

A Constraint-Based Analysis of the Phonological Adaptation of English Loanwords into Najdi Arabic

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المخلص

تبحث هذه الدراسة في العمليات الصوتية التي خضعت لها الكلمات الإنجليزية المستعارة لتتوافق مع قواعد اللهجة العربية النجدية. تهدف هذه الدراسة إلى تحليل هذه العمليات الصوتية. أظهرت النتائج أن إضافة حرف العلة وإطالة الحروف المتحركة وتقصيرها هي استراتيجيات تبناها متحدثو اللهجة النجدية لتعديل أشكال الكلمات المستعارة إلى شكل يعتمد على قواعد اللغة الأم. تُفسر منهجية البحث القائمة على (القيود النظرية الأمثلية) التعديلات الصوتية في الكلمات الإنجليزية المستعارة. يُنظر إلى عملية إضافة الحرف على أنها مدفوعة بمتطلبات بنية المقطع في اللهجة النجدية. يتم إضافة أجزاء صوتية، على سبيل المثال، لإصلاح المقاطع غير المسموح بها بالإضافة إلى إصلاح مجموعات الحروف الساكنة غير المسموح بها. علاوة على ذلك، فإن حسن تشكيل النطق هو الحافز الرئيسي وراء إطالة الحروف المتحركة وتقصيرها في سياق تكييف الكلمات الإنجليزية المستعارة. تخلص هذه الدراسة إلى أن الكلمات الإنجليزية المستعارة متناغمة مع قواعد النظام الصوتي النجدي حيث تخضع للتعديلات الصوتية لتسهيل نطقها على متحدثي اللهجة النجدية.



Abstract

This paper investigates the phonological processes that English loanwords had undergone to be in harmony with the grammar of Najdi Arabic (NA henceforth). This study aims to provide a theoretical analysis of these phonological processes. Epenthesis, vowel lengthening, and vowel shortening are shown in this study to be strategies adapted by Najdi Arabic speakers to modify the loanword forms into a shape based on their L1 grammar. The constraint-based theoretical framework of Optimality Theory (OT) accounts for the phonological modifications in English loanwords. Epenthesis is seen to be motivated by the requirements of Najdi Arabic's syllable structure. Sound segments are epenthesized, for instance, to repair illicit onsetless syllables as well as repair disallowed consonant clusters. Further, the foot well-formedness is the main incentive behind vowel lengthening and vowel shortening in the course of adapting English loanwords. This study concludes that English loanwords are harmonious with Najdi Arabic grammar where they go through phonological modifications to be pronounceable by Najdi Arabic speakers.

Keywords: *epenthesis, loanwords, Najdi Arabic, vowel lengthening; vowel shortening*

Introduction

As long as the technological advances are taking part worldwide and new inventions are discovered day by day, the chance of adapting loanwords from some languages, particularly English, into other languages such as Arabic is highly probable. Some of these words are adapted in the same form they appear in the source language, yet Amina (2019) in his study of French loanwords adapted into Algerian Arabic said that many loanwords have undergone morphologically or phonologically modification processes (Amina, 2019). Likewise, English loanwords followed certain rules and constraints to fit in the Arabic linguistic system. These adapted loanwords are frequently used in the target language, suggesting that they became part of the lexicon.

In fact, these loanwords are largely used in books, news, and everyday language both in Modern Standard Arabic (MSA) and dialectal Arabic (DA) although some of these adapted words violate the constraints of the Arabic system. The behavior of such words caught many researchers' attention, and they put valuable efforts to analyze them in multiple dialects. Salient instances of such work are Hadrami Arabic, Kuwaiti Arabic, Moroccan Arabic, and Jordanian Arabic (Al- Saqqaf, 2006; Dashti, 2017; Zellou, 2011; Zibin, 2019 respectively). Nonetheless, these studies were morphologically or semantically oriented. In other words, they captured how the adapted words are adjusted when attached to Arabic affixes and how they are interpreted differently or partially to remove ambiguity in the Arabic texts/ contexts without any significant reference to the phonological modification.

When it comes to phonological changes, again, they are discussed under the umbrella of either derivational morphemes or functional morphemes attached to them and how such words were modified accordingly. Little attention has been paid to the phonological change observed in English loanwords adapted into Arabic, particularly the NA. This phonological change where the source forms are not identical to the recreated forms is due to the restriction of NA's phonological system. To meet the requirements of NA, these loanwords have undergone phonological processes/ modifications to be in line with NA phonology and, hence, pronounceable for Najdi Arabic speakers. These loanwords have been given a general linguistic description in literature. There still remain questions about the modifications they have undergone to go well with the Arabic sound system. Thus, it is necessary to analyze them in depth within a theoretical framework.

Indeed, some studies have discussed this issue from a purely phonological point of view; nevertheless, these works provided a general overview of the change found in the resulting Arabic-like form of the foreign word. Hence, an in- depth analysis is necessary to reveal the modification these loanwords had undergone to be in the desired shape used by Najdi Arabic speakers. The present study, therefore, aims to provide a solid phonological analysis utilizing Optimality Theory framework (OT) to investigate the processes that English loanwords undergo during the adaptation.

The processes to be considered are epenthesis, vowel lengthening, and vowel shortening. The analysis is meant to address the following questions:

1. How are English loan/ borrowed words modified to be in harmony with the Najdi Arabic phonological system?

2. What constraints are considered in the analyses of the adaptation processes under investigation in this study?
3. What constraint rankings are considered in the analyses of the adaptation processes under investigation in this study?

This paper is divided into six sections. An introduction to the topic in question is provided above in section 1. Section 2 presents an overview of the literature. The methodology is presented in section 3 which also examines the theoretical framework adapted in the current study. The main findings of the phonological processes are provided in section 4 along with representative examples and descriptive generalizations. This is followed by section 5 which discusses the adaptation processes utilizing the constraint-based framework of OT. Section 6 presents the conclusion and general remarks on the study.

Literature Review

This section provides an overview of the literature of loanwords phonology. It sheds light on major works in this field which investigate the phonological adaptation of loanwords within different frameworks. In addition, it explains the definition of loanwords and how researchers refer to them in literature. It also reviews significant works that were conducted on adapting loanwords into multiple modern Arabic dialects from a phonological point of view. This section also reviews major works written in the phonology of Najdi Arabic.

The Concept of Loanwords

It is worth mentioning that the use of loanwords is different from code-switching. Although some people might confuse the use of the concept (loanword) with (code-switching), literature has distinguished them as two entirely different concepts. A possible justification of the assumption that loanwords and code-switching are two sides of the same coin resides in the belief that word borrowing happened by the means of code-switching. Despite the fact that code-switching is a source of having loanwords in Arabic lexicon as indicated by Dohlus (2010), other factors greatly impacted the spread of loanwords in Arabic more than code-switching such as loan translation, specifically of medical and technical terms. Eventually, although code-switching is a source of having loanwords, they are still different concepts and the boundaries between them are clear-cut.

Clearly, the concept of loanwords can be defined as words borrowed from other languages. The term has been defined by Haugen (1950) as “the attempted reproduction in one language of patterns previously found in another” (p. 211). These words either have no equivalent in the target language, which is NA in this study, or words that do have equivalents in the language but are not largely used. Alhoody (2019) presented an example of an English loanword frequently used by monolingual speakers of Qassimi Arabic (QA): “Internet”. He indicated that although this word has been Arabized into “the net of spider”, QA speakers insisted on using the source form. Indeed, there are plenty of reasons why the Arabized form is less used. One of which could be the misinterpretation of the source word’s meaning and referent. Therefore, QA speakers were reluctant to use the nativized version of “Internet.” However, to maintain the focus of this study, I only discuss the phonological aspect of loanwords.

Other researchers also define loanwords as words that are “incorporated into the discourse of L1, the recipient language, and have a mental representation in L1. Thus, they are made to conform with at least the outermost peripheral phonological constraints of L1, which represent absolute constraints in L1.” (Paradis and LaCharite, 1997, p. 385). This definition indicates an integral aspect of loanwords that is being affected by the adapted language's phonological rules and constraints. Hafez (1996) also commented on the loanwords adaptation in which he stated that: “integration of loanwords into the patterns of the receptive language (RL) should be thought of in terms of degrees.” (Hafez, 1997, p.388). The author indicated that the first degree of this integration is introducing the loanword by English-Arabic bilingual speakers. In this stage, the loanword is in the form of the source language phonologically as these bilinguals are proficient users of the language. Meanwhile, the medium of transferring loanwords to the target language is code-switching. After that, monolingual speakers assimilate these loanwords to the sound system of L1. In the final degree assumed by Hafez (1996), the loanword is introduced to the L1 lexicon which monolinguals repeatedly use it in daily communication. The definition of loanwords presented earlier indicates the change observed in the adaption process. Nevertheless, it has also been noticed that some loanwords are adapted into the target language in the same form without any modification. An illustration of this phenomenon is provided below.

Hafez (1996) pointed to the idea that some loanwords do not undergo any change in the course of integration due to many reasons, one of which is the absence of any conflict with the L1 linguistic system. In this regard, Haugen (1950) indicated tolerance levels in adapting foreign sound segments from the donor language to the receptive language. He stated that: "Some may be completely assimilated so that they are not felt foreign (e.g., /mu'si:qa/) due to their similarity to the phonological and morphological organization of the RL." (Haugen, 1950, p. 223). As a matter of fact, Smeaton (1973) in his study of the Arabic of Al-Hasa affirmed this notion of a complete assimilation of the adapted loanwords to be widely used by the society.

Consequently, the investigation of loanwords should be distinguished from code-switching. As they are totally different concepts, this paper excludes the discussion of code-switching because it is beyond the scope of this study. It only discusses loanwords from a phonological point of view. The next section examines previous studies that tackled the same issues discussed in the current study.

Arabic Loanword Phonology

As previously mentioned, dialects differ in the integration levels of loanwords. The use of a specific loanword can be widely spread among speakers of one dialect of Arabic but not in other dialects. In other words, loanwords found in one dialect do not necessarily exist in other dialects in one language. Therefore, Arabic dialects reveal variations in the adaptation of English loanwords. The discussion in this section is divided into two parts: the first one presents the previous works on adapting loanwords into Arabic dialects, which provides a descriptive investigation of the phonological change. The second part concerns studies presenting a constraint-based analysis of the phonological modification observed in the adapted loanwords.

Descriptive Analysis of Loanwords

Many studies partially investigated the phonological process of adapting English loanwords such as (Abdullah & Dafar, 2006; Al-saqqaf, 2006; Alahmari, 2022; Amina, 2019; Hafez, 1996; Jarrah & Saleh, 2013). Their work was not dedicated to the phonological change observed in the loanwords. In fact, the phonological change was analyzed briefly, and their studies included a discussion of the morphological and semantic changes as well. A significant work in this regard is Hafez (1996) who analyzed loanwords as adapted into Egyptian Arabic (EA) phonologically and morphologically. He presented the phonological analysis of loanwords in a comparison between the pronunciation of native Egyptian speakers and the source language (SL). He further argued that: "when producing a loanword, speakers attempt the closest proximation to the SL model." (Hafez, 1996, p. 391). Also, he attributed the phonological change to the lack of identical sound correspondences in the receptive language (RL), which forced Egyptian speakers to alternate some sound segments. Nonetheless, he only presented a mere comparison between RL and SL.

Another study that analyzed the adaptation of English loanwords descriptively is Al-saqqaf (2006). He concentrated on loanwords in Hadrami Arabic (HA). The main focus of this study was contrast, including a list of loanwords from English, Indonesian and Swahili origins. In his description of the adaptation process, he mentioned that "the outcome normally results in a number of psycholinguistic processes on the part of the RL native speaker in an effort to produce a satisfactory reproduction of the SL form." (Al-saqqaf, 2006, p. 80).

Moreover, he clarified that HA speakers usually add some features to the adapted forms not found in the source forms. For example, he stated that: "English has only one /t/ phoneme in words like 'watt' and 'tyre', but when they were loaned to HA they were rendered with two different phonemes, namely emphatic stop /t^h/ and /t/ in wa^h and ta yir." (Al-saqqaf, 2006, p. 84). The primary objective of Alsaqqaf's study was to offer educational implications for teaching bilinguals.

There is a difference in duration length between the vowel sounds uttered by Arabic speakers and native words, according to a study on loanwords conducted by Alahmari (2022). This study was concerned with the pronunciation features of the same vowels in both English and Arabic phonology. The author examined vowel quality and vowel duration. He discovered that the adaptation process impacted vowel production where participants tended to articulate them in shorter periods than the source words' vowels. This study was limited to examining long vowels and did not mention how short vowels shared in both the English/Arabic systems are produced.

The studies discussed above are instances of works that have not utilized a specific theoretical framework to analyze the data. They rather presented a general description. In contrast, the following section provides an overview of the major works that analyzed English loanwords within a specific theoretical framework such as Optimality Theory. These works thoroughly investigated the phonological change observed in the English loanwords adapted into the modern Arabic dialect.

Constraint-Based Analysis of Loanwords

This section is concerned with the studies that examined the phonological modification in adapted loanwords utilizing a theoretical framework. They provided a solid phonological investigation of the observed change, which is governed by the grammar of the Arabic dialects. Such studies include Abu Guba (2016), Aloufi (2016), Alhoody (2019), Mashaqba et al., (2023) and others. They contributed to the field of Loanwords phonology, particularly Arabic varieties, such as Ammani Arabic (AA), Urban Hijazi Arabic (UHA) Qassimi Arabic (QA) and Bedouin Jordanian Arabic (BJA) respectively.

Interestingly, Aloufi, 2016 accounted for data from UHA by utilizing two theoretical frameworks. The first framework is specially designed for investigating loanwords which is The Theory of Constraints and Repair Strategies Loanword Model (TCRSLM) proposed by Paradis and LaCharite (1997).

Optimality Theory (OT) which is introduced by Prince and Smolensky (1993) is the second framework she worked within to account for the data. The results of applying (TCRSLM) indicated that "the various adaptations of English consonants to their close counterparts are more preferable than importing or deleting them in UHA." (Aloufi, 2016, p. 22) Thus, the main role of TCRSLM was to make prediction about the phonological patterns. Nevertheless, this framework did not provide an accurate prediction and rather failed to account for the alternation in UHA consonants. Hence, TCRSLM is inadequate to account for the phonological adaptations in UHA.

On the other hand, Aloufi (2016) mentioned that OT could predict and explain the phonological alternations in UHA loanword dataset. A further explanation of OT principles and constraint will be provided in section 3. In the comparison between the two frameworks, Aloufi (2016) argued that although OT analysis better accounted for the phonological alternations in UHA, none of these theories were adequate in fully investigating loanwords in UHA. Additionally, she called for further research using experimental methodologies to account for the data as the previous theoretical frameworks fell short in this regard.

Another study, Abu Guba (2016), investigated English loanwords phonology in Ammani Arabic (AA), a sub-dialect of Jordanian Arabic. By adopting OT analysis, the author stated that: "the adaptation process is geared towards unmarkedness in that faithfulness to the source input is violated in order to render the output unmarked." (Abu Guba, 2016, p. 34). Furthermore, what is special about AA in the adaptation of English loanwords is the persistence of some foreign phonemes such as /v/ in 'video' although this sound specifications do not exist in AA sound inventory. He attributed this to sociolinguistic factors by which preserving /v/ in loanwords is rendered more prestigious than the old-fashioned /f/ counterpart. However, as /v/ is devoiced in some cases of the adaptation, the status of this sound as a phoneme in AA is still unknown.

Additionally, the author illustrated that "English source stress is mostly neglected in the adaptation process with stress assigned to the adapted phonological string according to AA stress constraints." (Abu Guba, 2016, p. 181). He further clarified that stress strongly correlates with syllable weight in the data set which led him to assume that WSP constraint (a constraint that requires that heavy syllables attract stress) is highly ranked in AA. So, heavy syllables are assigned stress even in final positions. This requirement, as indicated by Abu Guba (2016),

may result in violating NONFIN, a constraint which requires that no prosodic head is final in Prosodic Word. Hence, WSP is ranked even higher than NONFIN in AA. According to this analysis, the author concluded that the adaptation process is primarily phonological, though it is influenced by phonetics and other linguistic factors.

Another study, Alhoody (2019), discussed the segmental adaptation of English loanwords to QA. The author investigated the contrastive features of the sound segments. He mentioned that: "the inputs to QA are fully-specified English outputs, which serve as inputs to QA. Then, the native grammar of QA allows only the phonological features of inputs to surface that are contrastive in QA." (Alhoody, 2019, p. 62). He indicated that noncontrastive features of the source form are changed in the adaptation where he proposed that the contrastive features of QA play a role in the treatment of the English segments that are not part of the QA inventory. So, the foreign sounds are mapped to their phonologically closest match. For example, he stated that: "the English vowel /ɑ:/ is always replaced with the QA low vowel [a(:)+back], whereas the round one /ɒ/ is most frequently mapped to [u(:)]." (Alhoody, 2019, p. 185). He concluded that the examination of the contrastive features in adapting loanwords is of a great linguistic importance to explain the phonological modification.

Alhoody's study is different from the current study where the latter investigates processes of inserting new sound to the original English word or eliminating a sound in the original word during the adaptation while Alhoody (2019) investigates the features of the exact sound segments with no mention to added segments or deleted segments. In other words, Alhoody's study is concerned with how the specific sound has changed. He went through all English sounds one by one and investigated how QA sound inventory handled them. He mentioned that "for instance, in the adaptation of English consonants, the English input segment /p/ is mapped consistently to [b] in the QA. In this case, the contrastive hierarchy of QA consonant inventory contains the co-occurrence constraints [*αVoice, +labial*] and [*αCoronal, +labial*], which filter the input features if the input is fully-specified [-sonorant, +labial, -coronal, -continuant, -voiced, ...], and permits only the contrastive features [-sonorant, +labial, -continuant] to surface." (Alhoody, 2019, p. 186).

A final study in this section concentrated on Bedouin Jordanian Arabic (BJA). This study accounted for the pattern of the broken plural suffix in adapting loanwords. OT approach was implemented to select the optimal output. It revealed that this dialect showed preference towards heavy and superheavy syllables. Interestingly enough, this study also discussed the various interpretations entailed by the optimal output.

In sum, this section was concerned with the phonological studies that incorporated a constraint-based analysis to account for the loanwords data. They provided significant contributions to the dialects they investigated. To further contribute to the study of adapting English loanwords into Arabic dialects, the present study examines the phonological adaptations of loanwords into Najdi Arabic since the adaptation of loanwords in Arabic dialects varies according to their specific phonotactic constraints. The next section provides an overview of Najdi Arabic phonology with special attention to syllabification and stress assignment to pave the way for analyzing the data later.

Najdi Arabic (NA)

Geographical variations play a substantial role behind the existence of dialects. NA is spoken in a wide area of Saudi Arabia in which dialectology scholars, such as Ingham (1994), divided it into three types: Northern, Southern and Central Najdi. Ingham (1994) stated that: "Najdi Arabic is not simply one dialect, but rather the name refers to a relatively homogenous cultural group of dialects ... these dialects firstly include the speech of non-nomadic people from the areas of Central Najd." (Ingham, 1994, p. 42). The current study, thus, focuses on the phonological adaptations of English loanwords into Central Najdi dialect. The following subsections present the syllable types in NA as well as stress patterns, which are crucial to investigating the phonological processes tackled in this study.

Syllabification

Regarding syllable structure, Alqahtani (2014) clarified that codas in NA are optional, but single onsets are obligatory in all syllable structures. Therefore, NA does not tolerate English onsetless words in the adaptation process. Strategies adopted by NA speakers to repair onsetless syllables will be clarified in section 4. Alqahtani (2014) further mentioned that the onsets of all syllables in NA are either simple or complex. Syllables with complex onsets, regardless of their weight, appear only word-initially. Abu-Salim (1982) addressed this notion stating that: "complex onsets are restricted to the initial position because they are created in the non-final position by the deletion of an unstressed short vowel and the unstressed short vowel in the final position never undergoes the deletion." (Abu-Salim, 1982, p. 116). Consider the following distribution of syllable forms in NA which is adapted from Alqahtani (2014, p. 117):

Table 1

The Distribution of Syllable Types in Disyllabic Words in NA

Syllable type	Initial	Medial	Final
CV	[gi.tal] 'he killed'	[yis.ti.fīir] 'he consults'	[zir.na] 'we visited'
CVC	[ʃar.ban] 'he was drunk'	[ʃaa.fat.hum] 'she saw them'	['ki.tab] 'he wrote'
CVV	[ha:.dʒim] 'he attacked'	[mis.ta:.dʒir] 'a tenant'	-
CVVC	[ʃa:f.hum] 'he saw them'	[mi.ga:s.hum] 'their size'	[yix.ta:r] 'he selects'
CVCC	-	-	[wif.gilt] 'what you said'
CCV	[kti.bat] 'she wrote'	-	-
CCVC	[tkal.lim] 'you (m) are talking to'	-	-
CCVV	[zba:.lah] 'trash'	-	-
CCVVC	[kla:b.na] 'our dogs'	-	-
CCVCC	-	-	-

Based on Table 1, there are three types of syllables in NA: light syllables: CV and CCV. The syllable form CV is distributed freely in the word: initially, medially, and finally. However, CCV form only appears in word- initial position. The second type is heavy syllables which are in the form of CVC, CVV, CCVC, and CCVV. CVC syllable form is heavy in non-final positions and light in final position due to having its final consonant extrametrical (non-moraic); i.e., [CV.CV<C>]. According to Alber (2005), modern Arabic dialects consider CVC syllable heavy only in the non-final position. Moreover, CVV syllable form is found initially and medially as a heavy syllable but not in the final position. As Alqahtani (2014) indicated, this syllable form is exclusive to word initial and word medial positions since it appears as a heavy syllable only in these two positions. As for the heavy syllables CCVC and CCVV, they are restricted to word-initial position for the reason mentioned earlier, which has complex onsets. Again, syllables with complex onsets are only found word-initially in NA. The final type, which is represented in the following forms CVVC, CVCC, CCVVC, and CCVCC is superheavy. To begin with CVVC syllable form, it is distributed freely in NA retaining its weight. CVCC syllable form, nevertheless, is only found in final position. CCVVC syllable form only appears word-initially as it has a complex onset, for example, [kla:b.na]. Finally, CCVCC form is found in monosyllabic words such as [smint]. Interestingly, when adapting English loanwords with complex onsets in non-word-initial positions, NA speakers break this cluster by epenthesizing a vowel. A further explanation of this process is provided in section 5.

Proceeding to a relevant topic, the following subsection demonstrates how syllable weight can sometimes determine stress placement. Specifically, the stress pattern is greatly affected by whether the syllable is light, heavy, or superheavy. The following subsection presents an overview of the parameters governing stress assignment in NA.

Stress Assignment

Stress system in NA is similar, though not identical, to that of MSA. Stress is strongly associated to syllable weight and position. As indicated by Alqahtani (2014), the word stress system in NA is described as follows:

- a. The final syllable receives stress if it is either CVVC or CVCC.
[mak.'tu:b] 'written', [ʔin.ʕa.'raft] 'I became known'.
- b. When the ultimate syllable is neither CVVC nor CVCC, stress is placed on the heavy penultimate syllable.
[mak.'tu:.fah] 'tied (fm. sg.)', [ga.'bal.na] 'meet us (m.s.)'
- c. If the penultimate syllable is not heavy and the ultimate syllable is neither CVVC nor CVCC, the antepenultimate syllable receives stress.
[ʔin.ki.sar] 'it (ms. sg.) 'got broken'.
- d. Stress is assigned to the penultimate syllable in disyllabic words if the ultimate syllable is neither CVVC nor CVCC.
[ki.tab] 'he wrote'.

Overall, stress tends to fall as close to the right edge as possible. It never exceeds the antepenult; it respects the final three-syllable window. Concerning moras, Alqahtani (2014) asserted that in NA, CVC and CVV are heavy syllables with two moras (bimoraic), while CV is light with just one mora (monomoraic). It can be said that NA is a quantity-sensitive dialect that assigns stress based on the heaviness of the syllables. Consequently, in adapting English loanwords, this study demonstrates that NA speakers tend to apply their stress rules on English loanwords. For instance, final stress in Chimpanzee [tʃɪm.pæn'zi:] is assigned to the penultimate syllable in the adaptation [ʃɪm.'bɑ:n.zi]. Moreover, stress falls on the antepenultimate syllable as in ['mas.ka.ra] while the source English word (Mascara) has stress on the penultimate syllable [mæs'kɑ:rə]. In conclusion, stress in loanwords shifts from one syllable to another to meet NA stress system.

To sum up, the above sections provide an overview of literature concerning the topic in question. They introduce the reader to the topic by defining the key terms in the study such as loanwords, Najdi Arabi, etc. They also review the major works written in Arabic loanwords phonology as well as the approaches and frameworks to account for this phonological phenomenon of loanwords adaptation into Arabic dialects. The review concludes with a demonstration of some aspects of NA phonology (mainly syllabification and stress assignment) that are crucial to the analysis of loanwords. In order to understand other parts of NA phonology such as consonant and vowels, it might be helpful to refer to these tables (see Appendix D, Appendix E).

Methodology and Theoretical Framework

The analysis in this study is based on Optimality Theory (OT) (Prince & Smolensky, 1993,2004). In this theory, there are numerous ranked and violable constraints that correctly choose the best form from a large number of options (potential candidates). Markedness and Faithfulness constraints are the main types of constraints in OT. While markedness constraints make general statements about well- formedness, faithfulness constraints require that the input and output are in correspondence to one another (Prince & Smolensky, 1993,2004). This implies that outputs must be structurally well-formed in order to satisfy markedness constraints. In other words, these constraints enable outputs to avoid such marked structures.

Instances of markedness constraints include:

- ONSET (Prince & Smolensky, 1993,2004):
Syllables must have onsets.
- NO-CODA (Prince & Smolensky, 1993,2004):
Syllables are open.

On the other hand, faithfulness constraints require outputs to be exact correspondents to their inputs. This implies that outputs that are not identical to their inputs violate these constraints. Examples of faithfulness constraints include:

MAX-IO and DEP-IO. MAX-IO (McCarthy & Prince, 1995):

Every segment of the output has a correspondent in the input (no deletion).

DEP-IO (McCarthy & Prince, 1995):

Every segment of the output has a correspondent in the input (no epenthesis).

The violation of MAX-IO constraint entails removing the properties of the output that are found in the input. On the other hand, DEP-IO constraint specifies that the output corresponds to the input without adding any extra segments to the output properties entailing that there is no epenthesized segment or feature. Overall, OT analyses are constructed out of:

- Constraints that ban certain output configurations (markedness constraints).
- Constraints that require identity in input-output mappings (faithfulness constraints).

Before proceeding to the analysis, it is necessary to notice that McCarthy (2008) states that “Descriptive Generalization mediates between the data and the analysis” (p. 20). He also mentions, "Good descriptive generalizations are accurate characterizations of the systematic patterns that can be observed in the data” (p. 20). Descriptive generalizations of the phonological processes that are considered in this study are presented in the next section.

To summarize, this section is concerned with providing an overview of the theoretical framework adopted in the present study (Optimality Theory OT). As this framework is based on constraints interaction to produce the true output, the discussion of markedness and faithfulness constraints is provided above. The next section will present the main findings of the phonological processes that are under investigation in this study along with representative examples of each process.

Findings of the Phonological Adaptation Processes

As this study is concerned with the phonological adaptation of English loanwords into Najdi Arabic, I mainly depended on three sources; one of which is an etymological dictionary that includes a list of 800 loanwords adapted into colloquial Arabic (Al-Obodi, 2006). The other sources include corpora established by Alhoody (2019) and Aloufi (2016). In addition to this, I included my collection of loanwords as a native speaker of NA in which I particularly added the most recent loanwords adapted into NA. The primary transcriber of the data is the author who is a native speaker of the Central Najdi dialect. The transcription is provided to two other assessors, who are also native speakers of the same dialect, to avoid bias. As for English loanwords, IPA transcription is adapted from Cambridge Dictionary (2024). Syllabification and stress assignment of English loanwords are also taken directly from this dictionary. The rationale behind using this dictionary in particular is because it follows ‘Maximal Onsets Principle’ to divide multi-syllable words which will help in the evaluation of the segmental adaptation in OT latter in this study.

The data used in this study are divided below according to the alternation from English forms to NA forms. Further instances of each phonological process can be traced in the appendices. The phonological processes are listed below as follows: epenthesis, vowel lengthening, and vowel shortening.

Epenthesis

Table 2

Examples of Epenthesis Process

English Words	English Transcription	NA Transcription
Action	['æk.ʃən]	['ʔak.ʃɪn]
Orbit	['ɔ:r.bit]	['ʔo:r.bit]
Street	[stri:t]	[ʔis.ti'ri:t]
Express	[ɪk'spres]	[ʔik'sib.ris]

It can be seen in Table 2 that NA syllables must have an onset. The obligatory status of onset in NA grammar makes onsetless syllables banned in this dialect. In the adaptation of English words that begin with an onsetless syllable, a glottal stop is inserted to fix this banned structure.

Furthermore, it can be inferred from the above examples that clusters of more than two consonants such as street are banned in this dialect. To repair this disallowed form, a vowel is epenthesized. Indeed, this vowel is preceded by a glottal stop to avoid onsetless syllables. Further explanations for this insertion strategy are provided in the next section.

Another potential instance of epenthesis observed in the data is inserting a mora in the vowel-lengthening process. The following table includes representative examples of this process.

Vowel Lengthening

Table 3

Examples of Vowel Lengthening Process

English Words	English Transcription	NA Transcription
Toffee	['tɒf.i]	['tu:.fi]
Amazon	['æm.ə.zən]	[ʔa.ma'zo:n]

It can be noticed in the above table that foreign vowels such as /ɒ/ and / ə/ are not tolerated in NA. A strategy adopted by NA speakers when these foreign vowels occur in closed syllables is to substitute them with native long vowels. Lengthening the vowel has other purposes as well. For instance, the foreign vowel /ɒ / in toffee is replaced by a native long vowel /u:/ to repair an illicit syllable structure: ['tɒf.i] CVC.V □ ['tu:.fi] CVV.CV. Further, schwa sound in the final syllable of amazon is replaced by the native long vowel /o:/ to make the word entirely parsed into feet (LL)(H) instead of leaving the final syllable unparsed as in the source word (LL)L. A further clarification of these instances will be provided in subsection (5.2).

Intriguingly, these lengthened vowels are in closed syllables. It can be said that, thus, Arabic adapted forms should not have a foreign vowel. Otherwise, a native vowel is replaced

by this foreign element. The replaced vowel is lengthened except in an open syllable.

It is significant in this regard to clarify that this process is attributed to the differences in vowel quality between NA and English. The discussion of vowel quality is beyond the scope of this study, so I only investigate how it affects the adapted form to be in the desired shape in NA.

In contrast to this process, foreign vowels can be shortened in the course of the adaptation. Consider the table below which includes representative examples of vowel shortening:

Vowel Shortening

Table 4

Examples of Vowel Shortening Process

English Words	English Transcription	NA Transcription
Veto	[ˈvi:.təʊ]	[ˈfi:.tu]
Mascara	[mæsˈkɑ:.rə]	[ˈmas.ka.ra]

Table 4 demonstrates that vowel shortening in the course of the adaption targets foreign bimoraic vowels (either a diphthong or a long vowel) in the environment of open syllables. For example, the diphthong /əʊ/ in the second open syllable of veto is shortened to /u/. To describe this change, it can be said that the adapted forms into Arabic should not have a foreign (bimoraic) vowel in an open syllable. Otherwise, a native vowel (monomoraic) is replaced by this foreign element, and this requirement is enforced by vowel shortening. In fact, the bimoraic diphthong in the source English form has undergone shortening. There are some motivating factors for this process, among which is the avoidance of an unstressed heavy syllable of the form CVV as in the first example: [ˈvi:.təʊ]. Other factors, such as syllabification requirements and foot well-formedness, will be discussed in the next section.

To summarize, this section presented data of phonological adaptation of English loanwords into NA. It was observed that NA grammar requires epenthesis segments for multiple functions, like repairing onsetless syllables and avoiding disallowed consonant clusters. A further explanation for these processes is provided in the following section.

Discussion

This subsection presents an Optimality-Theoretic account of the phonological adaptation processes that are under investigation in this study. Epenthesis, vowel lengthening, and vowel shortening are described in light of the interaction between markedness and faithfulness constraints. The following is an OT analysis and discussion to account for the phonological processes revealed in the adaptation of English loanwords into NA.

Epenthesis

Epenthesis in loanwords is driven by syllable structure and syllabification requirements. As illustrated earlier (in subsection 2.3.1), NA syllables must have onsets, so

onsetless loanwords are repaired by inserting a glottal stop in the adaptation to avoid this banned structure. This requirement of inserting a consonant is enforced by the markedness constraint ONSET, which dominates the faithfulness constraint DEP-IO.

Assuming that constraints are ranked in terms of importance, and since onsetless syllables are not permitted in NA, the universal constraint ONSET is undominated in NA grammar.

Tableau 1

ONSET >> DEP-IO

Input: /æk.fən/	ONSET	Dep-IO
a. [ʔak.fɪn]		*
b. [ak.fɪn]	*!	

The first candidate, which is optimal, satisfies the highly ranked constraint ONSET that requires syllables to have onsets. However, it minimally violates DEP-IO because a glottal stop is epenthesized in the first syllable, which does not have a correspondent in the input. This violation of a lower-ranking constraint (DEP-IO) allows the requirements of a higher-ranking constraint to be met (ONSET). The second candidate violates the highly ranked constraint ONSET because the first syllable is onsetless which is a fatal violation. Although it satisfies DEP-IO as all input segments have correspondents in the output, it does not result in the desired syllable shape. If the ranking of ONSET and DEP-IO is switched, candidate (b) will be favored. Yet, it is not an acceptable form in NA which avoids onsetless syllables. Consequently, NA speakers tend to make the English words sound Arabic-like where they favor the candidate that goes in line with NA syllable structure.

In addition to this ranking, we need to consider another potential candidate that satisfies ONSET, but violates the faithfulness constraint MAX-IO.

Consider the following tableau:

Tableau 2

ONSET >> MAX-IO >> DEP-IO

Input: /æk.fən/	ONSET	MAX-IO	Dep-IO
a. [ʔak.fɪn]			*
b. [ak.fɪn]	*!		
c. [kɪn]		*!	

Although candidate (c) satisfies the highly ranked constraint ONSET, this tableau demonstrates that this candidate, in which the vowel /æ/ is deleted, fatally violates MAX-IO. Candidate (a) is the optimal candidate due to its violation of a lower ranked constraint DEP-IO in favor of satisfying high ranked constraints: ONSET and MAX-IO to produce the true output.

The insertion of a glottal stop in NA in initial position is of a great importance. It functions as a repairing strategy to avoid onsetless syllables in the language. Abu- Mansour

(1987) states that a glottal stop is available in the onset position to avoid onsetless syllables in most modern Arabic dialects. Consider the following examples which are adopted from Alqahtani (2014, p.11):

- a. /ʔakil/ → [ʔakil] ‘food’ cf. *[akil]
- b. /ʔa.mar.na/ → [ʔa.mar.na] ‘we ordered’ cf. *[a.mar.na]

Furthermore, it has been discussed earlier in the syllabification of NA that complex onsets are tolerated where bi-consonantal clusters in initial positions are allowed. However, clusters of more than two consonants are prohibited in this dialect. Therefore, epenthesis is motivated to meet the requirements of NA syllable shape.

In the course of the adaptation, adapted words should have onsets of no more than two consonants. Vowels are epenthesized to break the cluster of more than two consonants. For example, the triconsonantal English word street /'stri:t/ is adapted into NA as [ʔis.ti.'ri:t]. The interaction of multiple constraints enforces epenthesis here. The analysis of this loanword will be developed in the following tableaux:

Tableau 3

ONSET >> MAX-IO >> DEP-IO

Input: /'stri:t/	ONSET	MAX-IO	DEP-IO
a. [is.'tri:t]	*!		*
b. ['tri:t]		*!	

Both potential candidates in the above tableau violate the highly ranked constraints fatally: ONSET and MAX-IO. Although the first candidate epenthesized a vowel to break the cluster, it resulted in an onsetless syllable which is a fatal violation. Therefore, to produce the optimal candidate, another segment should be inserted to repair the onsetless syllable which is predictably the glottal stop. Consider the following tableau:

Tableau 4

ONSET >> MAX-IO >> DEP-IO

Input: /'stri:t/	ONSET	MAX-IO	DEP-IO
a. [is.'tri:t]	*!		*
b. ['tri:t]		*!	
c. [ʔis.'tri:t]			**

The above tableau could not discriminate any candidate as optimal. Although inserting a glottal stop in (c) produces a candidate that satisfies the highly ranked constraints ONSET and MAX-IO, this is still not the true output. According to Alghmaiz (2013), a glottal stop with a prosthetic vowel /i/ is inserted in some forms to avoid both initial consonant clusters and onsetless syllables. For example, /staktab/ □ [ʔis.tak.tab] ‘caused to write’. However, candidate (c) fails to be optimal because it has a syllable with a complex onset in word-final position. In fact, it is mentioned earlier in the distribution of NA syllables that CCVVC syllable form is

found in initial positions only. The markedness constraint *COMPLEXONSET is suggested to evaluate this candidate and consequently rule it out.

*COMPLEXONSET (Prince & Smolensky, 1993, 2004):

Syllables must not have more than one segment in the onset.

Note that the creation of initial bi-consonantal clusters in NA primarily results from the deletion of an unstressed high short vowel in an open syllable as illustrated by Alqahtani (2014). Consider this native word from NA: [ba.ga.ra] 'cow' □ [bga.ra]. The suggested ranking of *COMPLEXONSET in the grammar of NA is to be outranked by MAX-IO to allow this formation of complex onsets in initial positions. See Alqahtani (2014, p. 120 – 145) for further clarification on how complex onsets in initial position are created in NA.

A faithful output to the input street will also be ruled out by this constraint:

*COMPLEXONSET. The evaluation of these potential candidates is presented below:

Tableau 5

*ONSET >> MAX-IO >> *COMPLEXONSET >> DEP-IO*

Input: /'stri:t/	ONSET	MAX-IO	*COMPLEXONSET	DEP-IO
a. [is.'tri:t]	*!		*	*
b. ['tri:t]		*!	*	
c. [ʔis.'tri:t]			*!	**
d. ['stri:t]			*!	

None of these candidates is the true output of the word street as adapted into NA. Each of them incurs a violation of at least one syllable structure constraint. Candidate

(a) is onsetless, and candidate (d) has a triconsonantal cluster. As for the candidates

(b) and (c), they are excluded due to violating highly ranked constraints: MAX-IO and

*COMPLEXONSET. Therefore, inserting another vowel is motivated to repair the syllable shape. Consider the following tableau.

Tableau 6

*ONSET >> MAX-IO >> *COMPLEXONSET >> O-CONTIG >> DEP-IO*

Input: /'stri:t/	ONSET	MAX-IO	*COMPLEXONSET	O-CONTIG	DEP-IO
a. [is.'tri:t]	*!		*		*
b. ['tri:t]		*!	*		
c. [ʔis.'tri:t]			*!		**
d. ['stri:t]			*!		
e. [ʔis.ti.'ri:t]				*!	***
f. [sit.ri:t]				*!	*

Inserting a vowel produces the potential outputs (e) and (f) that align with NA syllabification requirements since they do not have a complex onset in an illicit distribution. In other words, they do not violate the highly ranked constraint:

*COMPLEXONSET. Nevertheless, they fatally violate the markedness constraint O-CONTIGUITY that disallows internal epenthesis:

O-CONTIG (CONTIGUITY-IO) (“No Insertion”) (McCarthy & Prince, 1995): The portion of S2 standing in correspondence forms a contiguous string. However, candidate (e) is more harmonic than (f) because it satisfies the markedness constraint SYLLABLE CONTACT that helps indicate the epenthetic vowel's preferred position.

SYLLABLE CONTACT (SYLLCON) (Bat El, 1996):

The onset of a syllable must be less sonorous than the last segment in the immediately preceding syllable, and the greater the slope in sonority the better.

Tableau 7

ONSET >> *SYLLCON* >> *MAX-IO* >> **COMPLEXONSET* >> *O-CONTIG* >> *DEP-IO*

Input: /'stri:t/	ONSET	SYLLCON	MAX-IO	*COMPLEXONSET	O-CONTIG	DEP-IO
a. [is.'tri:t]	*!			*		*
b. ['tri:t]			*!	*		
c. [ʔis.'tri:t]				*!		**
d. ['stri:t]				*!		
e. [Ⓢ] [ʔis.ti.'ri:t]					*	***
f. [sit.ri:t]		*!			*	*

The final ranking in the above tableau successfully chooses candidate (e) as the optimal candidate which satisfies SYLLCON constraint. Candidate (f) is eliminated because sonority is raised across the syllable boundary where /r/, as a liquid, is more sonorous than /t/ as a plosive.

Vowel Lengthening

Another instance of epenthesis in the adaptation of loanwords is demonstrated in vowel lengthening. This is illustrated in inserting a mora in violation of DEP-μ-IO to produce the true output.

DEP-μ-IO (McCarthy & Prince, 1995):

Every mora in S1 has a correspondent in S2.

The motivation behind this type of epenthesis could be attributed to the requirements of syllable structure in NA. Consider the structure of the English word *toffee* CVC.V ['tɒf.i]. the second syllable shape is disallowed in NA. Therefore, lengthening the first vowel is a

strategy adopted by NA speakers which leads to resyllabifying the word into a desired shape in NA, CVV.CV [ˈtu:.fi].

Thus, CVV.CV is more harmonious in NA than CVC.V. Consider the following analysis:

Tableau 8

ONSET >> *MAX-μ-IO* >> *DEP-μ-IO*

Input: [ˈtɒf.i]	ONSET	MAX-μ-IO	DEP-μ-IO
a. ^{ɪəp} [ˈtu:.fi]			*
b. [ˈtuf.i]	*!		
c. [ˈtuf]		*!	

A faithful candidate to the input (b) is ruled out due to the lack of onset in the second syllable. Although candidate (c) satisfies the highly ranked constraint ONSET, it is also ruled out due to violating MAX-μ-IO. The true output in (a) that minimally violates DEP- μ-IO is optimal due to satisfying the highly ranked constraints: ONSET and MAX- μ-IO. Overall, epenthesizing a mora repaired the adapted word's syllable structure to align with NA syllabification requirement.

It is worth mentioning in this regard that the adaptation of the English vowel /ɒ/ into NA is mapped into either the short vowel [u], for example /ˈlæp.tɒp/ [ˈla:b.tub], or the long vowel [u:] as in /ˈtɒf.i/ □ [ˈtu:.fi]. However, these different adaptation patterns are influenced by the distribution of stress. As indicated by Alhoody (2019) "if the adapted form ends in an open syllable, this open syllable cannot receive stress as stress does not occur finally unless the last syllable is heavy. Therefore, stress moves to the penultimate syllable." (p. 120). He further illustrated that "since the tendency of stress in the adapted forms of the English loanwords occurs on heavy syllables, the nucleus of the penultimate syllable is lengthened in order to constitute a bimoraic syllable." Clearly, this justifies the elimination of a potential form with a short vowel [ˈtu:.fi] which is not attested in NA. The vowel /ɒ/ in *toffee* is predictably lengthened to increase the weight of the syllable and, hence, assign stress to a heavy syllable. As indicated by Kager 1999, there is a match between the syllable weight and prominence (p. 155). So, the attraction of stress is more associated to heavy syllables than light syllables where heavy syllables are given priority in stress assignment. Hence, [ˈtu:.fi] is more harmonic than [ˈtu:.fi] in NA grammar. Based on the stress algorithm mentioned earlier (see subsection 2.3.2), as stress in quantity-sensitive languages, like NA, is received by heavy syllables, the high ranking of WSP constraint in the grammar of NA favors the candidate with a heavy syllable [ˈtu:.fi].

Another motivation behind this type of epenthesis (vowel lengthening) could be

attributed to what Kager (1999) mentioned in regard to foot well-formedness. He mentioned that "another important issue in quantity-sensitivity is its relationship with processes of epenthesis (or lengthening) and deletion (or shortening). It has been argued in the metrical literature that such processes may achieve metrical targets, for example ideally shaped feet" (Kager, 1999, p.175). Based on this assumption, the English source form *amazon* ['æm.ə.zən] is adapted into NA, which is a quantity sensitive dialect, as [ʔa.ma'zu:n] where the vowel in the final syllable is lengthened. This output goes in line with the ideal foot shape in NA, (LL)(H), which is potentially the incentive behind the vowel lengthening. Compare this to a three-light-syllable output: [ʔa.ma.zon]. This foot shape ('LL) L will leave the final syllable unparsed while the output [ʔa.ma 'zo:n] with vowel lengthening achieves (LL) (H). Note that, the final syllable in [ʔa.ma.zon] is treated as light syllable due to achieving the requirements of extrametricality which will be addressed in section (5.3). Further, as indicated in syllable distribution in NA earlier, CVC syllable form is only considered heavy in non-final position. Hence, for the sake of exhaustive parsing, mora epenthesis is prosodically motivated. This is to achieve metrical coherence. Consider the following tableau:

Tableau 9

ONSET >> PARSE-SYL >> DEP-μ-IO, DEP-IO

Input: ['æm.ə.zən]	ONSET	PARSE-SYL	DEP-μ-IO	DEP-IO
a. [ʔa.ma]('zo:n)]			*	*
b. [('ʔa.ma)zon]		*!		*
c. [('æm.ə)zon]	*!*	*		

Candidate (c) which is faithful to the input is ruled out due to having onsetless syllables. Moreover, candidate (b) is also ruled out because the final syllable is unfooted in a fatal violation of PARSE-SYL constraint. The first candidate (a) is optimal, satisfying the highly ranked constraints: ONSET and PARSE-SYL.

Conversely, vowels can be shortened in the course of the adaptation for the same purposes: reshaping the word according to NA syllable structure and achieving ideal foot shape. The following section provides an analysis of vowel shortening in loanwords.

Vowel Shortening

Regarding meeting the syllabification requirements of NA grammar, it was mentioned earlier in the discussion of CVV syllable form that it never appears word finally in NA. Alqahtani (2014) mentioned that [CVV] syllable form is exclusive to word initial and word medial positions since it appears as a heavy syllable only in these two positions. Hence, the English loanword *veto* ['vi:təʊ] □ CVV.CVV is adapted into NA as ['fi:tu] □ CVV.CV to avoid a disallowed syllable distribution. CV syllable form, on the other hand, is distributed freely in NA. Thus, deleting a mora from the final syllable results in a correct syllable

distribution: CV in final position. According to Alqahtani (2014), this process of shortening a long vowel in an unstressed heavy syllable (CVV) is motivated by the markedness constraint WSP which requires heavy syllables to be stressed.

WSP (Prince & Smolensky 1993, 2004):

Heavy syllables attract stress. Consider the following analysis:

Tableau 10

WSP >> MAX- μ -IO

Input: ['vi:.təʊ]	WSP	MAX- μ -IO
a. ɪ ['fi:.tu]		*
b. ['fi:.tu:]	*!	

In this tableau, Satisfying WSP, which is highly ranked, is at the expense of violating MAX- μ -IO. This results in optimizing candidate (a). On the other hand, candidate (b), which preserves the number of moras in the input, is eliminated due to fatally violating WSP where the final heavy syllable is unstressed.

This behavior of vowel shortening is attested in NA where a native word such as ['ham.ra:] "red" undergoes vowel shortening ['ham.ra] to comply with WSP constraint that is against unstressed heavy syllables. A further explanation about vowel shortening in this source NA word can be found in Alqahtani, 2014. Further, vowel shortening also involves changing the foot to the ideal shape.

Consider the adaptation on the English loanwords mascara [mæs.'kɑ:.rə]. A potential faithful candidate that maintain the vowel length will leave the final syllable unparsed: [mas.'kɑ:.ra] (H)(H)L. However, a candidate that shortens the vowel in the second syllable will result in having all syllables parsed into feet: ['mas.ka.ra] ('H)(LL). For the sake of exhaustive parsing, mora deletion is prosodically motivated, and achieves metrical coherence. Consider the following evaluation:

Tableau 11

PARSE-SYL >> MAX- μ -IO

Input: /mæs.'kɑ:.rə/	PARSE-SYL	MAX- μ -IO
a. [('mas)(ka.ra)]		*
b. [(mas)('kɑ:.ra)]	*!	

In this tableau, the first candidate is optimal due to satisfying the highly ranked constraint PARSE-SYL which requires all syllables to be parsed into feet. This satisfaction is at the cost of violating MAX- μ -IO where a mora is deleted from the second syllable. Candidate (b) which is faithful to the input, however, violates the constraint PARSE-SYL and, therefore, it is ruled out.

Conclusion

This study was concerned with the phonological adaptation of English loanwords into Najdi Arabic. It was observed in the data set that certain processes such as epenthesis, vowel

lengthening, and vowel shortening are used to modify the English loanword to end up with a harmonious word that goes in line with NA phonological system. To examine these processes, I utilized the Optimality Theory framework to account for the data and address the main research questions. As for epenthesis, it appears in this study as a strategy for repairing the disallowed onsetless syllables in English loanwords such as *action* [æk.fən] □ [ʔak.fɪn]. A glottal stop is epenthesized to adapt this form into Najdi Arabic. Further, as NA does not permit tri-consonantal clusters, epenthesis is used to break this cluster by inserting the high vowel /i/. If necessary, the insertion of a glottal stop is motivated in this regard to fix onsetless syllables whenever they occur. The constraint ranking considered in evaluating the potential candidates for this process is: ONSET >> SYLLCON >> MAX-IO >> *COMPLEXONSET >> O-CONTIG >> DEP-IO. Hence, in the course of the analysis, epenthesis is seen to be motivated by the requirements of syllable structure in NA.

Vowel lengthening is another process that is motivated by the requirements of syllable shape in NA. A mora is epenthesized to produce a form that is harmonious with NA syllable structure and distribution. For instance, the English loanword *toffee* □ CVC.V ['tɒf.i] has a disallowed final syllable in NA grammar. Therefore, lengthening the first vowel is a strategy adopted by NA speakers which leads to resyllabifying the word into a desired shape in NA, CVV.CV ['tu:.fi]. In addition to this, the significance of parsing all syllables by feet is an incentive behind vowel lengthening in words such as *amazon* ['æm.ə.zən]. A faithful candidate would result in an unparsed final syllable (LL)L whereas a candidate with the vowel lengthened would have all syllables footed [(ʔa.ma)('zo:n)] □ (LL)(H). For the sake of exhaustive parsing, therefore, vowel lengthening is motivated. As the interaction between markedness constraints and faithfulness constraints produces the optimal candidate, the constraint ranking considered in evaluating the potential candidates for this process is: ONSET >> PARSE-SYL >> MAX-μ-IO >> DEP-μ-IO, DEP-IO.

In contrast, for the same above purposes, vowel shortening is motivated in adapting certain English loanwords into NA such as the word *veto* ['vi:.təʊ] □ CVV.CVV. This syllable type (CVV) only appears as heavy in initial and medial positions in NA. Thus, the word is adapted into NA as ['fi:.tu] □ CVV.CV to avoid a disallowed syllable distribution. CV syllable form, on the other hand, is distributed freely in NA. Hence, deleting a mora from the final syllable results in a correct syllable distribution: CV in final position. The vowel shortening here is enforced by the markedness constraint WSP which is against unstressed heavy syllables. In addition to this, the significance of parsing all syllables by feet is an incentive behind vowel shortening in words such as *mascara* [mæs'kɑ:.rə] which is adapted into NA as ['mas.ka.ra]. Hence, vowel shortening helps parse all syllables by feet in this example. Full analysis of this example can be found in the discussion section. The constraint ranking considered in evaluating the potential candidates for this process is: WSP >> PARSE-SYL >> MAX-μ-IO. In summary, the concluding hierarchy of grammatical rules applied in this analysis is organized as follows: The paramount principle is ONSET, followed by SYLLCON, and then WSP. The ranking continues with PARSE-SYL followed by MAX-IO and MAX-μ-IO. The sequence proceeds with *COMPLEXONSET and O-CONTIG, concluding with DEP-μ-IO, and DEP-IO. This structure reflects the grammatical framework prioritized in the study's evaluation.

To conclude, this study provided a phonological investigation of the data through a constraint-based analysis to account for the phonological adaptation processes discussed

earlier. OT framework was sufficient to produce the true outputs used by NA speakers. Overall, this paper was meant to contribute to the study of loanwords by providing a phonological investigation of the adaptation processes of English loanwords into NA.

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Appendix A
Epenthesis

English Words	English Transcription	NA Transcription
Acid	['æ.s.ɪd]	[ʔa.'si:d]
Album	['æ.l.bəm]	[ʔal.'bu:m]
Amazon	[ʔa.ma.'zo:n]	['æm.ə.zən]
Airbag	['eə.bæg]	[ʔir.'ba:g]
April	['eɪ.prəl]	[ʔab'ri:l]
Aspirin	['æs.prɪn]	[ʔas.bi'ri:n]
Action	['æk.ʃən]	['ʔak.ʃɪn]
Orbit	['ɔ:r.bɪt]	['ʔo:r.bit]
Street	[stri:t]	[ʔis.ti'ri:t]
Express	[ɪk'spres]	[ʔɪk'sib.rɪs]

Appendix B
Vowel Lengthening

English Words	English Transcription	NA Transcription
Toffee	[ˈtɒf.i]	[ˈtuː.fi]
Amazon	[ˈæm.ə.zən]	[ʔa.maˈzoːn]
Airbag	[ˈeə.bæɡ]	[ʔir.ˈbaːɡ]
Album	[ˈæɫ.bəm]	[ʔal.ˈbuːm]
Classic	[ˈklæs.ɪk]	[klaˈsiː.ki]
Batman	[ˈbæt.mən]	[bat.ˈmaːn]
Orchid	[ˈɔːr.kɪd]	[ʔoːr.ˈkiːd]
Note	[nəʊt]	[nuːt]
Van	[væn]	[faːn]

Appendix C
Vowel Shortening

English Words	English Transcription	NA Transcription
Veto	['vi:təʊ]	['fi:tu]
Mascara	[mæs'kɑ:.rə]	['mas.ka.ra]
Bravo	[brɑ:'vəʊ]	['bra.fu]

Appendix D
NA Consonants

This table is adapted from Alqahtani (2014, p. 5).

	Bilabial	Labio-dental	Dentals	Emphatic interdental	Alveolar	Emphatic alveolar	Alveo-palatal	Palatal	Velar	Uvular	Pharyngeal	glottal
Plosive	b				t d	tʕ			k ɡ	q		ʔ
Fricative		f	θ ð	ðʕ	s z	sʕ	ʃ			χ ʁ	ħ ʕ	h
Affricate			ts dz				ɟʒ					
Nasals	m				n							
Lateral					l							
Flap					r							
Glides	w							j				

Appendix E
NA Vowels

This table is adapted from Alqahtani (2014, p. 19).

Short	Long
i	i:
a	a:
u	u:
-	e:
-	o: