Both scales of prominence are exemplified as in (103) and (104), respectively (Prince and Smolensky 1993: 149):

(103) **Syllabic prominence: Peak > Margin**

(104) **Segmental prominence: Vowels > r > l > nasals > obstruents > laryngeals**

Based on these prominence scales, Prince and Smolensky (1993) obtained another two sets of scalar markedness constraints, in which they align the component of both scales with respect to their relative prominence, more specifically prominent segments align with prominent positions. This indicates that non-prominent segments (obstruents, laryngeals) are the most preferred epenthetic segment in margin positions, while prominent segments such as vowels are the most favoured in peak positions (Prince and Smolensky 1993), the two markedness scales are illustrated in (105) and (106), respectively:

35 Indeed, the theory of Prominence Alignment introduced by Prince and Smolensky (1993) is actually the theory that Uffman (2007a) build on his proposal regarding the epenthesis of consonants.

(105) ***Margin/V >> *Margin/r >> *Margin/l >> *Margin/nas >> *Margin/obs >>*Margin/lar**

(106) ***Peak/lar >> *Peak/obs >> *Peak/nasal >> *Peak/l >> *Peak/r >> *Peak/V**

In fact, Prince and Smolensky (1993) consider vowel as the most marked segment in margin position while laryngeal is considered the least marked in this position. Alternatively, in the second markedness scale, vowels are least marked whereas laryngeals are most marked. However, they use vowel, but semi vowel is more accurate in order to avoid hiatus. In this respect, vowel (V) needs to be changed into semi vowel (SV) in both scales since we are talking about consonants epenthesis, as the following:

(107) ***Margin/SV >> *Margin/r >> *Margin/l >> *Margin/nas >> *Margin/obs >>*Margin/lar**

(108) ***Peak/lar >> *Peak/obs >> *Peak/nasal >> *Peak/l >> *Peak/r >> *Peak/SV**

Indeed, the epenthesis of consonants, more specifically the glottal stop and the glide /j/ can be simply exemplified under OT analysis. Starting with the glottal stop, this type of epenthesis can be modeled as a case of constraint interaction, more specifically, as interaction of two basic constraints, the first and the most important one is **ONSET** which is a markedness constraint that requires that syllables have an onset, the second one is **DEP-IO** that is a correspondence faithfulness constraint that militates against segment epenthesis. Both constraints can be defined as following according to Prince and Smolensky (1993):

(109) **ONSET:** Syllables must have an onset.

(110) **DEP-IO:** Every segment of the output has a correspondence in the input (no epenthesis).

In order to ensure the occurrence of consonant epenthesis the markedness constraint **ONSET** must outrank the faithfulness constraint **DEP-IO**, the reason for this ranking is basically governed by UHA phonology since fulfillment of the markedness constraint (having an onset) is more significant than fulfillment of the faithfulness constraint (banning segment insertion). This ranking only deals with consonant epenthesis without determining which consonant is inserted. In fact, this concern can be solved by the use of the prominence-based markedness scale for margins (indicating onsets being margins) discussed before given in (111):

(111) ***Margin/SV** >> ***Margin/r** >> ***Margin/l** >> ***Margin/nas** >> ***Margin/obs** >> ***Margin/lar**

This specific proposed ranking of these constraints along with use of the prominence-based markedness scale for margins can account for the epenthesis of the glottal stop. For instance it can straightforwardly evaluates the epenthesis of the glottal stop in the adaptation of the English loanword 'album' with initial onset-less into /**ʔal**'buːm/ in UHA given in tableau (112):

(112) The epenthesis of glottal stop before onset-less syllable in 'album' (margin position)

'album'	ONS	*Margin/SV	*Margin/r	Margin/l	*Margin/nas	*Margin/obs	*Margin/lar	DEP-IO
albuːm	*!							
talbuːm						*!		*
nalbuːm					*!			*
lalbuːm				*!				*
ralbuːm			*!					*
jalbuːm		*!						*
☞ ʔalbuːm							*	*

In this tableau, the first candidate [ˈalbəm] is clearly not chosen as an optimal since it fatally violates the higher-ranked markedness constraint **ONSET** that requires syllables to have an onset. On the other hand, the remaining candidates satisfy this constraint and violate the other faithfulness constraint **DEP-IO**. It is necessary to have another constraint, namely the markedness scale for margins can help in deciding which of these candidates is best optimal. By examining the remaining candidates separately, the candidate [jalbuːm] is clearly not considered since the epenthetic consonant is a glide, and it is the highly marked among other consonants in margin positions (semi vowel). Followed by the candidate [ralbuːm] with a rhotic consonant inserted, then the [lalbuːm] candidate with the lateral /l/. The next candidates are also ruled out since the epenthetic consonants in both of them are more marked than the laryngeal, with a nasal in the candidate [nalbuːm] and an obstruent in [talbuːm]. The best candidate among these options is [ʔalbuːm] as the epenthetic consonant in this candidate is the glottal stop and laryngeals are the least marked consonants in margin positions. It should be noted that the epenthesis of glottal stop in this position is due to the fact that it is the least marked segment in contrast with others in such positions (margin positions) as it is the least sonorous consonant. To sum up, the ranking that is responsible for the epenthesis of glottal stop in onset-less syllable word-initially in UHA loan phonology can be exemplified as in (113):

(113) **ONSET >> *Margin/SV >> *Margin/r >> *Margin/l >> *Margin/nas >> *Margin/obs >> *Margin/lar >> DEP-IO**

Concerning the epenthesis of the glide /j/ in UHA loanword dataset, it is necessary to use similar constraints that can adequately account for this type of insertion. It is generally known that onsets are typically considered as margins. This indicates that the epenthesis in such position should prefer the insertion of the glottal stop in order to satisfy onset requirement, this generalisation is based on the previous model that account for the glottal stop in margin positions. Though, it has been observed that in the UHA loanword dataset that in intervocalic positions, the epenthesis of the glide /j/ is more favoured as it is the most sonorous consonant. Indeed, the insertion of the glide /j/ minimises the prominence contrast as this epenthetic consonant is the closest segment to vowels (semi vowel). In this regard, onset in intervocalic position should be considered as peaks instead of margins (Uffmann 2007a: 461). Hence the intervocalic position itself is prominent, the maximally prominent consonant is thus optimal in such position (Uffmann 2007a: 461). In sum, the same markedness hierarchy that has been used before to account for the epenthesis of the glottal stop in margin positions, can be modified in order to account for the insertion of the glide /j/ in intervocalic positions by taking into consideration the special case of the glide (semi vowel) in peak positions (Uffmann 2007a: 461). This markedness hierarchy can be illustrated as in (114) (Uffmann 2007a: 461):

(114) ***V_V/lar >> *V_V/obs >> *V_V/nas >> *V_V/l >> *V_V/r >> *V_V/SV**

With the use of this markedness scale to determine accurately the optimal epenthetic consonant (by maximising prominence and minimising contrast in this type of epenthesis) along with the same ranking of the markedness constraint **ONSET** with the faithfulness **DEP-IO**, **ONSET** must outrank **DEP-IO** in order to ensure the occurrence of epenthetic glide /j/ in intervocalic onset-less syllable, to fulfill the requirement of the syllable to have an onset. This particular proposed ranking of these constraints along with use of the prominence-based markedness scale for peaks can account for the epenthesis of the glide /j/, it can be tested in the evaluation of the epenthesis of the glide /j/ in the adaptation of the English loanword ‘neon’ with intervocalic onset-less syllable into /ni**j**un/ in UHA loanword given in tableau (115):

(115) The epenthesis of glide before onset-less syllable in 'neon' (intervocalic position)

'neon'	ONS	*V_V/lar	*V_V/obs	*V_V/nas	*V_V/l	*V_V/r	*V_V/SV	DEP-IO
ni**un**	*!							
ni**ʔ**un		*!						*
ni**t**un			*!					*
ni**n**un				*!				*
ni**l**un					*!			*
ni**r**un						*!		*
☞ ni**j**un							*	*

By examining this tableau, the first candidate [ni**un**] is rejected due to the fact it fatally violates the higher-ranked markedness constraint **ONSET**. The candidate [ni**ʔ**un] with glottal stop insertion is the least optimal since the constraint against laryngeals is ranked highest intervocalically, for this reason it is not selected. The same can be said about the remaining candidates [ni**t**un], [ni**n**un], [ni**l**un], and [ni**r**un], as each of these candidates has an epenthetic obstruent, nasal, lateral and finally rhotic, that are clearly prominent in this position due to the fact they are the least sonorous epenthetic consonant, according to the markedness scale. In this case, the optimal among these candidates is [ni**j**un] in which the epenthetic consonant in this candidate is the glide /j/ that is the maximally sonorous consonant in peak positions. Indeed, the ranking that adequately account for the epenthesis of glide /j/ in onset-less syllable intervocalically in UHA loanword adaptation can be demonstrated as in (116):

(116) **ONSET >> *V_V/lar >> *V_V/obs >> *V_V/nas >> *V_V/l >> *V_V/r >> *V_V/SV >> DEP-IO**

At the end, the final ranking that can sufficiently account for the epenthesis of consonants (the glottal stop as well as the glide /j/) in onset-less syllable whether initially or intervocalically in UHA loan phonology can be exemplified as in (117). It should be noted that the ***Margin/** constraints are ranked in respect to each other and the ***V_V/** constraints are ranked in relation to each other, but ***Margin/SV** and ***V_V/lar** are not ranked in relation to each other as they can never apply in the same context (not conflicting).

(117) **ONSET >> *Margin/SV, *V_V/lar >> *Margin/r, *V_V/obs >> *Margin/l, *V_V/nas >> *Margin/nas, *V_V/l >> *Margin/obs, *V_V/r >> *Margin/lar, *V_V/SV >> DEP-IO**

Interestingly, this constraint hierarchy can be presented in a tabluea in the evaluation of the adaptation of the English loanword 'ion' /ˈʌɪ.ɒn/ with initial and intervocalic onset-less syllable into /**ʔ**ɑ**j**uːn/ in UHA loanword since it requires the epenthesis of two consonants the glottal stop and the glide /j/ given in the next tableau:

'ion'	ONS	*Margin/SV	*V_V/lar	*Margin/r	*V_V/obs	*Margin/l	*V_V/nas	*Margin/nas	*V_V/l	*Margin/obs	*V_V/r	*Margin/lar	*V_V/SV	DEP-IO
/ɑju:n/	**!													
/jɑju:n/		*!												*
/ʔɑʔu:n/			*!											*
/rɑju:n/				*!										*
/ʔɑtu:n/					*!									*
/lɑju:n/						*!								*
/ʔɑnu:n/							*!							*
/nɑju:n/								*!						*
/ʔɑlu:n/									*!					*
/tɑju:n/										*!				*
/ʔɑru:n/											*!			*
/ʔɑru:n/												*!		*
/ʔɑu:n/													*!	*
☞/ʔɑju:n/												*	*	**

6.2.2.2. Vowel Epenthesis

The second illicit syllable structure observed in UHA loanword dataset is onset clusters. Generally in loanword adaptation, there are two possible processes that are attested cross-linguistically, either the epenthesis of vowel in order to break the consonant cluster, or the deletion of a consonant. In UHA loanword dataset, only the epenthesis of a vowel and in more specific cases the epenthesis of a vowel and a consonant is the attested process to treat this type of illicit syllable structure. Onset clusters are adapted by the epenthesis of vowel in most of the cases, though in certain conditions it requires the epenthesis of a vowel along with a consonant, more specifically a glottal stop. The special cases that demand the epenthesis of a vowel as well as the glottal stop in onset clusters will be discussed later. Consider the examples in (118) that provides wide range of consonants in onset cluster word-initially and medially adapted by the epenthesis of a vowel found in UHA loanword dataset:

(118) The epenthesis of the vowel in onset clusters:

English	UHA	Gloss
1. /**bl**ɒk/	/buluk/	‘block’
2. /**br**əʊʧ/	/buruːʃ/	‘brooch’
3. /**fl**æʃ/	/filaːʃ/	‘flash’
4. /**fr**ɛʃ/	/firiʃ/	‘fresh’
5. /ˈ**kr**ɛm.lɪn/	/kirimlɪːn/	‘kremlin’
6. /**pr**əˈdʒɛk.tə/	/buruːʒiktur/	‘projector’
7. /ˈ**tr**eɪ.lə(r)/	/tirɑlɑ/	‘trailer’

The epenthesis of vowel in onset clusters in UHA loanword adaptation can be clarified as the result of a specific ranking of certain constraints, the interaction between the markedness constraint the ***COMPLEX$^{\text{ONSET}}$** that deal with onset clusters and correspondence faithfulness constraints **DEP-IO** and **MAX-IO**, these constraints can be exemplified as the following (Prince and Smolensky 1993):

(119) ***COMPLEX^{ONSET}:** complex onsets are not allowed.

(120) **DEP-IO** Every segment of the output has a correspondence in the input (no epenthesis).

(121) **MAX-IO** Every segment of the input has a correspondence in the output (no deletion).

The markedness constraint the ***COMPLEX^{ONSET}** is special case of the main constraint ***COMPLEX,** that basically disallows the occurrence of consonant clusters unrelated to syllable position. Indeed, this specific constraint disallows onset clusters. Additionally, two further basic markedness constraints are used specifically in the evaluation of onset clusters in order to ensure the position of the epenthetic vowel, more precisely **SYLLABLE CONTACT** and **CONTIGUITY**:

(122) **SYLLABLE CONTACT:** Sonority must not rise across a syllable boundary.

(123) **CONTIGUITY**: Elements adjacent in the input must be adjacent in the output.

The first constraint **SYLLABLE CONTACT** can mainly determine the best position of the epenthetic vowel by controlling the syllable sonority yielding the optimal sequence of consonants along with the inserted vowel. This indicates that this constraint is responsible for the position of the epenthetic vowel whether internally in the case of the rising sonority onset clusters or externally for falling sonority ones. The final condition of onset clusters with falling sonority will have vowel epenthesis at the edge of the syllable and demand another constraint to deal with this insertion, namely the **CONTIGUITY** constraint that must be ranked below the **SYLLABLE CONTACT** constraint**.** Though in certain cases of onset clusters (/s/ and an obstruent), the **CONTIGUITY** constraint must be ranked high in order to ensure the restricted occurrence of epenthesis at the edge of the words and preventing the break up of the clusters. This will be discussed in detail in the section on the epenthesis of vowel and consonant.

To start with the evaluation of the adaptation of onset clusters, the markedness constraint ***COMPLEX^{ONSET}** must be ranked high, since it will disallow the occurrence of complex onset. It should, therefore, outrank the faithfulness constraint **DEP-IO**, which militates against vowel epenthesis, as well as the other faithfulness constraint **MAX-IO** that bans the loss of segments. It is necessary to decide the ranking between the faithfulness constraints in respect to each other in order to ensure the occurrence of epenthesis instead of segment deletion. In this regard, the **MAX-IO** constraint must outrank the **DEP-IO**, and keeping high-ranked the markedness constraint ***COMPLEX^{ONSET}**. This basic ranking will consequently allow the epenthetic vowel to occur in syllables with onset clusters. This evaluation can be exemplified in tableau (124) that shows how /buluk/ will emerge as the optimal candidate, in the adaptation of the English loanword ‘block’ in UHA. ***COMPLEX^{ONSET}**, **SYLLABLE CONTACT and MAX-IO** are ranked highest, since neither complex onsets nor onset-less syllables are allowed in UHA. Furthermore, **DEP-IO** is ranked below **MAX-IO** to ensure vowel epenthesis:

(124) Internal vowel epenthesis in **onset cluster** in the adaptation of ‘block’

‘block’	*COMPLEX^{ONSET}	SYLLABLE CONTACT	MAX-IO	CONTIGUITY	DEP-IO
bluk	*!				
buk			*!		
ʔubluk		*!			**
☞buluk				*	*

In this evaluation, four possible candidates[36] have been proposed to include different patterns of importation, epenthesis or even deletion. The first candidate [**bl**uk] is not the optimal since it fatally violates the markedness constraint ***COMPLEX^{ONSET}** with the maintaining of the onset cluster. The second candidate [**b**uk] is clearly ruled out because of

[36] Presumably, other possible candidadtes such as [biluk] and [ʔibluk] are left aside here and discussed later in the discussion of vowel harmony where the new constraint ***MULTIPLE-u** is proposed.

the deletion of the consonant from the cluster consequently violate the faithfulness constraint **MAX-IO**. The **[ʔ**ubluk] candidate with vowel epenthesis is also ruled out even if it satisfies markedness constraint due to several violations, one of the higher-ranked constraint **SYLLABLE CONTACT** and two violations of **DEP-IO,** it violates the **DEP-IO** twice because of the epenthesis (two insertions), though the position of this epenthesis cause the second fatal violation of **SYLLABLE CONTACT.** The last candidate [buluk] is optimal at the expense of two violations of the least-ranked constraints, more precisely **DEP-IO** (epenthetic vowel) and **CONTIGUITY** (breaking up the onset cluster), though both violations are acceptable. To sum up, the epenthesis of vowel in order to deal with onset clusters in UHA loan phonology can be explicitly modeled with OT framework, by the satisfaction of major syllable structure markedness constraint ***COMPLEX$^{\text{ONSET}}$** under violation of correspondence faithfulness constraints **DEP-IO.** With such basic ranking of markedness and faithfulness constraints, it can precisely predict the epenthesis of vowel in complex onsets. Other markedness constraints have been used specifically in order to ensure the position of the epenthetic vowel.

6.2.2.3. The Epenthesis of the Vowel and Consonant

In some specific cases of initial onset cluster in UHA loanword adaptation, the consonant sequences demand the epenthesis of consonant (glottal stop) besides the epenthesis of vowel. In these cases, the vowel is not inserted internally in the onset cluster, instead it is inserted externally because the resistance of the sequence of consonant against any break up (falling sonority). The position of the epenthetic vowel (externally before the onset cluster) demands further epenthesis in order to deal with the new created onset-less syllable. Hence the epenthetic vowel is inserted externally before the initial onset clusters, the chosen segment in the second epenthesis is thus the glottal stop. The special case of vowel and glottal stop epenthesis is restrictedly found in the adaptation of initial onset cluster where sequence of consonant in this cluster is a combination of /s/ and obstruents. Consider the examples given in (125), that provides some cases of this specific type of onset cluster initially adapted by the epenthesis of vowel and glottal stop attested in UHA loanword dataset:

(125) The epenthesis of the vowel and the glottal stop in initial onset clusters:

English	UHA	Gloss
1. /ˈ**st**ɜː.lɪŋ/	/**ʔis**tɑrliːni/	‘sterling’
2. /ˈ**st**ɪk.ə(r)/	/**ʔis**tikɑr/	‘sticker’
3. /ˈ**sk**eɪ.tə(r)/	/**ʔis**ikietʌr/	‘skater’
4. /**str**iːt/	/**ʔis**tireet/	‘street’
5. /**spr**eɪ/	/**ʔis**birɑː/	‘spray’

The epenthesis of vowel and consonant (glottal stop) in the adaptation of initial onset clusters (/s/ and obstruents) can be clarified under OT framework, through the interaction between syllable structure markedness constraints **ONSET** as well as ***COMPLEX^{onset}** and correspondence faithfulness constraints **MAX-IO** and **DEP-IO** with the special use of additional constraint **CONTIGUITY.** The two markedness constraints are of special concern in this evaluation, since the **ONSET** constraint militates against the occurrence of onset-less syllables while the ***COMPLEX^{onset}** constraint disallows onset clusters. Both markedness constraints are equally ranked above other constraints in this evaluation. Concerning ranking of the faithfulness constraints, **MAX-IO** constraint must outrank the **DEP-IO** in order to ensure the occurrence of segment (whether vowel or consonant) epenthesis. The last constraint is the **CONTIGUITY** that must be ranked above the faithfulness constraint **DEP-IO** but below the other one **MAX-IO.** The use of this constraint is significant in this evaluation since it militates against the disruption of consonant sequence in the onset cluster and consequently leads to the external vowel epenthesis (at the edge of the word). Any break up of this illicit consonant cluster will cause violation of this constraint. As stated before, falling sonority onset clusters are resistant to any internal epenthesis of vowel; only external epenthesis will be acceptable. To clarify this interaction more, consider the next tableau which exemplify this interaction in the evaluation of the adaptation of the English loanword ‘sticker’ with initial onset cluster sC into /ʔistikɑr/ in UHA, given in the next tableau:

(126) External vowel epenthesis and glottal insertion in **onset cluster of special condition sC, sCC,** example tableau for the adaptation of 'sticker':

'sticker'	ONSET	*COMPLEX^{onset}	MAX-IO	CONTIGUITY	DEP-IO
stikɑr		*!			
sikɑr			*!		
istikɑr	*!				*
☞ʔistikɑr					**
sitikɑr				*!	*

In this tableau, five possible candidates have been suggested showing different potential patterns for the adaptation of initial onset cluster. The first candidate [stikɑr] with no change is ruled out because it fatally violates highest-ranked markedness constraint ***COMPLEX^{onset}** as it retain the initial onset cluster. The next candidate [sikɑr] with loss of consonant in the onset cluster satisfies both markedness constraints ***COMPLEX^{onset}** and **ONSET** but it is not included as it fatally violates faithfulness constraint **MAX-IO.** The following candidate [istikɑr] with external vowel epenthesis is also not considered since it fatally violates higher-ranked markedness constraint **ONSET** even though it satisfies other constraints such as ***COMPLEX^{onset}** and **CONTIGUITY.** The other candidate [sitikɑr] with internal vowel epenthesis fatally violates the constraint **CONTIGUITY** that disallows the break up of cluster at the cost of satisfying the markedness constraints ***COMPLEX^{onset}** and **ONSET.** Thus, the [ʔistikɑr] candidate with external vowel epenthesis along with glottal stop insertion is the best optimal among these candidates as it satisfies all the markedness and the faithfulness constraints at the expense of violating the least-ranked constraint **DEP-IO** (two insertions cause two violations). In sum, the basic ranking that is responsible for accounting for the epenthesis of vowel as well as glottal stop in adapting initial onset clusters of /s/ and an obstruent is given in (127):

(127) **ONSET, *COMPLEX^{onset} >> MAX-IO >> CONTIGUITY >> DEP-IO**

6.2.2.4. The Quality of the Epenthetic Vowel

In the case of selecting the epenthesis of vowels as the most preferred procedure in UHA loanword adaptation in order to deal with illicit syllable sequences, more specifically onset clusters to produce well-formed syllables accepted in UHA phonology, a fundamental question might be asked then is which vowel exactly is inserted in UHA loan phonology. Cross-linguistically, there are three basic procedures generally determine the quality of the epenthetic vowel that have been acknowledged in the literature. Firstly, the epenthetic vowel can be a default vowel; this means one vowel, which is consistently inserted in any contexts (Uffmann 2007b: 4-8). Otherwise, the quality of an adjacent underlying vowel can be mainly determine the inserted vowel that known as vowel copy or vowel harmony, and finally, the epenthetic vowel can be affected by the quality of the preceding consonant (consonant assimilation) (Uffmann 2007b: 4-8). In UHA loanword dataset, the first two patterns of deciding the choice of the epenthetic vowel are widely applied over the last one. Based on the UHA dataset, it has been seen that the /i/ is the default epenthetic vowel largely applied in the adaptation of onset clusters, whereas the choice of vowel harmony has been attested in the cases where the adjacent vowel is /i/ or /u/.

6.2.2.4.1. Epenthesis of default /i/

The epenthesis of default vowel /i/ has been attested in UHA loanword dataset in order to resolve onset clusters by inserting the /i/ internally after the first consonant. Consider the examples for this condition as demonstrated in (128). In these examples, the onset clusters comprise an obstruent, either one of the stops [p, t, b] or the fricative [f] as the first consonant, while the second one is one of the sonorant liquids [l, r]:

(128) The epenthesis of default vowel /i/ in onset clusters:

English	**UHA**	**Gloss**
1. /flæʃ/	/f**i**laːʃ/	'flash'

2. /ˈtreɪ.lə(r)/ /t**i**rɑlɑ/ 'trailer'
3. /breɪk/ /b**i**rɜːk/ 'break'
4. /ˈplas.tɪk/ /b**i**laːstic/ 'plastic'

In order to account for the epenthesis of default /i/, the correspondence faithfulness constraint **DEP-IO (F)** must be used that militates against the insertion of features in the output that have no correspondent in the input, more generally it militates against epenthesis, along with two other markedness constraints, the ***COMPLEX^{ONSET}** in which onset clusters are penalised by this constraint and another one that work against feature sharing that is ***MULTIPLE**. The ***MULTIPLE** constraint demands that every feature is associated with one segment alone, it can be defined as in (129):

(129) ***MULTIPLE**: features are associated with one mother node only (vowel harmony not allowed).

Since the epenthesis of default vowels in order to resolve onset clusters requires the insertion of further features, this constraint will be prohibited. Moreover, another violation will occur according to the faithfulness constraint **DEP-IO (F)**, though this violation will be minimal hence the inserted vowel will satisfy the other markedness constraints. Particularly, the ***MULTIPLE** constraint prevents feature spreading, more precisely vowel harmony, but on the other hand, it allows segment-to-feature association. It indicates that the multiple linkage of one feature to several mother nodes is definitely not allowed according to this markedness constraint. Clearly, there is a conflict between this constraint and the faithfulness constraint **DEP-IO (F)** since the last constraint is against insertion of features that have no correspondent in the input. Indeed, this conflict can be solved by the ranking of these constraints in respect of each other in order to ensure the epenthesis of the default vowel in onset clusters. In this respect, it is necessary to allow the violation of the faithfulness constraint **DEP-IO (F)** to guarantee the insertion of the default vowel features, suggesting a ranking in which the ***COMPLEX^{ONSET}** as well as ***MULTIPLE** constraints outranks **DEP-IO (F).** Such a ranking will allow the insertion of default vowel due to the fact that violation of the faithfulness constraint **DEP-IO (F)** disallowing feature insertion is more acceptable than violation of the higher-ranked constraints ***COMPLEX^{ONSET}** and ***MULTIPLE** that disallows onset clusters and multiple linkage. This proposed ranking of certain constraints in order to deal with the epenthesis of default vowel can be illustrated by the evaluation of the epenthesis of default vowel /i/ in the adaptation of the English loanword ‘flash’ with onset cluster into /f**i**la:ʃ/ in UHA given in tableau (130):

(130) Epenthesis of default /i/ in the adaptation of ‘flash’

‘flash’	***COMPLEX^{ONSET}**	***MULTIPLE**	**DEP-IO (F)**
fla:ʃ	*!		
fala:ʃ		*!	
fula:ʃ		*!	
☞f**i**la:ʃ			*

The input ‘flash’ in this tableau start with an illicit syllable sequence, namely onset cluster that can be solved by the epenthesis of vowel. In this case four potential candidates, the first one [fla:ʃ] with no change occurs and the onset cluster is retained. The remaining three candidates are suggested as possible outputs for determining the quality of the epenthetic vowel. They are the [fala:ʃ] candidate with vowel harmony of the /a/, while the [fula:ʃ] candidate with consonantal assimilation (the labiality of [f] spreading to the epenthesised vowel, yielding [u]), and lastly the [f**i**la:ʃ] candidate with the epenthetic of default /i/. This candidate will be chosen as optimal, the reason for this choice is that the first candidate [fla:ʃ] violates the higher-ranked markedness constraint ***COMPLEX^{ONSET}** since it has onset cluster, while the remaining two candidates [fala:ʃ] and [fula:ʃ] both violate ***MULTIPLE** because the epenthetic vowel is a spreading either of the adjacent vowel or consonant. The last candidate [f**i**la:ʃ] does not violate ***MULTIPLE** since the quality of the epenthetic vowel is determined by the insertion of default (unmarked) features, though it violates on the other hand the lower-ranked faithfulness constraint **DEP-IO (F)**, the violation is acceptable. Violation of higher-ranked ***MULTIPLE** on the other hand is fatal. The proposed ranking to exemplify the epenthesis of default vowel /i/ in cases with onset clusters in UHA loan phonology given in (131):

(131) ***COMPLEX^ONSET >> *MULTIPLE >> DEP-IO (F)**

6.2.2.4.2. Vowel harmony

Unlike the epenthesis of default vowel /i/, the vowel harmony is observed in UHA loanword dataset as a solution to deal with onset clusters. Consider the examples that represent some cases as demonstrated in (132) and (133). In these examples, the copying of the adjacent underlying vowel, generally the following vowel in UHA loanword dataset is essentially attested in the case when the following vowel is either one of the following (/i/, /ɛ/, /ɪ/, /ɒ/, /əʊ/ or /eɪ/) in input, which correspond to /i/, /ɪ/ or /u/ in UHA.

(132) The harmony of vowel /i/ in onset clusters:

English	**UHA**	**Gloss**
1. /ˈfriː.zə(r)/	/f**i**riːzɑr/	'freezer'
2. /ˈkrɛm.lɪn/	/k**i**rimlɪːn/	'kremlin'
3. /ˈtrɪl.jən/	/t**i**riljuːn/	'trillion'
4. /ɛkˈsprɛs/	/ʔɪks**i**bris/	'express'
5. /spreɪ/	/ʔ**i**sbirɑː/	'spray'
6. /kriːm/	/k**i**riːm/	'cream'

(133) The harmony of vowel /u/ in onset clusters:

	English	UHA	Gloss
1.	/brɒnz/	/b**u**runz/	'bronze'
2.	/blɒk/	/b**u**luk/	'block'
3.	/ˈprəʊ.tiːn/	/b**u**rutiːn/	'protein'
4.	/prəˈfɛsə/	/b**u**rufisuːr/	'professor'
5.	/brəʊʧ/	/b**u**ruːʃ/	'brooch'
6.	/prəˈdʒɛk.tə/	/b**u**ruːʒiktur/	'projector'

Vowel harmony in UHA loanword adaptation can be clarified using OT terms; this process in dealing with onset clusters can be evaluated using the same markedness and faithfulness constraints as well as the same ranking used before in evaluating the epenthesis of default vowel /i/. To clarify more, the syllable structure markedness constraint ***COMPLEX$^{\text{ONSET}}$** that bans onset clusters along with faithfulness constraint **DEP-IO** and the anti-sharing feature constraint ***MULTIPLE** are essential in the evaluation. Though, it is necessary to be more specific in using the ***MULTIPLE** constraint to account accurately for the vowel harmony. The possible solution in this case is to make this constraint more specific concerning feature spreading by not generally preventing all feature spreading but allow spreading from the adjacent vowel if this vowel is /u/. Indeed, the newly proposed anti-sharing feature constraint is ***MULTIPLE-u**, instead of the former general one ***MULTIPLE**, this special constraint used in UHA loanword adaptation can be defined in (134):

(134) ***MULTIPLE-u**: no vowel harmony except for /u/

Essentially, with the use of this special anti-sharing feature constraint ***MULTIPLE-u** along with the same markedness constraint ***COMPLEX$^{\text{ONSET}}$** that prohibits onset clusters besides the faithfulness constraint **DEP-IO**, it will sufficiently account for not only the epenthesis of default vowel but the vowel harmony as well. Similarly, the ranking of these constraints will be the same, the ***COMPLEX^ONSET^** must outrank the constraint ***MULTIPLE-u** and both must outrank the other constraint **DEP-IO.** Such ranking will manage the conflict between these constraints by allowing vowel harmony in certain cases, namely after /u/, as the ***MULTIPLE-u** constraint basically ensure the occurrence of vocalic spreading in special contexts, and undoubtedly works with both cases insertion of default vowel as well as vocalic spreading. To simplify more, this ranking of markedness and faithfulness constraints for evaluating vowel harmony in the adaptation of onset clusters can merely demonstrate vocalic spreading in the adaptation of the English loanword 'block' with onset cluster into /b**u**luk/ in UHA presented in tableau (135):

(135) Vowel harmony of /i/ in the adaptation of 'block'

'block'	***COMPLEX^{ONSET}**	***MULTIPLE-u**	**DEP-IO (F)**
bluk	*!		
biluk		*!	
☞buluk			*

Based on this tableau, three candidates are proposed in the analysis of vocalic spreading as the best solution for initial onset clusters, the first candidate is more faithful to the input, while the remaining candidates represent the different patterns of vowel epenthesis (default vowel and vocalic spreading). The first [bluk] that maintains the onset cluster is clearly not considered as it fatally violates the higher-ranked markedness constraint ***COMPLEX^{ONSET}**. The next candidate [b**i**luk] with default insertion of /i/ incurs a fatal violation on the other higher-ranked constraint ***MULTIPLE-u**, since this candidate insert a default vowel /i/ instead of allowing the vocalic spreading from the adjacent vowel /u/. The remaining candidate [b**u**luk] with vocalic one, satisfy both higher-ranked constraints ***COMPLEX^{ONSET}** as well as ***MULTIPLE-u**, though it violates the faithfulness constraint **DEP-IO** and it is acceptable. Indeed, this candidate [b**u**luk] is the optimal since it fulfil the satisfaction of both constraints ***COMPLEX**$^{\mathbf{ONSET}}$ and ***MULTIPLE-u** at the cost of violating the lower ranked constraint **DEP-IO**. Thus, the crucial ranking that can explicitly determine the quality of the epenthetic vowel whether epenthesis of default /i/ or vocalic spreading in the adaptation of onset clusters in UHA loan phonology is given in (136):

(136) ***COMPLEX**$^{\mathbf{ONSET}}$ **>> *MULTIPLE –u >> DEP-IO**

6.3. Discussion

The framework of optimality theory (Prince and Smolensky 1993) has been used as an alternative to the TCRS-LM in analysing the consonantal and syllabic adaptation of English loanword into UHA. The markedness and faithfulness constraints used here and their specific ranking account for the phonological patterns attested in UHA loanword dataset without any contradictions assuming specifically defined new constraints. The proposed optimality-theoretic analysis explicitly account for all the attested consonantal adaptations as well as importations in UHA loanword dataset without any difficulties in dealing with consistent adaptations (as seen in the adaptation of the English affricates /ʤ/ and /ʧ/, the voiceless stop /p/, the nasal /ŋ/) and lexical variation conditions (the adaptation of the English labiodental /v/) but it does not eliminate other possible outputs (the unattested ones). The evaluating of all the cases of adapting as well as importing of ill-formed consonants in UHA loanword dataset has been modeled through the interaction between basic constraints, more specifically the faithfulness correspondence constraint **IDENT-IO (F)** that basically prohibits the change of features (McCarthy and Prince 1995: 264) with relevant markedness constraints. With specific ranking that regulates the interaction between the markedness together with faithfulness constraints, different consonantal adaptations and importations have been determined. The basic ranking for determining the adaptation as well as importation of consonants in UHA loan phonology can be clarified by the outranking of correspondence faithfulness constraint **IDENT-IO (F)** by relevant markedness constraints since these constraints cannot be violated in UHA. The lexical variation that has been observed in the adaptation of the voiced English labiodental /v/ can be meaningfully illustrated by special ranking of a set of constraints, in which the evaluation allows the interaction between the highest-ranked markedness constraint ***v** and a series of equally ranked faithfulness constraints, namely **IDENT-IO [±voice]**, **IDENT-IO [±sonorant]** and **IDENT-IO [±continuant]**. With such ranking, the OT framework enables us to predict the occurrence of all of these possibilities of the adaptation of the labiodental /v/ but it unfortunately doesn't allow predicting which one will occur in which words. All the variations are possible and there does not appear to be any reason why one is chosen in any particular word. For instance the English loanword 'shovel' can be adapted into /ʃɑ**v**ɑl/ or /ʃɑ**b**ɑl/ instead of /ʃɑ**w**ɑl/, similarly, 'lava' can be /lɑ:**w**ɑ/ or /lɑ:**f**ɑ/ instead of /lɑ:**b**ɑ/ as all occur in the same position word-medially and intervocalically. Furthermore, there are no unique patterns that can distinguish between the variant occurrences of these possibilities in UHA loanword dataset. One possible explanation regarding the lexical variation in the adaptation of the labiodental /v/, is that these loanwords might have integrated into the UHA dialect at different times and that is why they come in different forms. Alternatively another possible explanation is that they might come into different varieties of Arabic instead of direct borrowing from English or even from different varieties of English. In conclusion, the crucial ranking for the consonantal adaptations as well as importation in UHA loan phonology can be exemplified as in (137):

(137) ***p, *v, *ŋ, *ʤ-onset, *ʧ-non low >> IDENT-IO [±voice] except for /p/ and /v/, IDENT-IO [place] except for /ŋ/, IDENT-IO [±continuant]**

Basically, the proposed OT analytic argument regarding the consonantal adaptations and importation in UHA loanword has revealed many aspects that, to some extent, support the findings of the existing literature on loanword adaptation adopting OT framework reviewed in Chapter II. To start with, the invoked ranking to account for the consonantal adaptation in UHA loanword adaptation indicating the highest-ranked relevant markedness constraints above the faithfulness one **IDENT-IO (F)**, supports entirely Lee's (2003: 138) indication that 'a markedness constraint outranks faithfulness', in the analysis of segmental adaptations in Korean loanwords. Variation that is observed in the adaptation of consonants has been treated differently in the literature of loanword adaptation following the OT approach. For instance, two studies from the discussed literature imply different accounts for infrequent variant changes in the adaptation of certain consonants. An example is Lee's (2003) analysis of the variation that is attested in the adaptation of interdental fricative in Korean loanwords, more precisely the adaptation of /θ/ into [s], [s'], [t] or [t'], which he finds as arbitrary change. In fact, Lee (2003: 149) signifies to this adaptation as 'a matter of free variation. Speakers have two options where two different pronunciations are possible'. Conversely, a different account has been proposed by Adler (2006: 1041) in analysing the variation spotted in the adaptation of /s/ in Hawaiian loanwords within an OT framework by using constraints, by specifying a series of **IDENT** faithfulness constraints which constrain feature changes and rank them equally with **MAX** constraints (since there is deletion and variation in the adaptation of this consonant). Additionally, Adler (2006: 1042) indicates that 'having the **IDENT** constraints outrank the relevant **MAX** constraints dictates that featural change will not be used to retain the fricatives'. What it is important in Adler's (2006: 1042) OT analysis of consonantal variation in Hawaiian loanwords is the use of equally ranked series of specified faithfulness constraint **IDENT.** This proposed special ranking of faithfulness constraints has been used in the analysis of the adaptation of the voiced English labiodental /v/ in UHA loanword and sufficiently account for its lexical variation of its adaptation. Indeed, this is significant evidence that proved the capacity of OT approach in dealing with irregular and infrequent phonological patterns in UHA loanword adaptation with meaningful and accurate clarification unlike the other theoretical approach that fails in exceptional patterns.

A sufficient optimality-theoretic analysis has been proposed in dealing with various syllabic patterns attested in the adaptation of illicit syllable structure in UHA loanword adaptation. It has been seen that the adaptation of onset-less syllables as well as consonant clusters are predictable by universal markedness relations that may interact with language-specific constraint rankings. With the relative ranking of major syllable structure markedness constraints, more particularly **ONSET** that enforces syllables have an onset and ***COMPLEX**$^{\text{ONSET}}$ where onset clusters are disallowed with respect to some faithfulness constraints **DEP-IO** and **MAX-IO** can decide whether the marked structure can appear in the output or whether it must be removed.

The epenthesis of consonants in the adaptation of onset-less syllable, namely the glottal stop word-initially and the glides intervocalically can be modeled under OT framework. With the use of basic ranking in which the markedness constraint **ONSET** must outrank the faithfulness constraint **DEP-IO** to ensure the occurrence of consonant epenthesis, due to the fact that in UHA phonology the satisfaction of the markedness constraint (having an onset) is more significant than satisfaction of the faithfulness constraint (banning segment insertion). This basic ranking demands the use of additional constraints to determine the best epenthetic consonants to be inserted in restricted environments whether word-initially or intervocalically. With the use of the prominence-based markedness scales for margins as well as peaks proposed by Uffmann (2007a) that is based on Prince and Smolensky's (1993: 149) theory of Prominence Alignment with two different prominence scales. The first one is related to the prominence of different syllable occurrences that it distinguishes between peaks and margins. The second one is associated with the prominence of the individual consonant according to the sonority scale indicating that semi vowels are the most prominent consonants, with laryngeals being the least prominent. Keeping these prominence scales in mind, two further sets of scalar markedness constraints, basically align the component of both scales with respect to their relative prominence, more specifically prominent segments align with prominent positions (Prince and Smolensky 1993). Building on Uffmann's (2007a: 451) proposal within the framework of OT, that explicitly clarify why glottal stop as well as the glides are often found as the most epenthetic consonants and further explains the fact that 'glottal stops are optimal margin consonants and thus inserted in margin positions (e.g. word-initially) while glides are optimal peak consonants, inserted in peak positions (e.g. as hiatus breakers)'. His proposal concerning the issue behind the demand of a further constraint helps in selecting the best epenthetic consonants in certain position by the use of the prominence-based markedness scale for margins in which onsets being margins, as follows:

(138) ***Margin/V >> *Margin/r >> *Margin/l >> *Margin/nas >> *Margin/obs >> *Margin/lar**

Alternatively, the prominence-based markedness scale for glide epenthesis in peak positions (intervocalically), as follows:

(139) ***V_V/lar » *V_V/obs » *V_V/nas » *V_V/l » *V_V/r » *V_V/V**

It indicates that non-prominent consonants (for instance glottal stop) are the most preferred epenthetic consonant in margin positions, while prominent consonants such as glides (semi vowel) are the most favoured in peak positions. Indeed, the use of these scales with the basic ranking of highest-ranked markedness constraint **ONSET** above the faithfulness constraint **DEP-IO,** account effectively for the epenthesis of the glottal stop in word-initial onset cluster and intervocalic glide /j/ insertion one in UHA loan phonology as in (140):

(140) **ONSET >> *Margin/SV, *V_V/lar >> *Margin/r, *V_V/obs >> *Margin/l, *V_V/nas >> *Margin/nas, *V_V/l >> *Margin/obs, *V_V/r >> *Margin/lar, *V_V/SV >> DEP-IO**

The second illicit syllable structure in UHA loanword adaptation is onset clusters that adapted by the epenthesis of vowel and in more special cases of onset clusters (sC clusters) the epenthesis of vowel and consonant (glottal stop) is applied. Within the framework of OT, the epenthesis of vowel in onset clusters in UHA loanword adaptation can be explained with the use of markedness constraint ***COMPLEX$^{\mathrm{ONSET}}$** that militate against the occurrence of onset clusters and anti-insertion **DEP-IO** and anti-deletion **MAX-IO** constraints. Two further markedness constraints, **SYLLABLE CONTACT** and

CONTIGUITY decide the preferred position of the epenthetic vowel according to sonority. Essentially, the above-proposed set of constraints can explicitly account for the normal patterns of vowel epenthesis and exceptional ones that require a further insertion of glottal stop. However, it is necessary to parameterize these constraints to be able to account for these patterns by the fulfillment of major syllable structure markedness constraint ***COMPLEX$^{\text{ONSET}}$** under violation of correspondence faithfulness constraints **DEP-IO.** Such basic ranking of markedness and faithfulness constraints can precisely predict the epenthesis of vowel in complex onsets in UHA loanword adaptation. Other markedness constraints have been used exclusively to ensure the position of the epenthetic vowel whether internally (as for onset clusters) or externally (for the initial sC onset cluster). The special case of vowel and glottal stop epenthesis has been seen in the adaptation of initial onset clusters (/s/ and obstruents) can be certainly modeled under OT framework, with the use of syllable structure markedness constraints **ONSET** as well as ***COMPLEX$^{\text{onset}}$** and correspondence faithfulness constraints **MAX-IO** and **DEP-IO** with the special use of additional constraint **CONTIGUITY.** Concerning the ranking of these constraints, the markedness constraints are equally ranked above other constraints with allowing the **MAX-IO** constraint to outrank the **DEP-IO** in this evaluation**. CONTIGUITY** is ranked above the faithfulness constraint **DEP-IO** but below **MAX-IO.** The last constraint is of special concern in dealing with this exceptional case as it militates against the disruption of consonant clusters in the initial sC onset cluster and thus leads to the external vowel epenthesis (at the edge of the word). This is because the falling sonority onset clusters are resistant to any internal epenthesis of vowel; only external epenthesis is allowed. In sum, the final ranking that deal with the adaptation of onset clusters in UHA loan phonology can be demonstrated as in (141):

(141) **ONSET, *COMPLEX$^{\text{ONSET}}$, SYLLABLE CONTACT >> MAX-IO >> CONTIGUITY, DEP-IO**

In fact, different OT account, to some extent been generally proposed in loanword adaptation that prefers the application of certain constraints to deal with onset clusters. For instance, Galal (2004: 13) in his OT analysis of English loanword adaptation in Cairene Arabic states the necessity in using the two constraints **SYLLABLE CONTACT** and **CONTIGUITY** in order to 'derive the split epenthesis pattern' along with ***COMPLEX** and **DEP-IO.** He further claims that:

> 'The interaction between **SYLLABLECONTACT** and **CONTIGUITY** is able to explain the pattern of split epenthesis in loanword phonology in CA, where falling and rising sonority clusters are treated differently. The ranking so far should go as: ***COMPLEX, ONS, MAX-IO, SYLLABLE CONTACT >> DEP-IO, ALIGN- *a*, CONTIGUITY'** (Galal 2004: 13)

His special use of **ALIGN- *a*** was to 'align syllables as close as possible to the right edge of the prosodic word' to ensure the position of the epenthetic vowel 'after the second of three consonants, thus bringing the syllable edge closer to alignment with the right edge of prosodic word' (Galal 2004: 8). Indeed, he later states some similarity between **ALIGN- *a*** and the constraint **CONTIGUITY** constraint hence the later 'is basically intended to keep elements adjacent in the input also adjacent in the output' (Galal 2004: 9). Other OT research to some extent in line with proposed basic ranking to account for the epenthesis of vowel and consonants. For instance Jarrah (2013) in investigating English loanword adaptation in MHA and Uffmann's (2007b) work on vowel epenthesis generally in loanword adaptation adopt the same basic ranking.

Based on the UHA loanword dataset, the quality of the epenthetic vowel in resolving illicit syllable sequences, more specifically onset clusters has been clarified as the application of one of two patterns either the default vowel /i/ insertion internally after the first consonant in the adaptation of onset clusters, or the vocalic spreading from the adjacent vowels in the case when the following vowel is one of the following (/i/, /ɛ/, /ɪ/, /ɒ/, /əʊ/ or /eɪ/) in input, which correspond to /i/, /ɪ/ or /u/ in UHA. Essentially, these two epenthetic patterns in determining the quality of the inserted vowel in UHA loan phonology can be effectively exemplified under the framework of OT with the relative ranking of ***MULTIPLE** constraint that militates against feature sharing with respect to markedness constraint

COMPLEX^ONSET^** the non-branching onset constraint along with the correspondence faithfulness constraint **DEP-IO (F)** whether the marked structure can appear in the output or whether it must be removed via spreading of a less marked feature. In the case of the epenthesis of default vowel /i/ the faithfulness constraint **DEP-IO (F)** will be violated in order to guarantee the insertion of the default vowel features, signifying a ranking in which the ***COMPLEX^ONSET^** as well as ***MULTIPLE** constraints outrank **DEP-IO (F).** Alternatively, the basic ranking to account for vowel harmony in UHA loanword adaptation demands the same ranking of these constraints with the specifying of the ***MULTIPLE** constraint to allow vocalic spreading for /u/, as ***MULTIPLE-u.** Indeed, this proposed specific ranking of certain constraints has been formally used by Uffmann (2007b) in suggesting a typology of epenthetic vowels under the OT framework generally in loanword adaptation, and effectively account for all the patterns of the epenthetic vowel in UHA loanword adaptation. Other loanword adaptation research prefers the use of different OT constraints to account for the quality of the epenthetic vowel, for instance Galal's (2004: 17) study of the adaptation of English loanwords in Cairene Arabic selects the use of other constraints such as **SYLLABLE CONTACT**, **S-IDENT** and **CONTIGUITY**. His proposal following ranking to determine the quality of the epenthetic vowel: 'COMPLEX, ONS, MAX-IO, SYLLABLE CONTACT, *MULTIPLE (V.Place) >> S-IDENT (+/-back, +/-round)*[+high], [-high], DEP-IO, ALIGN- *a*, CONTIGUITY**' (Galal 2004: 17)**.**

6.4. Concluding remarks

The Optimality-theoretic analysis proposed in this chapter is, on the whole, capable of providing an adequate account of all the consonantal as well as the syllabic adaptations attested in UHA loanword dataset. This theoretical approach manages to give a meaningful interpretation of different consonantal and syllabic adaptation. Thus, it has shown that it is possible to model different phonological patterns spotted in UHA loanword dataset in an OT framework. Within the general framework of OT, Prince and Smolensky (1993) propose a functional model of constraints interaction (markedness and faithfulness), which is grounded for accounting different phonological issues in loanword adaptation. The relative ranking of these constraints with respect to each other generates different processes in order to expect the output among different possible candidates.

In conclusion, major constraints invoked in the analysis and substantial ranking arguments have been considered in the investigation of UHA loanword dataset. For the consonantal adaptations and importations, the correspondence faithfulness constraint **IDENT-IO** plays a crucial role in both cases, which militates against the change of features along with relevant markedness constraints. The adaptation and importation of consonants is basically determined by high-ranked relevant markedness constraint above the **IDENT-IO** in UHA loan phonology. Concerning the syllabic adaptations, two main illicit syllabic sequences have been analysed by constraint interaction and formalised within OT, more precisely onset-less syllable as well as onset clusters. It has been clearly seen that segment epenthesis (whether vowel or consonants) occurs in order to satisfy syllable structure markedness constraints, most **ONSET** and ***COMPLEX$^{\text{ONSET}}$.** Syllabic adaptation of illicit onset can be modeled with OT if markedness constraints outrank the correspondence faithfulness constraints **DEP-IO** and **MAX-IO**. This basic ranking was extended by adding more specific markedness constraints in order to exemplify certain patterns of syllabic adaptations. Under OT framework, it can be possible to accurately account for the epenthesis of consonant in onset-less syllable with special use of the prominence-based markedness scales proposed by Prince and Smolensky (1993). The same can be said in the epenthesis of vowel in onset clusters with the use of specific constraints, such as **SYLLABLE CONTACT** and **CONTIGUITY**. The interplay of these constraints against relevant markedness constraints and the faithfulness constraints **DEP-IO (F)** as well as **MAX-IO** provides a clarification for different phonological patterns attested in UHA loanword adaptation. Even the quality of the epenthetic vowel can be explicitly accounted under this theoretical framework. The crucial ranking of universal constraints that sufficiently clarify the adaptation of English loanwords into UHA can be exemplified as in (142):

(142) ***p, *v, *ŋ, *ʤ-onset, *ʧ-non low, ONSET, *COMPLEX^{ONSET}, SYLLABLE CONTACT >> IDENT-IO [±voice] except for /p/ and /v/, IDENT-IO [place] except for /ŋ/, IDENT-IO [±continuant], *Margin/SV, *V_V/lar >> *Margin/r, *V_V/obs >> *Margin/l, *V_V/nas >> *Margin/nas, *V_V/l >> *Margin/obs, *V_V/r >> *Margin/lar, *V_V/SV, *MULTIPLE –u >> MAX-IO >> CONTIGUITY >> DEP-IO**

To sum up, the optimality-theoretic analysis of various phonological adaptation of UHA loanword found in the dataset is more accurate the other theoretical approach adopted in this study, the TCRS-LM, which fails to explain all of these phonological patterns.

CHAPTER VII

Conclusion

7.1. Introduction

The fundamental aim of the present study was to provide a plausible account of the phonological adaptation of English loanwords into UHA. In order to achieve plausibility of this aim, the consonantal as well as syllabic adaptation in UHA loanwords were investigated within two theoretical frameworks the TCRS-LM and OT. Eventually, the analysis of these issues within the two frameworks led to substantial evaluation of the adequacy of each of these theories in explaining the attested phonological adaptation of UHA loanwords. The main purpose of this chapter is firstly to summarise the main findings and secondly to shed light on the most important theoretical issues regarding the adopted theoretical models in the analysis, and lastly suggests some recommendations for future research in the field. Section 7.2 provides a general summary of the previous chapters and highlights the main points. Section 7.3 points out the main theoretical issues concerning the adopted approaches in the analysis of English loanwords into UHA (TCRS-LM and OT) and evaluating the capability of the models in predicting the attested consonantal and syllabic adaptations in UHA loanwords. Throughout that section, there is an emphasis on the issue of whether the TCRS-LM or OT is a better theoretical framework to account for the phonological adaptations in UHA loanwords. Section 7.4 proposes some of suggested recommendations for future research and concludes the study.

7.2. General Summary

Given the fact that the adaptation of English loanwords into UHA has never been phonologically investigated within both the TCRS-LM and OT, the first issue that this study tackled is stating some of the phonological patterns of consonantal and syllabic adaptations. Building on the work of Jarrah (2013), the study has extended the analysis of UHA loanwords to include the examination of the adaptation patterns of not only illicit syllable structure but also the consonants. Besides accomplishing this fundamental aim, it also analyses the attested consonantal and syllabic adaptations adopting two theoretical approaches the TCRS-LM and OT. In particular, the different proposed analyses in this study facilitated an evaluation of the adequacy of each of these theories in clarifying the discussed phonological patterns found in UHA loan phonology that consequently leads to the achieving of the study other essential aims.

Essentially, it was necessary to introduce the assumed theoretical frameworks in the study, particularly the Theory of Constraints and Repair Strategies Loanword Model (TCRS-LM) (Paradis and LaCharité 1997), and Optimality Theory (OT) (Prince and Smolensky 1993) prior addressing the revealed phonological adaptations of English loanwords in UHA. In this respect, a full review of both constraint-based frameworks, the TCRS-LM as well as OT has been provided (**Chapter II**) with a detailed discussion about their structures. Theoretically, the motivation of adapting loanwords and the way of integrating illicit forms is treated differently in these frameworks, as in the TCRS-LM the adaptation through the application of principles or constraints (Paradis and LaCharité 1997) while in OT it is merely motivated by constraint interaction (Prince and Smolensky 1993). Loanwords generally comprise segment or syllable patterns that violate the phonological constraints of the borrowing language. In the TCRS-LM, this violation of constraints can be solved by repair strategies that are subject to a set of principles (Paradis and LaCharité 1997). In OT there is no need for these repair strategies in the adaptation of loanwords; instead the phonological adaptations are determined by the interaction between constraints deciding the optimal between possible outputs (Prince and Smolensky 1993). Across the discussed literature, few studies have adopted both theoretical frameworks, the TCRS-LM and OT in their analysis of loanword adaptation, A great example of such research is the study of Adler (2006) of Hawaiian loanwords, where both theoretical perspectives was used to see which approach can satisfactorily predict the phonological adaptations.

A number of loanword adaptation studies that concerned specifically with analysing loanword adaptation using these theoretical approaches have been discussed in order to demonstrate how both models work and to reveal some of their generalisations as well as considerations. For the TCRS-LM, several studies range in their attitudes regarding this model's principles. They all agreed on how the Preservation Principle predicts the adaptation cases adequately, while they vary in their attitude regarding other principles (the Minimality Principle and the Threshold Principle). Most of the studies raise several issues against the Threshold Principle (Ulrich 1997; Brasington 1997; and Rose 1999), while others agree with Paradis and LaCharité (1997) on its role in predicting deletion cases in loanwords (for instance Adler 2006). Concerning the OT approach, all the reviewed studies indicate the adequacy of the OT framework in their analysis of loanword adaptations. Indeed, some considerable generalisations regarding segmental as well as syllabic adaptations been realised, for instance, the faithfulness constraint **IDENT-IO (F)** plays a significant role in evaluating the potential outputs along with relevant markedness constraints as seen in the analysis of Lee (2003) and Adler (2006). Conversely, several OT constraints have been used in the evaluation of syllabic adaptations, such as **MAX-IO**, **IDENT-IO (F)** and **DEP-IO**, besides the syllable specified constraints, for instance **ONSET** and ***COMPLEX**, along with other constraints such as **SYLLABLE CONTACT**, **CONTIGUITY** and ***MULTIPLE.** Indeed, it is the ranking of these universal constraints that can derive the evaluation of possible outputs in order to select the optimal one by having them dominated or equally ranked. A comparison between the two frameworks, the TCRS-LM and OT that significantly highlights the differences between the two theoretical perspectives in many aspects, such as constraints, constraint conflict and constraint violation has been presented in order to guide and enhance the analysis of this study. Fundamentally, the phonology of UHA in contrast with English is another important issue that needs to be clarified prior to the analysis of UHA loanword phonology (**Chapter III**). With the demonstration of the segmental inventories as well as the clarification of the main phonological characteristics in UHA as well as English, this undoubtedly enhanced the understanding of illicit phonological patterns as well as any potential consonantal and syllabic adaptations of English loanwords in UHA.

Furthermore, two aims of the current work were accomplished in **Chapter IV**. Firstly the stating of the adaptation patterns of English consonants that are absent in UHA inventory attested in English loanwords, such as voicing, devoicing, and other consonantal mapping. Secondly, finding out some of the adaptation patterns of English illicit syllable structures in UHA, for instance the epenthesis of consonants and vowels. Based on a dataset of 100 English loanwords in UHA obtained from various sources, Abdul-Rahim's (2011) dictionary of loanwords, Jarrah's (2013) recent study on English loanwords into MHA, and a data collection exercise, this study investigated the consonantal and syllabic adaptation of English loanwords into UHA. Although it is unfortunately beyond the scope of this study to investigate in detail all the phonological adaptation of English loanwords into UHA, it has been possible to explore some of the consonantal as well as the syllabic adaptation, and certain clear generalisations were made. Concerning the adaptation patterns of English consonants, the collected dataset has revealed the constant voicing of the voiceless bilabial /p/, the mapping of the two affricates /ʤ/ and /ʧ/ into /ʒ/ and /ʃ/, and systematic adaptation of the nasal /ŋ/ into /n/. The dataset has also shown the striking lexical variation in the adaptation of the English labiodental /v/, as it largely devoiced (/v/ > /f/), and infrequently weakened (/v/ > /w/), or strengthened (/v/ > /b/). Of course, the dataset has revealed lexical variation in the adaptation of /v/, but not revealed any for the other concerned consonanats. With a big dataset, perhaps several possibilities might be found and similar variation could be attested in the adaptation of for instance /p/ and /ŋ/. Generally, there are a lot of complexities in the study of loanwords. One of these issues is that a loanword might come to a language at different time or through different dialect, alternatively, other possible issue is due to socio-linguistic or historical factors. For consonantal importations and deletions, the obtained dataset has revealed infrequent importations for the English affricates /ʤ/ and /ʧ/, but no attested cases of deletion in UHA loanword dataset. Regarding the adaptation patterns of English syllable structures, the illicit syllable sequences are onset-less syllable, onset clusters. Onset-less syllables are adapted by consonant epenthesis though their occurrences in the word highly determined the type of the inserted consonant, glottal stop epenthesis initially while the glide /j/ intervocalically. Onset clusters, on the other hand, are adapted by the epenthesis of vowel or vowel and consonant (the glottal stop) that is found in the adaptation of sC or sCC clusters. These two types of illicit syllable structures never treated by importation or deletion. Some of the discussed adaptation patterns in this study consistent with what has been reported in the study of Jarrah's (2013) on English loanwords into MHA, namely the voicing of /p/, and the devoicing of /v/ and the mapping of /ʧ/ into /ʃ/. Similarly, onset-less syllable and onset clusters, furthermore, the epenthesis of vowels in consonant clusters in Cairene Arabic loanwords in Galal's (2004) study, implies the similarities between the two dialects MHA as well as Cairene Arabic in contrast with UHA.

With the determination of the adopted theoretical approaches of this study and the obtaining of the UHA loanwords dataset, **Chapter V** investigated the attested adaptation patterns of English consonants as well as syllable structure in UHA loanwords within the first phonological framework (TCRS-LM). A primary concern of this theoretical approach was whether it could be capable of accounting all the discussed consonantal and syllabic adaptations of UHA loanwords similar to Paradis and LaCharité (1997) initial analysis of French loanwords in Fula. A theoretical discussion of several phonological researches on loanword adaptations adopting this model (section 2.2.2.) range in their attitudes concerning this model's principles and the adequacy of its predictions. In the current study, the TCRS-LM principles, to some extent, make correct predictions regarding the adaptation of consonantal constraints in most of the cases while in the syllabic one it exhibits conflicting predictions.

To begin with the Preservation Principle, it succeeded in predicting that adaptation will be largely favoured over deletion, and the deletion will be rarely applied (in the case of UHA loanword dataset there were none). The second principle, that is the Minimality Principle, is not entirely activated since some selected strategies are certainly not minimal especially in the syllabic adaptation. The Precedence Convention is never followed since no preference is found in selecting one constraint to be repaired among conflicting violated constraints. The last principle that is the Threshold Principle fails in accounting for the too many preferred attested strategies in UHA loanwords (for instance the case of sCC cluster). To sum up, the TCRS-LM is not a sufficient theoretical framework for suggesting the exact prediction regarding the consonantal as well as the syllabic adaptation in UHA loanwords. The TCRS-LM principle that fails in accounting for these adaptations is the Minimality principle in the case of consonantal adaptation while for the syllabic ones it is the Preservation and Threshold principles. Several pieces of evidence have been found in the analysis of UHA consonantal and syllabic adaptations prove the failure of the TCRS-LM in accounting for these phonological patterns.

For instance, one evidence of this model's failure can be seen in accounting for the preference of the lexical variation in the adaption of the English voiced labiodental /v/ attested in UHA as it indicates that weakening of this illicit consonant will be more favourable than other alteration (devoicing or strengthening) hence it entails inserton instead of deletion of features in the adaptation. Equally, further failure evidence has been discovered in the analysis of syllabic adaptation, namely the multiple strategies applied in the adaptation of sCC onset cluster involving the epenthesis of vowel as well as the glottal stop but no deletion, which definitely exceed the limit of the Threshold Principle and go against the predictions of the TCRS-LM's principles.

The other theoretical approach of OT has been proposed in **Chapter VI,** as a better alternative to adequately analyse the consonantal and syllabic adaptation of English loanword into UHA. With the use of certain markedness and faithfulness constraints along with their specific ranking account sufficiently for several phonological patterns attested in

UHA loanword dataset. Indeed, it has shown that it is possible to model different phonological patterns spotted in UHA loanword dataset under OT perspective. Within the general framework of OT, Prince and Smolensky (1993) propose a functional model of constraints interaction (markedness and faithfulness) to account for different phonological issues in UHA loanword adaptation. The relative ranking of these constraints with respect to each other generates different processes in order to expect the best output among different possible candidates, more precisely the optimal. The suggested optimality-theoretic analysis account to some extent for all the attested consonantal adaptations as well as importations in UHA loanword dataset. The evaluating of all the cases of adapting as well as importing of ill-formed consonants in UHA loanword dataset has been modeled through the interaction between the faithfulness correspondence constraint **IDENT- IO (F)** with relevant markedness constraints. The basic ranking for determining the adaptation as well the importation of consonants in UHA loan phonology can be clarified by the outranking of correspondence faithfulness constraint **IDENT-IO (F)** by relevant markedness constraints. Furthermore, the lexical variation in the adaptation of the voiced labiodental English /v/ can be illustrated by special ranking of a set of constraints, in which the evaluation allows the interaction between the highest-ranked markedness constraint ***v** and a series of equally ranked specified faithfulness constraints.

Regarding the syllabic adaptations, two main illicit syllabic sequences have been examined by constraint interaction and formalised within OT framework, more precisely onset-less syllable as well as onset clusters. It has been clearly seen that segment epenthesis (whether vowel or consonants) occurs in order to satisfy syllable structure markedness constraints, most remarkably **ONSET** and ***COMPLEX**$^{\textbf{ONSET}}$. Syllabic adaptation of illicit onset can be modeled with OT if markedness constraints outrank the correspondence faithfulness constraints **DEP-IO** and **MAX-IO.** This basic ranking was extended by adding more specific markedness constraints in order to deal with exemplifying certain patterns of syllabic adaptations. Under OT approach, it can be possible to accurately account for the epenthesis of consonant in onset-less syllable with special use of the prominence-based markedness scales proposed by Prince and Smolensky (1993). Equally, the epenthesis of vowel in onset clusters can be possibly determined with the use of specific constraints, such as **SYLLABLE CONTACT** and **CONTIGUITY**. The interplay of these constraints against relevant markedness constraints and the faithfulness constraints **DEP-IO (F)** as well as **MAX-IO** provides meaningful clarification for different phonological patterns attested in UHA loanword adaptation. Even the quality of the epenthetic vowel can be explicitly accounted under this theoretical framework.

7.3. Theoretical Issues

Generally, the two adopted constraint-based theories, the TCRS-LM (Paradis and LaCharité 1997) and the Optimality Theory (Prince and Smolensky 1993), share noticeable similarities in focusing on constraints, nevertheless the TCRS-LM is closer to the traditional rule-based theories in the concept of serial derivation than OT. Another similarity between the two theoretical frameworks (TCRS-LM and rule-based approach) is that there is no violation of constraints in the surface forms, unlike OT where the constraints can be slightly violated in the output (Rose 1999). According to the TCRS-LM, phonological adaptations are as a result of the application of repair strategies while there is no repair strategy in OT. In fact, constraint interaction essentially determines these phonological alterations. In OT, constraints are universal but they can still be violated and ranked by importance based on language-specific settings instead of being parameterised in the TCRS-LM. Equally, in the TCRS-LM constraints is more active as they construct the output form, different from being inactive in the OT. The selecting of output from a set of candidates is taken by constraints without determining the output in the OT, whereas in the TCRS-LM, they impact the phonological alterations. It is true that repair strategies are not randomly applied in the TCRS-LM but within an adequate constraint-based perspective, moreover, it makes a connection between constraints and surface changes. According to Paradis and LaCharité (1993: 134), repair strategies in the TCRS-LM 'enforce conformity to universal and language-specific constraints'.

Apparently, the two constraint-based approaches the TCRS-LM and OT, share similarities between their principles and constraints more precisely, the Preservation Principle in contrast with the Faithfulness constraints as both against segment deletions. Furthermore, epethesis is also universally disfavoured in OT but not so in the TCRS-LM. Both frameworks have constraints and their constraints are violated, though the handling of constraint violations is different. Besides this difference, the issue of constraint conflict is considered differently in both constraint-based approaches as in the TCRS-LM mainly related to the occurrence of violations in phonological processes that must be solved by the PLH. In the TCRS-LM, constraint conflict is essentially the difficulty of determining the priority for applying the appropriate repair strategy among possible strategies in dealing with illicit phonological patterns to solve constraint violations that can be merely controlled by the PLH. This indicates that the conflicted constraints are surface inviolated in the TCRS-LM that can be considered the crucial distinction between the two theoretical frameworks the conflict between constraints in the optimality-theoretic perspective occurs as a result of the violability of these constraints, which indicates the involvement of surface-violated constraints in this conflicts under the optimality theoretic approach. Solving constraint conflict in OT is settled by a language- specific prioritization (ranking) of constraints.

After recalling the main distinctions between the two theoretical frameworks, it is time to comprehensively indicate which of these constraint-based approaches is better in analysing the consonantal and syllabic adaptations of English loanwords in UHA. In order to tackle this issue, it is necessary to highlight the advantages and disadvantages of each theoretical framework, as far as the considered phonological patterns in UHA loanword adaptations are concerned. Throughout the preceding chapters, this study has discussed the phonological adaptation of English loanwords into UHA within two theoretical frameworks the TCRS-LM and OT and fundamentally demonstrates how the optimality-theoretic analysis is better in contrast to the Theory of Constraint and Repair Strategy. Several evidences from the UHA loanword adaptations can plausibly support this claim.

The OT account of the discussed consonantal adaptations in UHA loan phonology is sufficient to explain the attested phonological patterns as well as grasping unique issues. The proposed optimality-theoretic analysis adequately account for all the attested consonantal adaptations as well as importations in UHA loanword dataset without showing any difficulties in dealing with consistent adaptations (the affricates /ʤ/ and /ʧ/, the stop /p/, and the nasal /ŋ/) or lexical variation conditions (the labiodental /v/). It predicts the occurrence of all of these possibilities of the adaptation of the labiodental /v/ but it unfortunately doesn't predict which one will occur in which words. The OT evaluation of all the cases of adapting as well as importing of ill-formed consonants in UHA loanword dataset has been modeled through the interaction between the faithfulness correspondence constraint **IDENT-IO (F)** with relevant markedness constraints. With specific ranking of these constraints that significantly regulates the interaction between the markedness and faithfulness constraints, different consonantal adaptations and importations have been straightforwardly determined. However, there is still unattested consonantal variation and possible outputs that are not accounted under OT. The OT framework can accurately account for the attested consonantal cases better than TCRS-LM but it doesn't eliminate other possibilities and that because OT doesn't have kind of machinery that feature geometry gives us in the TCRS-LM.

Equally, The TCRS-LM account of the discussed consonantal adaptations in UHA loan phonology is, to some extent, straightforward in all the cases but not in exceptional patterns. The choice of adapting ill-formed consonants rather that deleting them is consistent with the Preservation Principle predictions. Besides, the maximal consonantal preservation of the English consonants is governed by the Threshold Principle. In short, the predictions of the TCRS-LM principles concerning the consonantal adaptations are true since ill-formed English consonants are adapted (not deleted), minimal (demands one step), and involve as few steps of repair strategies as possible. The main concern with the TCRS-LM's principles regarding the consonantal adaptation is that they permit the attested adaptation (as in the adaptation of /p/, /ŋ/ and /v/), they also permit unattested adaptations and do not predict which one will occur. Proposing too many repair strategies that are all considered minimal according to the Minimality Principle and some of them are unattested has been considered a problem not only for the UHA loanword adaptation but also for other studies in loanword adaptation adopting the same theortical framework (such as Ulrich 1997). An issue that been hardly handled by Paradis and LaCharité (1997: 404-405) in their theoretical framewok as they suggest the role of the Preservation Principle in predicting the best minmal adaptation among other available possibilities. This also been an issue in the OT framework as it accounts for the attested consonantal cases but it doesn't eliminate other possibilities. The incapablity of dealing with this matter within the TCRS-LM or OT has been signified by Stoltzfus (2014: 11) as follows:

> 'the present ability of the TC framework to eliminate most unlikely adaptation strategies currently does a much better job at dealing with the Too-Many-Solutions problem than does the OT framework, the framework adopted by Steriade and Miao. The Too-Many-Solutions problem is a much larger issue in OT where it has been dealt with more widely' (Stoltzfus 2014: 11)

Uffmann (2011: 184) further states that:

> 'Optimality Theory is dogged by the problem that a constraint violation could, in principle, invite a number of possible repairs, many of which, however, are robustly unattested. This has been dubbed the 'Too Many Repairs' problem … and a uniformly accepted solution to this problem is still not available in Optimality Theory' (Uffmann 2011: 184)

Another concern is regarding stating the exact preference for the best repair strategy in the adaptation of consonants. An example for that is accounting the preference regarding the lexical variation of the adaptation of the English labiodental /v/. The notable issue regarding the predictions of the TCRS-LM principles of this adaptation is asserting that the weakening of the English labiodental /v/ will be more preferred among other adaptations (devoicing and strengthening) hence it demands insertion instead of deletion of segmental feature. This claim doesn't hold true in the UHA loanword dataset, as the most preferred adaptation of this labiodental is the devoicing in contrast with other attested alternatives.

One possible solution for this issue is suggesting the modification of the PLH in which not all features are placed at the same level (feature without dependent) where feature like [continuant] should be treated higher than other terminal feature for instance [voice]. A solution that formely suggested by (Ulrich 1997) and to some extent make correct predictions concerning the preference in UHA loanword adaptation.

Equally, this failure of accounting for the variation in consonantal adaptations is not restricted to UHA loan phonology; it found in the literature, for instance Adler's (2006) study as the TCRS-LM fails to predict the variation for the English fricative /s/ in Hawaiian loanwords, as it suggests unattested (/s/ > /n/ or /l/). The variant adaptation of consonant is handled under the optimality-theoretic account with special ranking of a set of constraints, in which the evaluation allows the interaction between the highest-ranked of relevant markedness constraint above a series of equally ranked specified faithfulness constraints. Such special ranking of constraints certainly handles the lexical variation in the adaptation of the voiced English labiodental /v/ where it evaluated by the interaction between the highest-ranked markedness constraint ***v** over a series of equally ranked faithfulness constraints, namely **IDENT-IO [±voice]**, **IDENT-IO [±sonorant]** and **IDENT-IO [±continuant]**. The OT framework enables us to predict the occurrence of all of these possibilities of the adaptation of the labiodental /v/ but it unfortunately doesn't allow predicting which one will occur in which words. It doesn't explain the reason that some outputs occur more than the others (as for the unattested cases for the /p/ and /ŋ/). Still, this is significant evidence regarding the capacity of OT approach to some extent in dealing with the attested phonological patterns in UHA loanword adaptation with accurate explanation unlike the other theoretical approach TCRS-LM that fail in exceptional patterns.

The OT account of the discussed syllabic adaptations in UHA loan phonology provides a sufficient analysis in dealing with various syllabic patterns attested in the dataset without showing any difficulties in grasping unique conditions. The adaptation of onset-less syllables as well as consonant clusters is predictable by universal markedness relations that may interact with language-specific constraint rankings. With the relative ranking of main syllable structure markedness constraints, **ONSET,** and ***COMPLEX^{ONSET}** with respect to certain faithfulness constraints **DEP-IO** and **MAX-IO** decide the best attested procedure in handling illicit syllabic patterns. On the other hand, The TCRS-LM account of the discussed syllabic adaptations in UHA loan phonology to some extent holds true in some of the illicit syllabic cases with a failure in dealing with certain conditions. Firstly, the epenthesis of segments is the largely preferred strategy over deletion in repairing violated syllabic constraints, as predicted by the Preservation Principle. The TCRS-LM predictions regarding the adaptation of onset-less syllable indicates that the epenthesis of consonant is preferred strategy over deletion in which all the segments are retained (following the Preservation Principle), the repair is minimal and at the lowest phonological level to which this constraint refers, that is the skeletal level (the Minimality Principle).

The fundamental concern with this prediction is that it doesn't specify the most preferred epenthetic consonants to be selected which therefore considered the first evidence of the failure of the TCRS-LM principle's predictions regarding syllabic adaptations but it has been handled by the feature geometry aspect of this framework. This concern doesn't exist under the OT approach with the use of the prominence-based markedness scales for margins as well as peaks proposed by Uffmann's (2007a) based on Prince and Smolensky (1993: 149) theory of Prominence Alignment, along with the basic ranking of highest-ranked markedness constraint **ONSET** above the faithfulness constraint **DEP-IO;** account effectively for the epenthesis of the glottal stop in word-initial onset cluster and intervocalic glide /j/ insertion one in UHA loanword adaptation. Furthermore, the OT framework can effectively determine the quality of the epenthetic vowel in adapting onset clusters that been considered under the TCRS-LM with a special ranking of the ***COMPLEX^{ONSET}** as well as ***MULTIPLE** constraints outranks **DEP-IO (F)** to account for the default vowel epenthesis. Otherwise, the basic ranking to account for vowel harmony in UHA loanword adaptation demands the same ranking of these constraints with the specifying of the ***MULTIPLE** constraint to allow vocalic spreading for /u/, as ***MULTIPLE-u.**

Additionally, there is a second failure of the TCRS-LM predictions noticeably seen in the adaptation of illicit syllabic constraints requiring multiple strategies, more specifically the suggested repair strategies by this model in dealing with the sCC onset cluster involving the epenthesis of vowel and consonant, which certainly exceed the limit of the Threshold Principle and go against the predictions of the TCRS-LM's principles. The special case of vowel and glottal stop epenthesis in the adaptation of initial onset clusters sCC can be straightforwardly modeled under OT framework, with the equal ranking of syllable structure markedness constraints **ONSET** as well as ***COMPLEX^{onset}** above other faithfulness constraints allowing the **MAX-IO** constraint outrank the **DEP-IO** in this evaluation**.** With the special use of the **CONTIGUITY** constraint that ranked above the faithfulness constraint **DEP-IO** but below **MAX-IO.** This constraint is of special concern as it militates against the disruption of consonant clusters in the initial sC onset cluster and consequently triggers the external vowel epenthesis (at the edge of the word). This unique case of onset cluster sCC can be phonologically exemplified because the falling sonority onset clusters are resistant to any internal epenthesis of vowel; only external epenthesis is allowed, yielding additional epenthesis of the glottal stop.

The last evidence of the incapability of this framework is revealed in the adaptation of cases with two violated constraints segmental and syllabic ones requiring too many strategies to be repaired and none of them is deletion. For instance, the adaptation of the voiceless bilabial /p/ and onset cluster. There is contradiction between the predictions of the TCRS-LM principles and attested strategies in repairing these violations, since the attested strategies are the epenthesis of the vowel to break the onset cluster and the voicing of /p/. No preference is given to one violated constraint over the other (against the Precedence Convention); no deletion occurred and preservation exceeds two steps (against the Preservation and Threshold Principles) and there are too many steps to repair both violated constraints (against the Minimality Principle). Conversely, onset cluster with the voiceless bilabial /p/ is not considered an exceptional pattern under the OT account, as it normally treated with the same basic ranking that deal with all the cases of onset clusters, by the ranking of the consonantal and syllabic markedness constraints ***p** as well as **ONSET** under violation of correspondence faithfulness constraint **DEP-IO.** Overall, these cases show strong evidence of how the TCRS- LM principles are incapable of accounting for the attested repair strategies and the adequacy of the optimality-theoretic analysis in accounting for the phonological patterns in UHA loanword adaptation.

In sum, the OT account is better than the TCRS-LM at predicting the actual attested changes. On the other hand, the TCRS-LM is better than OT in suggesting which of variants is predictable (for instance alveolar vs. labial nasal), but only through feature geometry. The OT framework doesn't have that structured approach to phonological features. The adavantage that we get from the TCRS-LM is basically from the feature geometry not from the actual principles of the TCRS-LM itself.

The relevance of the constraint-based framework TCRS-LM by Paradis and LaCharite (1997) to the notion of markedness is robust as stated by Stoltzfus (2014: 11) 'markedness and simplicity are at the heart of TC', while OT been signified by McCarthy and Prince (1994: 1) as a framework that 'aims to combine an empirically adequate theory of markedness with a precise formal sense of what it means to be 'unmarked.''.

7.4. Future Research and Concluding Remarks

Similar to other loanword adaptation research, the present study has attempted to enhance our understanding of how the English loanwords phonologically integrated into UHA, what potential consonantal and syllabic adaptation found in this dialect, how phonological theories (the TCRS-LM and OT) account for these changes, and how different the phonological theories (the TCRS-LM and OT) these adaptation. However, given that works on the phonological aspect of loanword adaptations in Arabic, contrastive with regard to its dialects, and that adopt a theoretical approach are scarce, much more exploration and investigation is required before final claim can be laid to a better understanding of loanwords phonology. This section provides a summary of the work on a broader sense with specific respect for areas of improvement for future research. One of the most apparent extensions is that the present study calls for further similar investigation with a wider range of Arabic dialects. Such studies will not only allow Arabic phonologists to evaluate the findings of the present study across Arabic dialects but also to tackle, on the basis of larger corpora, with numerous phonological differences that were not possible to explore in this research. Similarly, another apparent extension is to broaden the scope of the studied segmental and syllabic adaptations. In addition to the consonantal and syllabic adaptations explored in this work, future studies may include vowels and stress adaptations. With regard to vowel adaptations, much of the existing work in Arabic phonology has mainly been concerned stating their alternatives in Arabic loanwords rather than discussing the reason behind their mapping to these equivalents in Arabic inventory in a broader sense.

Given the benefits of the adopted theoretical approach for the examination the consonantal as well as the syllabic adaptations in general, the present research demands further application of the approach to study to what extent the TCRS-LM and OT frameworks able to account for the vowel changes in the adaptation of loanwords in Arabic. Such studies might require experimental research that allow understanding of the selection of vowels equivalents in Arabic loanwords and will offer interesting data for research on loanword adaptations and Arabic phonology. With regard to phonological adaptations, follow-up study exploring whether the discussed consonantal and syllabic adaptation of English loanwords follow divergent patterns in Arabic dialects other than UHA as well might reveal interesting results. Such a study would not only reveal the extent to which English segments and syllable structures might follow similar patterns in loanword adaptation but such a study would also shed light on the most preferred phonological adaptation among Arabic dialects. From a theoretical perspective, adopting more than one theoretical approach in the analysis of the adaptation patterns in loanwords might allow exploration of their contrastive accounting and explanations of the adaptation patterns. That is, instead of following one theoretical framework or even the widely used phonological approach, it might be good to involve another framework in the analysis that would reveal the extent to which phonological approach might be adequate in accounting for adaptation patterns. The benefits of applying two constraint-based theoretical approaches, the TCRS-LM (Paradis and LaCharité 1997) and OT (Prince and Smolensky 1993), to UHA loanword have been shown to reach beyond the benefits of the exclusive findings based on one theoretical approach presented in previous studies of Arabic loanword adaptation.

These are just a few considerations for incoming research, which might contribute to a deeper understanding of loanword phonology. Indeed, these are some issues raised in this study that still require further exploration. At the end, hopefully this study has shown the significance of theoretical research in Arabic phonology, more importantly the field of loanword adaptation in Arabic definitely deserves more attention. It is time to reconsider the way to tackle Arabic phonology both theoretically and methodologically. By adopting adequate methodological procedures that include experimental research with refined statistical methods, this way Arabic phonological research will be able to contribute considerably not only to the field of phonology but also to linguistic research.

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APPENDICES

Appendix 1

University of Sussex

PARTICIPANT INFORMATION SHEET

Study title

The Phonology of English Loanwords in UHA

'*You are being invited to take part in a research study. Before you decide whether or not to take part, it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully*'.

What is the purpose of the study?
The purpose of the study will be to test people memory and knowledge according to their age differences.

Why have I been invited to participate?
You have chosen to take part in the study regarding different age and there will be four people in your group will be asked to participate.

Do I have to take part?

'*It is up to you to decide whether or not to take part. If you do decide to take part you will be given this information sheet to keep and be asked to sign a consent form. If you decide to take part you are still free to withdraw at any time and without giving a reason*'.

What will happen to me if I take part?
Your task is in two phases (identifying 42 pictures and answering 6 questions), which will be presented in a software. The reason for this is to test your knowledge and memory. Once you response to the given task, the software will eventually record your answers. The

software will record their responses before proceeding to the second screen and so on, and the duration will be around 30 minutes. The first screen of the software has five buttons with the following functions:

1- (Add New): for registering a new participant.
2- (Commit): for saving the information of the participant in the database.
3- (Update): used for saving amendment to the existing record.
4- (Delete): for deleting a certain participant from the database.
5- (Clear): for clearing the blanks from any mistakes.

There are the four blanks for the participants' personal details such as name (indeed, their name will be anonymous, and it will be labeled into numbers, these information is just between the researcher and the participant), age, gender, and level of education. To start the experiment, I click on Add New. All of the five functional buttons are inactivated, except for Commit and Clear. Then, I enter the personal information of the participant as I ask them. Once finished, I click on Commit, and a screen is shown (New record added to the database). This means that the record of the participant of this information is automatically saved in a folder and the participant's details and number of answers are saved in an Excel file, see Figure 1.

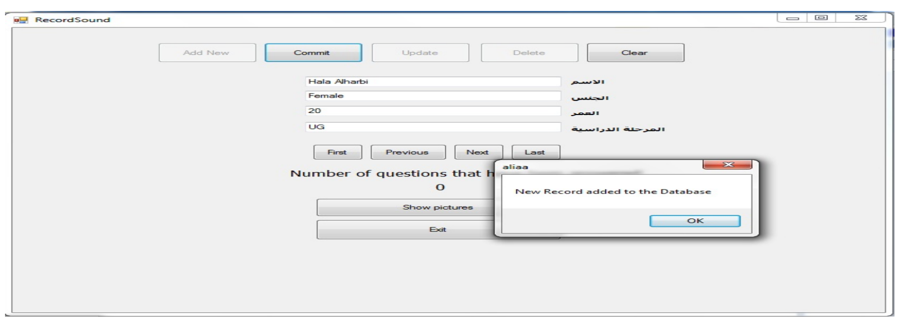

Figure 1

After this stage, I click on Show Pictures, to start the experiment. The next screen will be as in Figure 2, and has some details on the top (the name of the participant, number of answers). At the bottom, there will be six buttons and their functions are:

1- Play: To play the recorded sound.
2- Stop: To stop recording the participant's response.
3- Start Record: To start recording the participant's response.
4- Next Picture: To move on to the next picture.
5- Previous Picture: To go back to the previous picture.
6- Stop Test: To stop the test when the participant has finished.

Once I finish recording the participant's answer, a message will appear asking to stop recording sound, and I should click on OK, which means that the answer is successfully recorded (Figure 2).

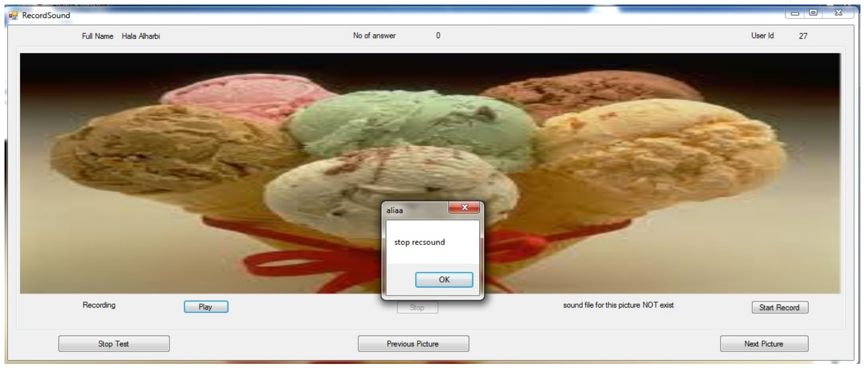

Figure 2

The next example is about the second phase of the experiment. The word 'Anemia' will be the answer for the given question written in Arabic as in (Figure 3), a new button will appear (Play Question), which plays a recorded question about the word.

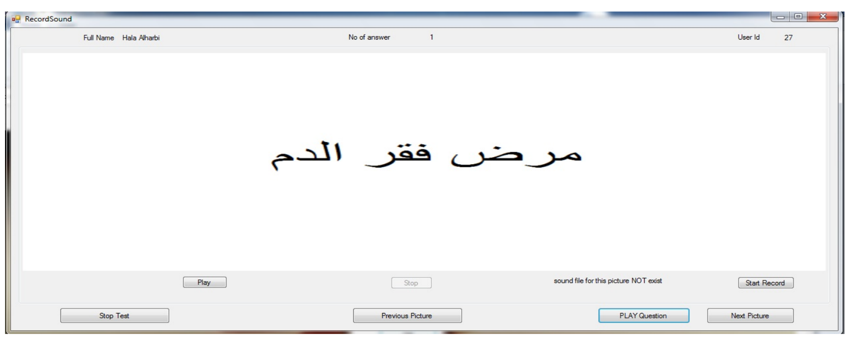

Figure 3

Will my information in this study be kept confidential?

All your information will be kept strictly confidential, As you see, There are the four blanks in the test software for the participants' personal details such as name (indeed, their name will be anonymous, and it will be labelled into numbers, these information is just between the researcher and the participant), age, gender, and level of education. It will be anonymous, as it will be used to decide in which group test you will participate.

What will happen to the results of the research study?

The results will be used in a data collection exercise in the first stage, and depending on how relevance these results to the research question, it might be used in the thesis and it will not be published.

Who has approved this study?

This research has been approved through the School of English.

Contact for Further Information

Contact details for further information:
Aliaa Aloufi
MPhil Linguistics
Email: A.Aloufi@sussex.ac.uk

Please don't hesitate to contact my supervisor Dr Lynne Cahill if you have any concerns about the way in which the study has been conducted.
Dr Lynne Cahill
Email: lynneca@sussex.ac.uk

thank you for participating

Date

04/11/2013

Appendix 2

University of Sussex

CONSENT FORM FOR PROJECT PARTICIPANTS

PROJECT TITLE: **The Phonology of English Loanwords in Urban Hijazi Arabic (UHA)**

I agree to take part in the above University of Sussex research project. I have had the project explained to me and I have read and understood the Information Sheet, which I may keep for records. I understand that agreeing to take part means that I am willing to:

- Be interviewed by the researcher
- Allow the interview to be audio taped

I understand that any information I provide is confidential, and that no information that I disclose will lead to the identification of any individual in the reports on the project, either by the researcher or by any other party.

I understand that my participation is voluntary, that I can choose not to participate in part or all of the project, and that I can withdraw at any stage of the project without being penalised or disadvantaged in any way.

I consent to the processing of my personal information for the purposes of this research study. I understand that such information will be treated as strictly confidential and handled in accordance with the Data Protection Act 1998.

Name: ______________________________

Signature ______________________________

Date: ______________________________

Appendix 3

Classification of the data based on the consonantal and syllabic adaptation

1-Consonantal Adaptation

Adaptation of /p/: English /p/ ➔ UHA /b/

No	Gloss	British	UHA	Source
1.	panda (n)	/ˈ**p**an.də/	/**b**ɑndɑ/	Abdul-Rahim (2011)
2.	pence(n)	/**p**ɛns/	/**b**ins/	Abdul-Rahim (2011)
3.	piano (n)	/**p**ɪˈan.əʊ/	/**b**ijɑːnuː/	Abdul-Rahim (2011)
4.	professor (n)	/**pr**əˈfɛsə/	/burufisuːr/	Abdul-Rahim (2011)
5.	aspirin (n)	/ˈæs. **p**ɪrɪn/	/ʔis**b**iriːn/	Jarrah (2013)
6.	april (n)	/ˈeɪ.**pr**(ɪ)l/	/ʔi**b**riːl/	Jarrah (2013)
7.	plastic (n)	/ˈ**p**las.tɪk/	/**b**ilaːstic/	Jarrah (2013)
8.	lamp (n)	/læm**p**/	/lʌm**b**a/	Jarrah (2013)
9.	shampoo (n)	/ʃæmˈ**p**uː/	/ʃʌm**b**o/	Jarrah (2013)
10.	parachute (n)	/ˈ**p**arəʃuːt/	/**b**ɑːrɑʃuːt/	Data Collection Exercise
11.	chips (n)	/ʧɪ**p**s/	/ʃi**b**s/	Data Collection Exercise
12.	helicopter (n)	/ˈhɛlɪkɒ**p**tə(r)/	/hiliko**b**tʌr/	Data Collection Exercise
13.	police (n)	/**p**əˈliːs/	/**b**oliːs/	Data Collection Exercise
14.	powder (n)	/ˈ**p**aʊ.də/	/**b**ɔːdræ/	Data Collection Exercise
15.	telescope (n)	/ˈtɛlɪskəʊ**p**/	/tiliskoː**b**/	Data Collection Exercise
16.	captain (n)	/ˈkæ**p**.tɪn/	/kɑː**b**tin/	Data Collection Exercise
17.	computer (n)	/kəmˈ**p**juː.tə/	/kum**b**juːtɑr/	Data Collection Exercise
18.	cup (n)	/kʌ**p**/	/kuː**b**/	Data Collection Exercise
19.	express (adj)	/ɛkˈs**p**rɛs/	/ʔɪksi**b**ris/	Data Collection Exercise
20.	ketchup (n)	/ˈkɛʧ.ʌ**p**/	/kɑːʧɑ**b**/	Data Collection Exercise
21.	petrol (n)	/ˈ**p**ɛt.r(ə)l/	/**b**itruːl/	Data Collection Exercise
22.	projector (n)	/**p**rəˈdʒɛk.tə/	/**b**uruːʒiktur/	Data Collection Exercise
23.	protein (n)	/ˈ**p**rəʊ.tiːn/	/**b**urutiːn/	Data Collection Exercise
24.	spray (n)	/s**p**reɪ/	/ʔis**b**irɑː/	Data Collection Exercise
25.	packet (n)	/ˈ**p**ækɪt/	/**b**ɑːkɑt/	Data Collection Exercise
26.	poster (n)	/ˈ**p**əʊstə(r)/	/**b**uːstɑr/	Data Collection Exercise

Adaptation of /ŋ/: English /ŋ/ ➔ UHA /n/

No	Gloss	British	UHA	Source
1.	shilling (n)	/ˈʃɪ.lɪ**ŋ**/	/ʃili**n**/	Abdul-Rahim (2011)
2.	sterling (adj)	/ˈstɜː.lɪ**ŋ**/	/ʔistɑrliː**n**i/	Abdul-Rahim (2011)

Adaptation of /ʧ/: English /ʧ/ ➔ UHA /ʃ/

No	Gloss	British	UHA	Source
1.	chips (n)	/**ʧ**ɪps/	/**ʃ**ibs/	Data Collection Exercise
2.	brooch (n)	/brəʊ**ʧ**/	/buru:**ʃ**/	Data Collection Exercise
3.	chat (n)	/**ʧ**æt/	/**ʃ**ɑ:t/	Data Collection Exercise
4.	inch (n)	/ɪn**ʧ**/	/ʔin**ʃ**/	Data Collection Exercise

Importation of English /ʧ/

No	Gloss	British	UHA	Source
1.	clutch(n)	/klʌ**ʧ**/	/kælʌ**ʧ**/	Jarrah (2013)
2.	ketchup (n)	/ˈkɛ**ʧ**.ʌp/	/kɑ:**ʧ**ɑb/	Data Collection Exercise

Adaptation of /ʤ/: English /ʤ/ ➔ UHA /ʒ/

No	Gloss	British	UHA	Source
1.	agenda (n)	/əˈ**dʒ**ɛn.də/	/ʔɑ**ʒ**indɑ/	Abdul-Rahim (2011)
2.	hydrogen(n)	/ˈhaɪ.drə.**dʒ**ən/	/hidru**ʒ**i:n/	Abdul-Rahim (2011)
3.	judo(n)	/ˈ**dʒ**u:.dəʊ/	/**ʒ**u:du/	Abdul-Rahim (2011)
4.	Jug(n)	/**dʒ**ʌg/	/**ʒ**ɑk/	Abdul-Rahim (2011)
5.	nitrogen(n)	/ˈnʌɪ.trə.**dʒ**(ə)n/	/nitru:**ʒ**i:n/	Abdul-Rahim (2011)
6.	jacket (n)	/ˈ**dʒ**æ.kɪt/	/**ʒ**akji:t/[37]	Data Collection Exercise
7.	jeans (n)	/**dʒ**i:nz/	/**ʒ**inz/	Data Collection Exercise
8.	jumbo (n)	/ˈ**dʒ**ʌm.bəʊ/	/**ʒ**ɑmbu:/	Data Collection Exercise
9.	projector (n)	/prəˈ**dʒ**ɛk.tə/	/buru:**ʒ**iktur/	Data Collection Exercise
10.	jelly (n)	/ˈ**dʒ**ɛlɪ/	/**ʒ**i:li/	Data Collection Exercise

Importation of English /ʤ/

No	Gloss	British	UHA	Source
1.	massage(n)	/ˈmasɑ:**dʒ**/	/mɑsɑ:**dʒ**/	Abdul-Rahim (2011)
2.	message (n)	/ˈme.sɪ**ʤ**/	/mɑssi**ʤ**/	Data Collection Exercise

[37] This existence of the /j/ here is might be related to vowel adaptation but not glide epenthesis.

Adaptation of /v/: English /v/ ➔ UHA /f/

No	Gloss	British	UHA	Source
1.	veto (n)	/ˈ**v**iː.təʊ/	/**f**iːtuː/	Abdul-Rahim (2011)
2.	caravan(n)	/ˈkærə**v**æn/	/kɑːrɑ**f**ɑn/	Abdul-Rahim (2011)
3.	vaseline (n)	/ˈ**v**æsəliːn/	/**f**ɑːzliːn/	Abdul-Rahim (2011)
4.	vatican (n)	/ˈ**v**ætɪkən/	/**f**ɑːtiːkɑːn/	Abdul-Rahim (2011)
5.	virus (n)	/ˈ**v**ʌɪ.rəs/	/**f**iruːs/	Jarrah (2013)
6.	vanilla (n)	/**v**əˈnɪlə/	/**f**anila/	Jarrah (2013)
7.	villa (n)	/ˈ**v**ɪlə/	/**f**illa/	Jarrah (2013)
8.	vase (n)	/**v**ɑːz/	/**f**ɑːzɑ/	Jarrah (2013)
9.	van (n)	/**v**æn/	/**f**ɑːn/	Data Collection Exercise
10.	receiver (n)	/rɪˈsiː.**v**ə/	/risiː**f**ʌr/	Data Collection Exercise
11.	volt (n)	/**v**ɒlt/	/**f**uːltˤ/	Data Collection Exercise
12.	avocado (n)	/æ.**v**əʊˈkɑː.dəʊ/	/ʔɑ**f**uːkɑːduː/	Data Collection Exercise
13.	cover (n)	/ˈkʌ**v**.ə(r)/	/kɑ**f**ɑr/	Data Collection Exercise
14.	nervous (n)	/ˈnəː.**v**əs/	/nɑr**f**ɑzɑ/	Data Collection Exercise
15.	overall (n)	/ˈəʊ. **v**ə.rɔːl/	/ʔɑ**f**ruːl/	Data Collection Exercise
16.	save (v)	/seɪ**v**/	/sɑː**f**/	Data Collection Exercise
17.	visa (n)	/ˈ**v**iː.zə/	/**f**iːzɑː/	Data Collection Exercise

Adaptation of /v/: English /v/ ➔ UHA /w/

No	Gloss	British	UHA	Source
1.	reverse (v)	/rɪˈ**v**əːs/	/rɑ**w**ɑs/	Data Collection Exercise
2.	shovel (n)	/ˈʃʌ**v**.(ə)l/	/ʃɑ**w**ɑl/	Data Collection Exercise
3.	varnish (n)	/ˈ**v**ɑː.nɪʃ/	/**w**ɑːrniːʃ/	Data Collection Exercise

Adaptation of /v/: English /v/ ➔ UHA /b/

No	Gloss	British	UHA	Source
1.	lava (n)	/ˈlɑː.**v**ə/	/lɑː**b**ɑ/	Data Collection Exercise
2.	vacuum-brake (n)	/ˈ**v**æk.jʊəm breɪk/	/**b**ɑːkim/	Data Collection Exercise

2-Syllabic Adaptation

- The epenthesis of consonant

The glottal stop epenthesis before onset-less syllable

No	Gloss	British	UHA	Source
1.	accordion (n)	/əˈkɔː.dɪ.ən/	/ʔɑku:rdijun/	Abdul-Rahim (2011)
2.	squash (n)	/**skw**ɒʃ/	/**ʔis**kwɑʃ/[38]	Abdul-Rahim (2011)
3.	adrenalin (n)	/əˈdrɛnəlɪn/	/ʔɑdrinili:n/	Abdul-Rahim (2011)
4.	agenda (n)	/əˈdʒɛn.də/	/ʔɑʒindɑ/	Abdul-Rahim (2011)
5.	ammonium (n)	/əˈməʊ.nɪ.əm/	/ʔɑmu:nijum/	Abdul-Rahim (2011)
6.	ion (n)	/ˈ**ʌɪ.**ɒn/	/ʔɑju:n/	Abdul-Rahim (2011)
7.	ozone (n)	/ˈ**əʊ.**zəʊn/	/ʔuzu:n/	Abdul-Rahim (2011)
8.	april (n)	/ˈ**eɪ.**pr(ɪ)l/	/ʔibri:l/	Jarrah (2013)
9.	aspirin (n)	/ˈæs. pɪrɪn/	/ʔisbiri:n/	Jarrah (2013)
10.	anemia (n)	/əˈni:.mɪ.ə/	/ʔɑni:mijɑ/	Data Collection Exercise
11.	album (n)	/ˈal.bəm/	/ʔalbu:m/	Data Collection Exercise
12.	ice cream (n)	/ˈʌɪs ˌkri:m /	/ʔiskiri:m/	Data Collection Exercise
13.	aerial (n)	/ˈ**ɛ:.r**ɪəl/	/ʔɑ:r.jɑ:l/	Data Collection Exercise
14.	overall (n)	/ˈ**əʊ.**və.rɔ:l/	/ʔɑfru:l/	Data Collection Exercise
15.	avocado (n)	/**æ.**vəʊˈkɑ:.dəʊ/	/ʔɑfu:kɑ:du:/	Data Collection Exercise
16.	express (adj)	/**ɛk**ˈsprɛs/	/ʔɪksibris/	Data Collection Exercise
17.	asphalt (n)	/ˈ**æs.**fælt/	/ʔɑsfilt/	Data Collection Exercise
18.	atlas (n)	/ˈ**æt.**ləs/	/ʔatˤlɑs/	Data Collection Exercise
19.	inch (n)	/**ɪntʃ**/	/ʔinʃ/	Data Collection Exercise

The glottal stop and vowel epenthesis before onset cluster CC or CCC

No	Gloss	British	UHA	Source
1.	sterling (adj)	/ˈ**st**ɜ:.lɪŋ/	/**ʔis**tɑrli:ni/	Abdul-Rahim (2011)
2.	skater (n)	/ˈ**sk**eɪ.tə(r)/	/**ʔis**ikietʌr/	Jarrah (2013)
3.	street (n)	/**stri**:t/	/**ʔis**tireet/	Jarrah (2013)
4.	sticker (n)	/ˈ**st**ɪ.kə(r)/	/**ʔis**tikɑr/	Data Collection Exercise
5.	spray (n)	/**spr**eɪ/	/**ʔis**birɑ:/	Data Collection Exercise

The glide /j/ epenthesis before onset-less syllable

No	Gloss	British	UHA	Source
1.	phobia (n)	/ˈfəʊ.bɪ.**ə**/	/fu:bi**jɑ**/	Abdul-Rahim (2011)
2.	accordion (n)	/əˈkɔ:.dɪ.**ən**/	/ʔɑku:rdi**jun**/	Abdul-Rahim (2011)
3.	ammonium (n)	/əˈməʊ.nɪ.**əm**/	/ʔɑmu:ni**jum**/	Abdul-Rahim (2011)
4.	calcium(n)	/ˈkæl.sɪ.**əm**/	/kɑlsi:**jum**/	Abdul-Rahim (2011)
5.	helium (n)	/ˈhi:.lɪ.**əm**/	/hi:li**jum**/	Abdul-Rahim (2011)
6.	ion (n)	/ˈʌɪ.**ɒn**/	/ʔɑ**ju**:**n**/	Abdul-Rahim (2011)
7.	neon (n)	/ˈni:.**ɒn**/	/ni**jun**/	Abdul-Rahim (2011)

38 This is considered a case of onset-less syllable resulting from metathesis not epenthesis of vowel and glottal stop.

8.	piano (n)	/pɪˈ**an**.əʊ/	/bi**jɑ**:**n**u:/	Abdul-Rahim (2011)
9.	bacteria (n)	/bækˈtɪə.rɪ.**ə**/	/bʌktiri**ja**/	Jarrah (2013)
10.	battery(n)	/ˈbæt.ər.**ɪ**/	/batar**ja**/	Jarrah (2013)
11.	cafeteria (n)	/kæ.fəˈ.tɪə.rɪ.**ə**/	/kʌfatiri**ja**/	Jarrah (2013)
12.	anemia (n)	/əˈni:.mɪ.**ə**/	/ʔɑni:mi**ja**/	Data Collection Exercise
13.	soya (n)	/ˈsɔɪ.**ə**/	/sˤu:**jɑ**:/	Data Collection Exercise
14.	sodium (n)	/ˈsəʊ.dɪ.**əm**/	/sˤu:di**jum**/	Data Collection Exercise

- The epenthesis of vowel

The vowel epenthesis in onset CC or CCC clusters

No	Gloss	British	UHA	Source
1.	bronze (n)	/**br**ɒnz/	/burunz/	Abdul-Rahim (2011)
2.	freezer (n)	/ˈ**fr**i:.zə(r)/	/firi:zɑr/	Abdul-Rahim (2011)
3.	kremlin(n)	/ˈ**kr**ɛm.lɪn/	/kirimlɪ:n/	Abdul-Rahim (2011)
4.	professor (n)	/**pr**əˈfɛsə/	/burufisu:r/	Abdul-Rahim (2011)
5.	trailer (n)	/ˈ**tr**eɪ.lə(r)/	/tirɑlɑ/	Abdul-Rahim (2011)
6.	trillion (n)	/ˈ**tr**ɪ.ljən/	/tirilju:n/	Abdul-Rahim (2011)
7.	block (v)	/**bl**ɒk/	/buluk/	Jarrah (2013)
8.	break (n)	/**br**eɪk/	/birɜ:k/	Jarrah (2013)
9.	christmas(n)	/ˈ**kr**ɪs.məs/	/kirismas/	Jarrah (2013)
10.	clutch(n)	/**kl**ʌʧ/	/kælʌʧ/	Jarrah (2013)
11.	cream (n)	/**kr**i:m/	/kiri:m/	Jarrah (2013)
12.	flash (n)	/**fl**æʃ/	/fila:ʃ/	Jarrah (2013)
13.	fresh (adj)	/**fr**ɛʃ/	/firiʃ/	Jarrah (2013)
14.	plastic (n)	/ˈ**pl**as.tɪk/	/bila:stic/	Jarrah (2013)
15.	ice cream (n)	/ˈʌɪs ˌ**kr**i:m /	/**ʔ**iskiri:m/	Data Collection Exercise
16.	brooch (n)	/**br**əʊʧ/	/buru:ʃ/	Data Collection Exercise
17.	express (adj)	/ɛkˈ**spr**ɛs/	/ʔɪksibris/	Data Collection Exercise
18.	projector (n)	/**pr**əˈdʒɛk.tə/	/buru:ʒiktur/	Data Collection Exercise
19.	protein (n)	/ˈ**pr**əʊ.ti:n/	/buruti:n/	Data Collection Exercise

The quality of the epenthetic vowel

Epenthesis of default /i/

No	Gloss	British	UHA	Source
1.	trailer (n)	/ˈtreɪ.lə(r)/	/t**i**rɑlɑ/	Abdul-Rahim (2011)
2.	break (n)	/breɪk/	/b**i**rɜ:k/	Jarrah (2013)
3.	flash (n)	/flæʃ/	/f**i**la:ʃ/	Jarrah (2013)
4.	plastic (n)	/ˈplas.tɪk/	/b**i**la:stic/	Jarrah (2013)

Other vowel insertion /æ/

No	Gloss	British	UHA	Source
1.	clutch(n)	/klʌʧ/	/k**æ**lʌʧ/	Jarrah (2013)

The vowel harmony of the /i/

No	Gloss	British	UHA	Source
1.	freezer (n)	/ˈfriː.zə(r)/	/f**i**riːzɑr/	Abdul-Rahim (2011)
2.	kremlin(n)	/ˈkrɛm.lɪn/	/k**i**rimlɪːn/	Abdul-Rahim (2011)
3.	trillion (n)	/ˈtrɪ.ljən/	/t**i**riljuːn/	Abdul-Rahim (2011)
4.	christmas(n)	/ˈkrɪs.məs/	/k**i**rismas/	Jarrah (2013)
5.	cream (n)	/kriːm/	/k**i**riːm/	Jarrah (2013)
6.	fresh (adj)	/frɛʃ/	/f**i**riʃ/	Jarrah (2013)
7.	express (adj)	/ɛkˈsprɛs/	/ʔɪks**i**bris/	Data Collection Exercise
8.	ice cream (n)	/ˈʌɪs ˌkriːm /	/ʔisk**i**riːm/	Data Collection Exercise
9.	spray (n)	/spreɪ/	/**ʔis**birɑː/	Data Collection Exercise
10.	sticker (n)	/ˈstɪ.kə(r)/	/**ʔi**stikɑr/	Data Collection Exercise

The vowel harmony of the /u/

No	Gloss	British	UHA	Source
1.	bronze (n)	/brɒnz/	/b**u**runz/	Abdul-Rahim (2011)
2.	professor (n)	/**prə**ˈfɛsə/	/burufisuːr/	Abdul-Rahim (2011)
3.	block (v)	/blɒk/	/b**u**luk/	Jarrah (2013)
4.	brooch (n)	/brəʊʧ/	/b**u**ruːʃ/	Data Collection Exercise
5.	projector (n)	/prəˈdʒɛk.tə/	/b**u**ruːʒiktur/	Data Collection Exercise
6.	protein (n)	/ˈprəʊ.tiːn/	/b**u**rutiːn/	Data Collection Exercise

Unpredicted adaptation

The adaptation of voiceless bilabial and onset cluster CC

No	Gloss	British	UHA	Source
1.	professor (n)	/**pr**əˈfɛsə/	/burufisuːr/	Abdul-Rahim (2011)
2.	april (n)	/ˈeɪ.**pr**(ɨ)l/	/ʔibriːl/	Jarrah (2013)
3.	plastic (n)	/ˈ**pl**as.tɪk/	/bilaːstic/	Jarrah (2013)
4.	projector (n)	/**pr**əˈdʒɛk.tə/	/buruːʒiktur/	Data Collection Exercise
5.	protein (n)	/ˈ**pr**əʊ.tiːn/	/brutiːn/	Data Collection Exercise
6.	express (adj)	/ɛkˈ**spr**ɛs/	/ʔɪksibris/	Data Collection Exercise

The adaptation of voiceless bilabial and onset cluster CCC

No	Gloss	British	UHA	Source
1.	spray (n)	/**spr**eɪ/	/ʔisbirɑː/	Data Collection Exercise

The epenthesis of vowel and glottal stop before onset clusters

No	Gloss	British	UHA	Source
1.	sterling (adj)	/ˈ**st**ɜː.lɪŋ/	/ʔistɑrliːni/	Abdul-Rahim (2011)
2.	skater (n)	/ˈ**sk**eɪ.tə(r)/	/ʔisikietʌr/	Jarrah (2013)
3.	street (n)	/**str**iːt/	/ʔistireet/	Jarrah (2013)
4.	sticker (n)	/ˈ**st**ɪ.kə(r)/	/ʔistikɑr/	Data Collection Exercise