

An Alternative Account of English Consonant Cluster Adaptations in Bengali Dialects*

Chin-Wan Chung
(Chonbuk National University)

Chung, Chin-Wan. (2019). An alternative account of English consonant cluster adaptations in Bengali dialects. *The Linguistic Association of Korea Journal*, 27(3), 99–123. This study provides a constraint-based analysis of cluster adaptations occurring in Bengali dialects such as spoken Bengali, Dhaka, and Sylheti when English complex words are realized by Bengali speakers or borrowed into Bengali. In spoken Bengali, speakers only employ epenthetic strategy when they realize onset clusters of English. For the selection of vowels, the neutral vowel of English is generally inserted between consonants but the high front vowel is prothesized when a cluster is composed of /s/ plus a voiceless stop. In Dhaka dialect, coda clusters are fixed by either insertion or deletion. Unlike spoken Bengali, the inserted vowel between sonorant consonants is affected by a neighboring vowel. Deletion of an obstruent normally occurs when a cluster consists of a sonorant plus an obstruent but an obstruent survives if a sonorant is dental liquid /r/ in Dhaka. Onset cluster adaptations in Sylheti is similar to that of spoken Bengali but one difference between the two dialects is that an interconsonantly inserted vowel is affected by a following vowel in Sylheti while spoken Bengali still maintains the quality of a neutral vowel. (Chonbuk National University)

Key Words: consonant clusters, adaptations, insertion, deletion, repair strategy

1. Introduction

* This research was supported by “Research Base Construction Fund Support Program” funded by Chonbuk National University in 2019. I am thankful to anonymous reviewers for their insightful comments. Any remaining errors are my own responsibility.

When a language borrows words from a foreign language, borrowed words are subject to be affected by a recipient language in every aspect of linguistics. One of the most prominent aspects in linguistic changes in borrowed words is observed in phonology (Hyman, 1970; Holden, 1976; Kawahara 2008, Kang, 2010, 2011). This is because source words are realized by speakers of recipient language whose phonological system is different from that of the donor language. The differences in phonological elements in both languages are generally mediated by the speakers of recipient language. In addition to this, phonological modifications in borrowed words are subject to further minute changes if the recipient language has different dialects.

Considering this, the current study mainly focuses on the variant consonant cluster modification strategies employed by Bengali dialects when English words with consonant clusters are realized by Bengali speakers or borrowed into Bengali, having undergone adaptation processes. We discuss issues presented in previous studies and find out their problems. For the analysis, the issues to be dealt with in the study are as follows. Firstly, what is the norm that motivates consonant cluster modifications in Bengali even though Standard Colloquial Bengali marginally allows consonant clusters? Secondly, are onset and coda clusters repaired uniformly or are they differently modified? Thirdly, are there any strategic differences in Bengali dialects in changing consonant clusters in borrowed words from English? Fourthly, what are the emerging patterns in consonant cluster adaptations in Bengali dialects?

The study is constructed as follows. Section 2 presents the relevant data of English words borrowed into Bengali and a brief introduction of the language. Section 3 discusses previous studies and points out their problems. Section 4 presents an alternative analysis of English words borrowed into Bengali and it is followed by conclusion and some theoretical implications of the study in section 5.

2. Data Presentation

Bengali is an Indo-Aryan language, which is mainly spoken in West Bengal and Bangladesh (Dasgupta, 2003). Bengali words mainly come from Sanskrit

(Thompson, 2012) which are divided into two groups. The first group is dubbed *tatsame* which is used in Bengala and it has not undergone any modification from Sanskrit. Such words account for about half of the Bengali words. The second group is called *tadbhava* and it is composed of Sanskrit words, which have undergone some changes and have phonologically been modified to conform to Bengali (Kar, 2009; cf. Kang, 2010). On the other hand, the rest of the Bengali lexicon is composed of native Bengali (*deshi*) and foreign words (*bidishi*). Thus, English-borrowed words along with other foreign words such as Hindi, Arabic, Persian, Turkish, and Portuguese belong to *bidishi* stratum in Bengali lexicon.

Concerning phonological information, we first present its vowels and consonants. Bengali has seven vowels as presented in (1).

(1) Vowels (Dimock, Bhattachrji & Chatterjee, 1976; Thompson, 2012)

	front	mid	back
high	i		u
mid	e		o
lower-mid	æ		ɔ
low		a	

The consonants of Bengali are represented in (2) where we follow Dasgupta and Thompson but modify some terms and symbols in representing consonants.

(2) Consonants (Dasgupta, 2003: 358–359; Thompson, 2012: 389)

	labial	dent.	retrof.	pal.	Vel.	Gl.
stops	p, ph	t, th	t̪, t̪h	c, ch	k	
	b, bh	d, dh	ɖ, ɖh	j, jh	g, gh	
nas.	m	n	ɳ	ɲ	ŋ	
liq.		r	ɽ			
lat. liq.		l				
fri.		s	ʃ	f		h

With respect to the syllable structure, Standard Colloquial Bengali marginally allows consonant clusters while native Bengali (*deshi*) does not allow clusters in onset and coda positions.

Based on the simple background information of Bengali, we present some of the English examples that are realized in Bengali. The English examples are divided into three types of Bengali-English words. The first type consists of English words that are spoken by Bengali speakers. The second type is composed of English words that are borrowed into Dhaka dialect of Bengali and such words undergo sound adaptations. The final type represents English words that are borrowed into Sylheti dialect and undergo sound modification processes.

We first present the examples of English words that are realized by Bengali speakers. The examples are from Karim (2010: 28). In the examples, SC. Bengali stands for Standard Colloquial Bengali and S. Bengali for Spoken Bengali realized by Bengali speakers. In S. Bengali, English words with onset clusters seem to undergo modifications while coda clusters are realized as they are in the output because coda clusters are marginally allowed in SC. Bengali.

(3) A. Onset clusters consisting of an obstruent plus a liquid

English	SC. Bengali	S. Bengali	
a. frʌnt	frʌnt	fərʌnt	'front'
b. flæt	flæt	fəlæt	'flat'
c. krim	krim	kərim	'cream'
d. grup	grup	gərup	'group'
e. flɔr	flɔr	fəlɔr	'floor'

B. Clusters consisting of /s/+ voiceless stops

English	SC. Bengali	S. Bengali	
a. speɪfəl	speɪfəl	ispeɪfəl	'special'
b. speɪn	speɪn	ispeɪn	'Spain'
c. steɪfən	steɪfən	isteɪfən	'station'
d. sku:l	sku:l	isku:l	'school'

As presented in (3A), when an onset cluster consists of an obstruent plus a liquid, it is modified by inserting a schwa between the two consonants. This indicates that S. Bengali does not employ deletion strategy to fix an onset cluster of English. Concerning the quality of the inserted vowel, the speakers of Bengali select schwa as an epenthetic vowel to modify the undesirable

English onset clusters.

Compared to (3A), the speakers utilize a different epenthetic position and different vowel in (3B). When an onset cluster is composed of a dental fricative /s/ and a voiceless stop, the Bengali speakers select /i/ as the epenthetic vowel and locate it before the onset cluster. The different quality and location of an epenthetic vowel are interesting in that the speakers of Bengali may regard onset clusters (3A) and (3B) as different so that they select non-identical epenthetic vowels and positions of insertion. Thus, we may attribute such selectional differences found in the Bengali speakers to the composition of the clusters. The possible difference between the two groups of cluster is the sonority sequencing: it rises from C₁ to C₂ in (3A) and it falls in (3B).

On the other hand, medial consonant clusters are allowed in Bengali because they do not form a tautosyllabic cluster since they belong to hetero-syllables as shown by the examples in (4). We put syllable marks for the relevant medial clusters in the following data.

(4) Word-medial clusters

English	SC. Bengali	S. Bengali	
a. əstɒnɪʃ	əs.tɒɪʃ	əs.tɒɪʃ	‘astonish’
b. kəntɪnyu	kən.tɪnyu	kən.tɪnyu	‘continue’
c. mʌndər	mʌn.dər	mʌn.dər	‘Monday’
d. eɪprəl	eɪp.rəl	eɪp.rəl	‘April’

As in (4), word medial clusters that show rising or falling sonority between them are not repaired by the Bengali speakers. This indicates that the target of cluster modification in English words in S. Bengali is limited to tauto-syllabic clusters.

Next, we present cluster modifications in Dhaka, a Bengali dialect, where coda clusters are fixed by either insertion or deletion. The examples are also from Karim (2011: 25–26) and they are presented in (5) and (6).

(5) Insertion in liquid+nasal sequence

English	SC. Bengali	Dhaka	
a. hɔrn	hɔrn	hɔrɔn	‘horn’

b. fɔrm	p ^h ɔrm	p ^h ɔrɔm	'form'
c. fɪlm	fɪlm	fɪlɪm	'film'

When a coda cluster is constituted with a liquid plus a nasal, a vowel is epenthesized between the sonorants. This insertion strategy is similar to that of fixing onset clusters observed in S. Bengali. However, unlike S. Bengali where either a schwa or /i/ is inserted, the inter-consonantly inserted vowel in Dhaka is affected by a vowel in the preceding syllable. Thus, the quality of epenthetic vowel in Dhaka seems to be highly controlled by a neighboring vowel.

In addition to this, deletion of a consonant is also employed in Dhaka. There are three of such types. In the first type, a voiceless stop is deleted in homorganic nasal-stop coda clusters. In the second type, a dental liquid /r/ is deleted when it is followed by an obstruent. In the final type, an obstruent is deleted when it is preceded by dental liquid /l/ as shown by the following examples.

(6) A. Deletion in nasal+obstruent clusters

English	SC. Bengali	Dhaka	
a. bæŋk	baŋk	baŋ	'bank'
b. paʊnd	paʊnd	paun	'pound'
c. pænt	paŋt	pan	'pant'
d. læmp	lamp	lam	'lamp'

B. Deletion in liquid /r/+obstruent clusters

English	SC. Bengali	Dhaka	
a. park	park	pak	'park'
b. tɔɹtʃ	tɔrc	tɔc	'torch'
c. nərv	narb ^h	nab ^h	'nerve'
d. bɔrd	bord	boɔ	'board'
e. ʃərt	sart	saɹt	'shirt'

C. Deletion in liquid /l/+obstruent clusters

English	SC. Bengali	Dhaka	
a. belt	belɹ	bel	'belt'
b. gold	gold	gol	'gold'

The common factor of segmental composition in (6) is that the clusters are composed of a sonorant plus an obstruent. Considering each element in the coda clusters and their realizations in (6), it can be assumed that Dhaka dialect prefers a sonorant coda except for the dental liquid /r/, which reflects non-rhotic feature of British English.

The final set of examples is from Sylheti dialect (Goswami, 2013), which is spoken in the Sylheti district of present Bangladesh. Sylheti dialect shows both similar and different onset cluster modification strategies from those in S. Bengali as shown by the following examples.

(7) Onset clusters consisting of dental /s/ + voiceless stops

English	SC. Bengali	Sylheti	
a. sku:l	sku:l	iskul	'school'
b. steɪʃən	steɪʃən	istɪʃən	'station'
c. spi:d	spi:d	ispid	'speed'
d. sti:l	sti:l	istil	'steel'

When an onset cluster is composed of /s/+voiceless stops, the high front vowel /i/ is inserted before such onset clusters just like what we have observed in S. Bengali. However, unlike S. Bengali where the schwa is inserted between consonants with a rising sonority, the inserted vowel is affected by the vowel in the following syllable. This type of vowel influence is different from S. Bengali while it is similar to the inserted vowel in Dhaka dialect. The inserted vowel between consonants with rising sonority is represented by the examples in (8).

(8) A. /i/ insertion before /i/

English	SC. Bengali	Sylheti	
a. kri:m	kri:m	kirim	'cream'
b. klik	klik	kilik	'click'
c. klip	klip ^h	kilip ^h	'clip'
d. slip	slip ^h	silip ^h	'slip'

B. /e/ insertion before /e/

English	SC. Bengali	Sylheti	
a. dreɪn	dreɪn	dereɪn	'drain'
b. treɪn	treɪn	tereɪn	'train'

c. dres	ɔres	ɔeres	‘dress’
---------	------	-------	---------

C. /o/ insertion before /a/

English	SC. Bengali	Sylheti	
a. gla:s	gla:s	gollas	‘glass’

As presented in (8A–B), the epenthetic vowel seems to be influenced by a vowel in the following syllable, realizing as a vowel with the same tongue position and height feature specifications of the following lexical vowel. Concerning the example in (8C), it is not easy to make a generalization on the vowel change now but there is a certain contextual influence of lexical vowels in Sylheti just like as we have seen in Dhaka.

So far we have presented three sets of English complex words where each dialect shows minute differences in mending onset/coda clusters of English words. What is interesting in the data sets is that when English words with complex onset and coda clusters are realized by Bengali speakers or adapted into Bengali, clusters seem to abide by the syllable structure of native Bengali rather than SC. Bengali. However, the quality of an inserted vowel is either contextually colored or the English neutral vowel is selected in S. Bengali (cf. Uffmann, 2006). Considering background information of Bengali, we present former studies on the modification of the English complex words in Bengali in the next section.

3. Previous Studies

In this section, we review former studies concerning cluster modification of the English words in Bengali and discuss their possible problems. The first former study deals with the cluster realizations of English complex words by Bengali speakers. Framed in Optimality Theory (Prince and Smolensky, 1993, 2004) and Correspondence Theory (McCarthy and Prince, 1995), Karim (2010) provides an analysis of onset cluster of English words realized by the Bengali speakers. Karim points out that the cluster modification strategy varies depending on the composition of cluster constituents as the examples presented

in (3). For the analysis, Karim employs the constraints given in (9) and their ranking in (10).

- (9) a. *CC_{ONS}: No consonant clusters in the onset.
- b. Max-IO: Input segments must have output correspondents (No deletion).
- c. Dep-IO: No epenthesis.
- d. Contiguity-IO: No medial epenthesis or deletion of segment.
- e. Syllable Contact: Sonority must not rise across a syllable boundary (Murray & Venneman, 1983; Gouskova, 2004).

(10) *CC_{ONS} » Syllable Contact, Max-IO » Contiguity-IO » Dep-IO

As reflected in (9) and (10), the motivation of cluster modification in Bengali is implemented by *CC_{ONS}. This undominated constraint indicates that the speakers of Bengali follow the syllable structure of native Bengali, which does not allow complex syllable margins. However, Bengali speakers follows SC. Bengali in the realization of coda clusters. Concerning the landing site of an epenthetic vowel, it hinges on the sonority relation between the consonants. Thus, if sonority rises from C₁ to C₂, a vowel is inserted between the consonants. On the other hand, if there is falling sonority between C₁ and C₂ as shown by the examples in (3B), a vowel is epenthesised before the first consonant. This sonority relation between the consonants is dictated in Syllable Contact. Syllable Contact crucially dominates Contiguity-IO since insertion of a vowel between consonants should be allowed to prevent rising sonority over a syllable boundary, which leads to a violation of Contiguity-IO. The lowest-ranking Dep-IO allows a vowel insertion. The following tables show how the given constraints and their ranking can explain complex English words in Bengali.

(11) i. fr_{ANT} → fə_rANT ‘front’ ii. spɛɪfəl → ispɛɪfəl ‘special’

i. fr _{ANT}	*CC _{ONS}	SylCon	Max	Contig	Dep
ɛʃfə _r ANT				*	*
əf _r ANT		*!			*
f _r ANT	*!				
f _{ANT}			*!	*	
ii. spɛɪfəl					

is.pɛɪ.fəl					*
si.pɛɪ.fəl				*!	*
sɛɪ.fəl	*!				
pɛɪ.fəl			*!		

As represented in (11i) and (11ii), cluster modifications of English complex words in S. Bengali can be explained by the given ranking. However, the analysis is unable to account for the selection of the epenthetic vowel quality. That is, the account does not provide us with a reason why we have two different epenthetic vowels such as /ə/ and /i/ in S. Bengali.

Another problem is that the proposed account should be able to explain the lexical items that have medial clusters. However, the current constraint ranking selects an incorrect output as optimal when applied to the example *April* in (4d).

(12) eɪprəl → eɪprəl ‘April’

eɪprəl	*CC _{ONS}	SylCon	Max	Contig	Dep
eɪ.pɪ.rəl	*!				
ɛɪ.p.rəl		*!			
ɛɪ.p.ə.r.əl				*	*
eɪ.pəl			*!	*	

The second former study also comes from Karim (2011) who deals with the modification of coda clusters in Dhaka. Unlike the S. Bengali, Dhaka dialect does not allow coda clusters. In terms of fixing coda clusters of complex English words, Dhaka dialect employs both insertion and deletion strategies, which are different from what we have observed in the realization of onset clusters by Bengali speakers. The relevant Dhaka examples are given in (6) and Karim (2011: 27–28) proposes the following constraints to account for the data.

- (13) a. *ComplexCoda: Codas are simple.
- b. Anchor-R: Any segment at the right periphery of the output has a correspondent at the right periphery of the input.
- c. Max-IO: Input segments must have output correspondents.
- d. Dep-IO: Output segments must have input correspondents.

- e. Contig C–Stop: An adjacent consonant stop sequence standing in correspondence in the input forms a contiguous string, as does the corresponding portion in the output.
- f. Max–C/V: Do not delete a consonant that is adjacent to a vowel.
- g. Contiguity–IO: The portion of S_1 standing in correspondence forms a contiguous string, as does correspondence portion of S_2 .

Some of the constraints are general but others are somewhat specified so we discuss several specific constraints. Contig C–stop focuses only on the sequence of stop consonants and it only applies if input consonant plus stop sequence and output consonant plus stop sequence stand in correspondence. Max–C/V calls for faithful realization of consonant occurring right after a vowel, which is based on the concept proposed by Côté (2004) who argues that a post–vocalic consonant is affected by vowel transition so that it is perceptually stronger than a consonant occurring farther away from the vowel. Thus, in a sequence of post–vocalic consonants (VC_1C_2), C_1 has a better chance of realization in the output than C_2 .

With respect to ranking of the constraints, Karim proposes two different rankings to explain consonant deletion and vowel insertion. The constraint rankings in (14a) and (14b) represent the ranking for insertion and deletion, respectively.

- (14) a. *ComplexCoda, Max–C/V, Max–IO \gg Contig–IO, Anchor–R, Dep–IO
- b. *ComplexCoda, Max–C/V, Contig C–stop \gg Max–IO, Anchor–R, Dep–IO

The following constraint table illustrates how the constraint (14a) explains insertion of a vowel between segments in coda clusters whose examples are presented in (5). We slightly modified the evaluation of each constraint.

(15) $h\text{ɔ}rn \rightarrow h\text{ɔ}r\text{ɔ}n$ ‘horn’

$h\text{ɔ}rn$	*CC–Coda	Max–C/V	Max	Contig	Anch–R	Dep
$h\text{ɔ}rn$	*!					
$h\text{ɔ}n$		*!	*!	*		
$h\text{ɔ}r$			*!		*	
$h\text{ɔ}r\text{ɔ}n$				*		*

As illustrated in (15), when an English word has a complex coda, such a coda cluster is repaired by inserting a vowel between consonants if two consonants are sonorants. Concerning the deletion of one consonant in coda clusters, the proposed constraint ranking in (14b) can explain such examples in Dhaka.

(16) i. pant → pan ‘pant’ ii. gold → gol ‘gold’

i. pant	*CC-Coda	Max-C/V	ContigC-stop	Max	Anch-R	Dep
pant	*!					
pat		*!		*		
^ɪ pan				*	*	
pa.nat			*!			*
ii. gold						
gold	*!					
god		*!		*		
^ɪ gol				*	*	
go.lod			*!			*

In (16i) and (16ii), *Comp-Coda, Max-C/V, and Contig C-Stop play an important role in the selection of optimal forms. Thus, when a coda cluster consisting of a sonorant plus an obstruent, the final obstruent is not realized in Dhaka. The proposed constraint rankings in (14) seem to account for the coda cluster modification examples of English in Dhaka. However, there are problems in the analysis. The first problem is that the proposed ranking for deletion strategy to repair coda clusters cannot explain the examples with coda clusters consisting of /r/+stops as presented in (6B). This is shown by the following constraint table.

(17) park → pak ‘park’

park	*CC-Coda	Max-C/V	ContigC-stop	Max	Anchor-R	Dep
park	*!					
^ɪ par				*	*	
^ɪ pak		*!		*		
pa.rak			*!			*

The given constraint ranking selects the second candidate as optimal. However the actual optimal form is the third candidate as represented by the constraint

evaluation. Thus, the given constraint selects the incorrect third output form as optimal. Accordingly, the constraint in (14b) cannot account for the examples given in (6B).

The second problem is that the constraint ranking in (14b) is unable to explain examples where an epenthetic vowel occurs after a coda cluster because the given constraint selects two optimal forms as illustrated in (18). Thus, we have to reconsider relevant constraints for the analysis.

(18) gold → gol ‘gold’

gold	*CC-Coda	Max-C/V	ContigC-stop	Max	Anch-R	Dep
gold	*!					
god		*!		*		
gol				*	*	
go.lod			*!			*
gol.do					*	*

The third problem of the account is that the quality of an inserted vowel should be mentioned because there seems to be a regular pattern in the epenthetic vowel. If an epenthetic vowel is not [ɔ] but other vowels in (15) such as the [i] in [hɔrin] or the [u] in [hɔrun], how the given constraints will eliminate candidates with other vowels than [ɔ]. That is, there should a constraint which should control the quality of an epenthetic vowel in Dhaka. The final problem is that there should be one constraint ranking for Dhaka because we are dealing with the modifications of coda clusters in Dhaka whether a repair strategy is insertion or deletion.

The final previous study comes from Goswami (2013) who provides an account of Sylheti onset cluster of Bengali dialect. Goswami proposes the following constraints in (19) and their rankings in (20).

- (19) a. *Complex^{ONS}: Onsets are simple.
 b. Dep-IO: Output segments must have input correspondents.
 c. Max-IO: Input segments must have output correspondents.
 d. Onset: Syllables must have onsets.
 e. Contiguity: Elements adjacent in the input must be adjacent in the output.
 f. Syllable Contact: Sonority must not rise across a syllable boundary.

(20) a. Ranking for sibilant plus stop onsets

*Complex^{ONS}, Syllable Contact, Max-IO, Contiguity » Onset » Dep-IO

b. Ranking for obstruent plus sonorant onsets

*Complex^{ONS}, Syllable Contact, Max-IO, Onset » Contiguity » Dep-IO

The constraint ranking in (20a) can explain the examples in (7) while the one in (20b) can apply to the examples in (8). The two constraint rankings are used in the following tables. The example in (21ii) is an English example, which we modify slightly from Goswami (2013).

(21) i. steɪfən → ɪstɪfən ‘station’ ii. dres → ɖeres ‘dress’

i. steɪfən	*CC ^{ONS}	SylCon	Max	Contig	Onset	Dep
ɪs.tɪ.fən					*	*
si.tɪ.fən				*!		*
steɪ.fən	*!					
teɪ.fən			*!			
ii. dres	*CC ^{ONS}	SylCon	Max	Onset	Contig	Dep
ɖeres					*	*
ed.res		*!		*!		*
ɖres	*!					
res			*!			

As shown in (21i) and (21ii), the proposed constraint rankings seem to explain English onset cluster modification in Sylheti. However, the analysis should clarify the quality of an epenthetic vowel and how a neighboring vowel affects an epenthetic vowel. In addition to this, the analysis should provide an uniform constraint ranking for Sylheti.

So far we have briefly reviewed previous studies on cluster repair strategies adopted by Bengali dialects. We found out that each study provides its own theoretical analysis but there are some points that should be ironed out in a more detailed analysis. Thus, in the next section, we provide an alternative analysis of each dialect.

4. An Alternative Analysis

In this section, we provide a constraint-based account just like previous researchers but the analysis in this study is different from them in that we provide one constraint ranking for each Bengali dialect. We also compare how each dialect has minute difference in repairing English words with clusters when they are realized by Bengali speakers or borrowed into Bengali dialects. For S. Bengali whose examples are presented in (3) and (4), we propose the following constraints. We adopt some of the constraints from the previous studies.

- (22) a. *Complex-Onset: Onsets are simple.
 b. Max-IO: Every input segment has its correspondent in the output.
 c. Anchor-Left: Input and output have identical left element.
 d. Contiguity-IO: No medial epenthesis or deletion of a segment.
 e. Syllable Contact: Sonority of consonant does not rise across the syllable boundary.
 f. High Front Vowel-s+stop:
 High front vowel /i/ is preferred before a sequence of /s/+stop.
 g. Dep-Vowel: Epenthesis of a vowel in the output is prohibited.

Since English onset clusters are repaired only by insertion of a vowel in S. Bengali, *Complex-Onset and Max-IO must dominate Dep-IO. At the same time, the high-ranking constraints are ranked over Contiguity-IO and Anchor-Left since the former is to be violated if a vowel is inserted between two consonants and the latter violated if the high front vowel is prothesized. High Front Vowel-s+stop constraint is motivated to explain the insertion of /i/ before s+stop sequences. The preference of Coronals plus high vowels is also presented in explaining Lenakel vowel epenthesis where a general epenthetic vowel is [ə] but a high vowel [i] is inserted after coronals such as in /t-n-ak-ol/ → [ti.na.kəl] ‘you (sg.) will do it’ (Kager, 1999: 126). According to Selkirk (1981), Itô (1986), and Lowenstamm and Kaye (1986), an epenthetic segment tend to be ‘minimally marked’ and it is subject to be affected by their contexts. It has also been argued that [i], [i̠], and [ə] are frequently chosen as insertion vowels. Based on this, we propose High Front Vowel-s+stop which specifies that the high front vowel /i/ is preferred before the s+stop sequences in S.

Bengali.

Concerning the site of an epenthetic vowel, it is determined by the sonority relation between onset clusters as argued for by Karim (2010). So a vowel is inserted between onset consonants if there is rising sonority while a vowel is inserted before an onset cluster if there no rising sonority between them. The landing site of an epenthetic vowel is secured by ranking Syllable Contact over Dep-IO for inter-consonantal insertion and prothesis by ranking High Front Vowel-s+stop over Anchor-Left and Dep-IO.

In addition to this, we should consider medial consonant sequences, which are not the target of repair, and the proposed account should explain such examples as well. Thus, a constraint such as Syllable Contact is not highly ranked in the analysis because there is an example where the constraint is violated as in [ɛp.rəl] ‘April.’ Thus, Syllable Contact is a dominant constraint, which is ranked equally with Contiguity in the analysis.

(23) i. fr_{ANT} → fə_rfr_{ANT} ‘front’ ii. sp_{ei}n → is_{pe}n ‘Spain’

i. fr _{ANT}	*CC-Ons	Max	HF	Contig	SylCon	Anch-L	Dep
fr _{ANT}	*!						
ɛ _f fr _{ANT}				*			*
ə _f fr _{ANT}					*	*!	*
fr _{ANT}		*!		*			
ii. sp _{ei} n							
sp _{ei} n	*!						
sə _. pe _i n				*!			*
əs _. pe _i n			*!			*	*
ɛ _s is _. pe _i n						*	*
pe _i n		*!				*	

As shown in (23i) the given constraint selects the second form as optimal where a vowel is inserted between consonants. On the other hand, candidates with prothesis and deletion of a segment are eliminated by violating Anchor-Left and Max-IO, respectively. The optimal form in (23ii) shows that the quality of epenthetic vowel is regulated by the language specific High Front Vowel-s+stop, which edges out the third candidate. The second candidate is suboptimal due to its violation of Contiguity. The ranking in (23) can explain all the examples in (3). Additionally, this constraint ranking also

can be applied to medial sequences of consonants as given in (4).

(24) eɪprəl → eɪprəl ‘April’

eɪprəl	*CC-Ons	Max	HF	Contig	SylCon	Anch-L	Dep
eɪ.prəl	*!						
ɛɪp.rəl					*		
eɪ.pə.rəl				*			*!
eɪ.pəl		*!		*			

Next we provide an analysis of the Dhaka dialect of Bengali where coda clusters of English words are repaired. Dhaka, unlike S. Bengali, does not allow coda clusters and their solution to fix the coda clusters are multi-lateral. This is because both insertion and deletion strategies are employed in the language. For the analysis of coda cluster repair methods in Dhaka, we use the following constraints.

- (25) a. *Complex-Coda: Codas are simple.
 b. *r]_{wd}: Word final [r] is not allowed.
 c. Non-final Vowel: Words do not end in a vowel.
 d. Max-Son(-cont): Input sonorants with [-continuant] are faithfully realized in the output.
 e. Max-Son(+cont): Input sonorants with [+continuant] are faithfully realized in the output.
 f. Son-Coda: Sonorant codas are preferred.
 g. Max-SonSeq: A sequence of sonorants has its correspondents in the output.
 h. Dep-vowel: Output vowels have their correspondents in the input.

For the case where a vowel is inserted between two sonorants as given in (5), Non-final Vowel is ranked high along with *Complex-Coda and Max-SonSeq and they dominate Dep-vowel. This is shown by the following constraint table.

(26) hɔrn → hɔrɔn ‘horn’

hɔrn	*CC-Coda	NFV	Max-SS	Dep
hɔrn	*!			

hɔr.nɔ		*!		*
ɛʰhɔ.rɔn				*
hɔr			*!	
hɔn			*!	

When codas are composed of two sonorants, deletion strategy is not adopted in Dhaka but vowel insertion is employed to separate the coda cluster. It is triggered by *Complex-Coda and the site of an epenthetic vowel is secured by undominated Non-final Vowel over Dep-V. Deletion of sonorant to prevent an output coda cluster is barred by Max-SonSeq in (26).

Unlike sonorant coda clusters, when coda clusters are composed of a sonorant plus an obstruent, deletion of an obstruent is generally selected. However, when a cluster begins with /r/, an obstruent survives in the output instead. In order to make a difference between /r/ and the other sonorants such as /l, m, n, ŋ/, we propose Max-Son(+cont) and Max-Son(-cont). The distinction between the two groups of sonorants is based on Roca & Johnson (1999:110) and Halle & Clements (1983: 33) who argue that the lateral /l/ is [-continuant] so that the second group is characterized as having [-continuant]. By ranking Max-Son(-cont) over Max-Son(+cont), we can explain the deletion of /r/ before an obstruent. As to the prohibition of deleting obstruent when it is preceded by /r/, the markedness constraint *r]_{wd} is ranked very high in the analysis.

To explain the realization of sonorants with the [-cont] feature specification when followed by obstruents, Son-Coda is ranked high, playing a role in the analysis but it is ranked lower than *r]_{wd} in the account. The following constraint table illustrates the deletion of a post-sonorant obstruent.

(27) pant → pan ‘pant’

pant	*CC-Coda	NFV	Son-Coda	Max-Son(-cont)	Dep
pant	*!		*		
pa.nat			*!		*
pan.ta		*!			*
ɛʰpan					
pat			*!	*	

The deletion of [r] before an obstruent in coda is demonstrated by the table

in (28) where ranking Dep-Vowel over Max-Son(+cont) plays an important role. If ranking them were reversed, the second candidate would be optimal.

(28) park → pak ‘park’

park	*CC-Coda	*r] _{wd}	NFV	Son-Coda	Dep	Max-Son(+cont)
park	*!			*		
pa.rak				*	*!	
par.ka			*!		*	
par		*!				
পাক				*		*

As presented in (26), (27), and (28), the given ranking for insertion and deletion strategies employed in Dhaka can explain the modification of complex coda clusters of English words. One thing we should note in this account is that how to explain the selection of an epenthetic vowel in Dhaka. It seems that an epenthetic vowel is influenced by the vowel in the preceding syllable in /hɔrn/ → [hɔrn̩] ‘horn’. Based on this, we propose the following constraint.

(29) a. Agree-Vowel(B/H)

Vowels in adjacent syllables agree in their back and height feature specification.

b. Ident-Vowel: Input and output vowels are identical in their back and height feature specification.

Contextual coloring of an inserted vowel is explained by ranking Ident-Vowel over Agree-Vowel(B/H) as shown in (30). We only include candidates that have to do with the selection of an epenthetic vowel.

(30) film → filim ‘film’

film	*CC-Coda	Id-V	Agr-V	Dep
film	*!			
ফি.লিম				*
ফি.লম			*!	*
ফে.লেম		*!		*

The constraint ranking that can apply to all Dhaka examples is provided in (31).

- (31) *Complex-Coda, *r]_{wd}, Non-final Vowel, Max-SS » Son-Coda,
 Ident-Vowel, » Agree-Vowel(B/H), Max-Son(-cont) » Dep-V »
 Max-Son(+cont)

The final alternative account we provide is about Sylheti, which only employs insertion strategy to repair onset clusters. This is very similar to S. Bengali in many aspects but Sylheti is different from S. Bengali in that its epenthetic vowel, except for prothesis, is contextually affected by a vowel in the following syllable. In this respect, the selection of epenthetic vowel is similar to that of Dhaka. So we adopt some of the constraints used for S. Bengali and Dhaka.

- (32) a. *Complex-Onset: Onsets are simple.
 b. Max-IO: Every input segment has its correspondent in the output.
 c. High Front Vowel-s+stop: High front vowel /i/ is preferred before a sequence of /s/+stop.
 d. Contiguity: No medial epenthesis or deletion of a segment.
 e. Syllable Contact: Sonority of consonant does not rise across the syllable boundary.
 f. Anchor-Left: Input and output have identical left element.
 g. Dep-Vowel: Epenthesis of a vowel in the output is prohibited.
 h. Agree-Vowel(B/H): Vowels in adjacent syllable agree in their back and height feature specification.
 i. Ident-Vowel: Input and output vowels are identical in their back and height feature specification.

Since Sylheti only utilizes epenthetic strategy, Max-IO is undominated along with the trigger of cluster repair, *Complex-Onset, and the contextually markedness constraint High Front Vowel-s+stop. Like S. Bengali, we equally rank Syllable Contact and Contiguity but both of them are ranked lower than the undominated constraints. Anchor-Left and Agree-Vowel(B/H) are ranked equally but they are ranked lower than Syllable Contact. On the other hand,

Ident–Vowel dominates Agree–Vowel (B/H) which enables an input vowel to keep its back and height features. Since Ident–Vowel and Syllable Contact are not in conflict, we rank them equally. The following constraint table illustrates how constraints and their ranking account for onset clusters in Sylheti.

(33) spi:d → ispid ‘speed’

spi:d	*CC-Ons	Max	HF	Contig	Anch-L	Agr-V
spid	*!					
ispid					*	
ospid			*!		*	**
sipid				*!		
sid		*!		*		

When onset cluster begins with /s/ plus a stop, the only landing site of an epenthetic vowel is before the cluster and the quality of a epenthetic vowel is specified by High Front Vowel–s+stop. All the other options adopted by final three candidates are suppressed by HF, Contiguity, and Max–IO constraints, respectively.

For the examples consisting of an obstruent and a sonorant, an epenthetic vowel is placed interconsonantly since prothesis would result in rising sonority between two consonants. At the same time, an epenthetic vowel is affected by a vowel in the following syllable, which is explained by ranking Ident–Vowel over Agree–Vowel(B/H).

(34) i. klik → kilik ‘click’ ii. dres → dres ‘dress’

i. klik	*CC-Ons	Contig	SylCon	Id-V	Anch-L	Agr-V	Dep-V
klik	*!						
iklik			*		*!		*
ku.luk		*		*!			*
ku.lik		*				*!	*
ki.lik		*					*
ii. dres							
dres	*!						
ed.res			*		*!		*
do.res		*				*!	*
de.res		*					*

As illustrated in (34), the quality of an epenthetic vowel is determined by the interaction between Id-V and Agr-V. Concerning the position of the epenthetic vowel, it is led by ranking SylCon over Anch-L in the analysis. The combined constraint ranking for the Sylheti dialect of Bengali is presented in (35).

- (35) *Complex-Onset, Max-IO, High Front Vowel-s+stop » Contiguity,
Syllable Contact, Ident-Vowel » Anchor-Left, Agree-Vowel(B/H) »
Dep-Vowel

So far we have presented three cases of English complex-word realizations in S. Bengali and clusters adaptation in Dhaka and Sylheti. They show some similarities and differences but a common underlying premise all three cases show is that their norm in modifying clusters of English words is based on the syllable structure of native Bengali, which is CVC. In what follows we briefly summarize the study and discuss its implications for phonology.

5. Conclusion and Implications

This study provided a constraint based analysis which explains how complex English words are realized and adapted in Bengali dialects. In S. Bengali, Bengali speakers adopt a vowel insertion strategy to fix onset clusters of English words based on the simple syllable structure of native Bengali. The epenthetic vowel is generally schwa while the high front vowel is selected before /s/+obstruent stop sequences. An interesting aspect of S. Bengali is that the inserted schwa is not subject to be affected by a neighboring vowel. Thus, Bengali speakers fix onset clusters based on their native Bengali syllable structure while they still utilize the least marked vowel of English as an epenthetic segment.

In the Dhaka dialect of Bengali where coda clusters are mended to conform to the simple syllable structure of native Bengali, both segment deletion and insertion strategies are employed. Deletion of a consonant occurs

only with a sonorant plus an obstruent sequence while epenthesis applies to two sonorant sequences. Dhaka is different from S. Bengali in utilizing deletion strategy and an interconsonantal epenthetic vowel is affected by the preceding vowel.

Sylheti, a dialect of Bengali, also adopts only insertion strategy to fix onset clusters like S. Bengali. However, Sylheti deviates from S. Bengali in that its epenthetic vowel is influenced by a vowel in the following syllable in its back and height features. Thus, being influenced by a neighboring lexical vowel of an epenthetic vowel is very much like that of Dhaka even though each dialect focuses only on different sub-syllabic elements such as onset and coda.

From the study, we can draw several implications for phonology. First, asymmetrical strategies are employed in onset and coda clusters. In onset clusters, only epenthetic strategy is used while both insertion and deletion strategies are used in coda clusters. Second, it is interesting to note that the principles of cluster repair depend on the syllable structure of native Bengali in either English word realizations or adaptation of complex English words. Third, there are different degrees of repair in cluster realizations by Bengali speakers and English words borrowing into Bengali (cf. Kang 2010). Fourth, syllable contact is not active in SC. Bengali while it plays an important role in deciding the position of an epenthetic vowel, which is newly emerged in the process of realizations and adaptation of English words into Bengali. This is because syllable contact is not prominent in both English and Bengali.

References

- Côté, M.-H. (2004). Consonant cluster simplification in Quebec French. *Probus*, 16, 151–201.
- Dascupta, P. (2003). Bangala. In G. Cardon & D. Jain (Eds.), *The Indo-Aryan languages* (pp. 386–428). London: Routledge.
- Dimock, E, Bhattacharji, S., & Chatterjee, S. (1976). *Introduction to Bengali: Part 1*, New Delhi, India: Manohar.
- Gouskova, M. (2004). Relational hierarchies in optimality theory: The case of

- syllable contact. *Phonology*, 21, 201–250.
- Goswami, A. (2013). Simplification of CC sequence of loan words in Sylheti Bangala. *Language in India*, 13, 182–192.
- Halle, M. & Clements, G. N. (1983). *Problem book in phonology*. Cambridge, MA: MIT Press.
- Holden, K. (1976). Assimilation of borrowings and phonological productivity. *Language*, 52, 131–147.
- Hyman, L. M. (1970). The role of borrowing in the justification of phonological grammars. *Studies in African Linguistics*, 1, 1–48.
- Itô, J. (1986). *Syllable theory in prosodic phonology*. Doctoral dissertation, University of Massachusetts, Amherst.
- Kager, R. (1999). *Optimality theory*. Cambridge: Cambridge University Press.
- Kang, Y.-J. (2010). Tutorial overview: Suprasegmental adaptation in loanwords. *Lingua*, 120, 2295–2310.
- Kang, Y.-J. (2011). Loanword phonology. In M. van Oostendorp, C. J. Ewen, E. Hume, & K. Rice (Eds.), *The Blackwell companion to phonology Vol. IV* (pp. 2259–2282). Malden, MA: Blackwell Publishing Ltd.
- Kar, S. (2009). *The syllable structure of Bangla in optimality theory and its application to the analysis of verbal inflectional paradigms in distributed morphology*. Unpublished doctoral dissertation, Universität Tübingen, Tübingen, Germany.
- Karim, K. (2010). Vowel epenthesis in Bengali: An optimality theory analysis. *Working Papers of the Linguistic Circle of the University of Victoria*, 20, 26–36.
- Karim, K. (2011). An optimality theoretic (OT) account of word-final vowel epenthesis and deletion in the incorporation of loanwords into the Dhaka dialect of Bangla. *Working Papers of the Linguistic Circle of the University of Victoria*, 21, 22–33.
- Kawahara, S. (2008). Phonetic naturalness and unnaturalness in Japanese loanword phonology. *Journal of East Asian Linguistics*, 17, 317–330.
- Lowenstamm, J., & Kaye, J. (1986). Compensatory lengthening in Tiberian Hebrew. In L. Wetzels & E. Sezer (Eds.), *Studies in compensatory lengthening*, (pp. 97–146). Dordrecht: Foris.
- McCarthy, J. J., & Prince, A. (1995). Faithfulness and reduplicative identity. In J. Beckman, L. W. Dickey, & S. Urbanczyk (Eds.), *University of Massachusetts Occasional Papers in Linguistics*, 18 (pp. 249–348). Amherst, MA: GLSA, University

of Massachusetts.

- Murray, R. & W. Vennemann, T. (1983). Sound change and syllable structure in Germanic phonology. *Language*, 59, 514–528.
- Roca, I., & Johnson, W. (1999). *A course on phonology*. Malden, MA: Blackwell Publishing.
- Prince, A., & Smolensky, P. (1993). *Optimality theory: Constraint interaction generative grammar*. Unpublished manuscript. Rutgers University and University of Colorado, Boulder.
- Prince, A., & Smolensky, P. (2004). *Optimality theory: constraint interaction in generative grammar*. Malden, MA: Blackwell.
- Selkirk, E. O. (1981). Epenthesis and degenerate syllables in Cairene Arabic. *MIT Working Papers in Linguistics*, 3, 209–232.
- Thompson, H.-R. (2012). *Bengali*. Amsterdam: John Benjamins Publishing Company.
- Uffmann, C. (2006). Epenthetic quality in loanwords: Empirical and formal issues. *Lingua*, 116, 1079–1111.

Chung, Chin-Wan

Professor

Department of English Language and Literature

Chonbuk National University

664-14 Duckjin-dong, Duckjin-gu, Jeonju, Korea 561-756

Phone: 82-63-270-3205

Email: atchung@hanmail.net

Received on August 1, 2019

Revised version received on September 26, 2019

Accepted on September 30, 2019