CHAPTER ONE

Introduction

1.0 Background of the Study

Many second language learners aim at acquiring a native-like pronunciation of the target language that they are learning. Some could fulfil this dream, but many could not. The difficulty of acquiring a native-like pronunciation is expected because phonological acquisition is a complex process especially for those whose first language`s phonological system is different from the phonological system of the target language. This is the case where interlanguage develops, when aspects of the first language (henceforth, L1) transfer to the second language (henceforth, L2) in the process of language learning. There are many factors which contribute to such complexity in learning the phonology of a foreign language and hence the development of interlanguage. The two main factors resulting in such difficulty could be the strong influence of the mother tongue and the markedness of the forms learnt along with some other factors like the age of learners, learners` attitudes toward the target language and the methods of learning the language (Brown, 2000). All these factors must be considered in order to understand the reasons leading to the difficulties in acquiring native-like pronunciation.

This thesis discusses the interlanguage errant production demonstrated by the native speakers of Arabic in their pronunciation of English words containing complex coda clusters. The study consists of a constraint-based analysis within the framework of Optimality Theory of the classical Arabic syllable pattern CVCC (Consonant Vowel Consonant Consonant) as well as the interlanguage pronunciation of those Arabic speakers learning English as their L2. These analyses are crucial to investigate the assumption proposed by the Contrastive Analysis Hypothesis (CAH) that speakers

avoid complex structures in speaking an L2 by adopting rules and strategies from their own native language and applying them erroneously in producing L2 structures. In addition, the analysis in the study investigates the assumption proposed by the Markedness Deferential Hypothesis (MDH) that speakers of L2 avoid complex structures in speaking their L2 English because these structures are universally marked forms despite the existence of these complex structures in their own native language (Eckman, 1977). Moreover, the study examines the origin and the choice of simplification strategies used by Arabic speakers when pronouncing the English complex coda clusters within the framework of Optimality Theory.

The following sections explain the key concepts such as the syllable in section 1.1, English vs. Arabic syllable patterns in section 1.2, background of English language system in 1.3, background of Classical Arabic system in 1.4, a review of Optimality Theory in section 1.5, and the background of the study which includes the introductions of interlanguage phonology and hypothesis, CAH and MDH in section 1.6. In addition, section 1.7 presents the objectives of the study, section 1.8 states the research questions that the study tries to answer, section 1.9 clarifies the significance of the study presented, and section 1.10 declares the scope and the limitations of the study, and finally section 1.11 provides the conclusion of this chapter.

1.1 The Syllable

The syllable is considered to be the basic unit of speech which could be analyzed phonetically and phonologically. According to Roach (2000), a syllable can be phonetically described as a structure in which its centre is a loud sound that has "little or no obstruction to airflow", while the adjacent sounds - before and after it- have "greater obstruction to airflow and/or less loud sound" (p.70). An example of a phonetic analysis of syllables is that the word *cat* /kæt/ has a centre sound /æ/ which has little obstruction,

while the adjacent segments /m/ and /t/ have complete obstruction of the airflow because they are plosives. On the other hand, According to Laver (1994), the syllable can be phonologically analyzed as "a complex unit made up of nuclear and marginal elements" (p.114). The nuclear is a vowel segment or a syllabic segment, while the marginal elements are the consonant segments or the non-syllabic segments. An example on a phonological analysis of the syllable is that the word *craft* /kræft/ has nuclear /æ/, which is a vowel segment, while the preceding consonant segments /kr/, and the proceeding consonant segments/ ft/ are the marginal elements.

As stated in Roach (2000), the syllable structure could be presented graphically by means of a tree diagram. In this diagram, the syllable uses the Greek sigma σ which has two immediate constituents or branches: the Onset, which consists of any consonant segments preceding the nuclear element; and the Rhyme, which consists of both the nuclear element and the marginal elements that follow it. In turn, the Rhyme has two branches attached with it such as the Peak, which is also known as the Nucleus and the Coda. The Peak is the nuclear element, while the Coda is the marginal elements that follow it. So the syllable structures of the above examples could be graphically presented in the following figures.

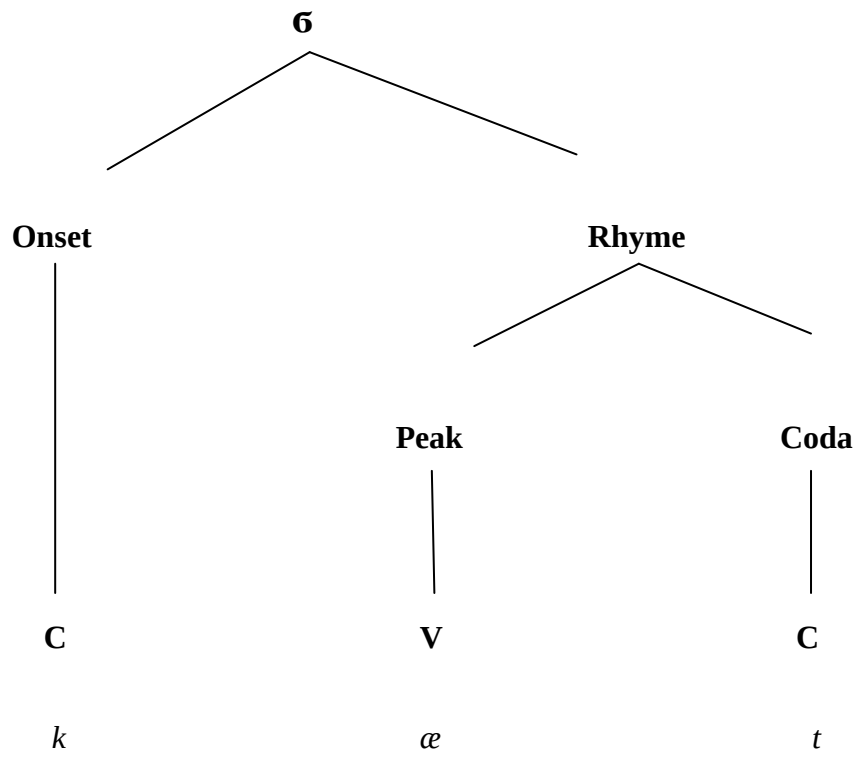

Figure 1.1 The syllable structure of the word *cat*

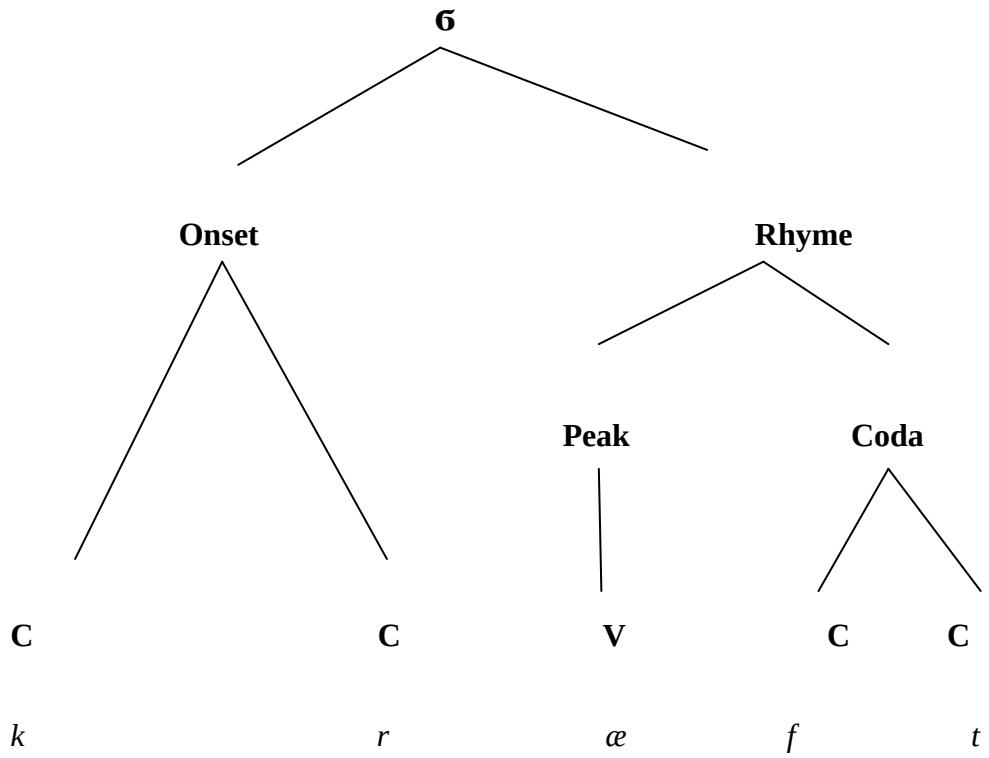

Figure 1.2 The syllable structure for the word *craft*

1. 2 English versus Arabic syllable Patterns

Phonologically, there are differences between English and Arabic. The two languages display two different syllable structures. Unlike English, Arabic does not have a cluster of consonants within a syllable. However, this general rule is not absolute for all phonological environments in the language. It is argued that the CVCC structure is the only syllable pattern that phonetically demonstrates a complex consonant cluster in Arabic, and this pattern results from interactions held between universal constraints (Ryding, 2005). Although this particular type of coda cluster (-CC) exists in Arabic, English coda clusters present difficulty -especially the more complex ones- for English as a Second Language (ESL) learners who try to simplify such structures in many ways. They may produce vowel epenthesis, substitute consonant segment or reduce consonant clusters. OT is therefore used in this study partly to explain the origin and the choice of

simplification strategies employed by those learners on the structure of English coda clusters.

1.3 Background of English Language

English nowadays has many varieties; thus, the number of speech sounds in English varies from one variety to another. Since this thesis concentrates on the varieties of American English, the following section provides an overview of the nature and system of this particular type of English.

General American English (GE), which is also known as Standard American English (SAE), is considered the main accent of American English. Acar (2006) stated that as the standard form of English language, SAE is widely used in national news, formal speeches and American radio broadcasts. SAE is also used in teaching learners of English as a Second Language both in the United States and other regions outside America. Moreover, Acar argued that many Asian countries encourage ESL teachers to use American English as a medium in teaching L2 English to the students.

1.3.1 Standard American English Phonology

- ***The Vowel System of Standard American English***

The vowels in SAE can be presented in the following table.

Table 1.1: The Vowel System in SAE

	Front	Central	Back
Closed	i,ɪ		u
Half-Closed	e		ʊ
Half-closed/half-open		ə,ɚ	o
Half-open	ɛ	ʌ, ɝ	ɔ, ɒ
Open	æ		ɑ

Note:[ɚ] and [ɝ] are often analyzed as sequence of / ər/ and / ʌr/, respectively.

There are five diphthongs, which are:

/a ɪ/, /e ɪ/, /a ʊ/, / ɔ ɪ/ and /o ʊ/ (Watson, 2002).

- ***The Consonant System in Standard American English***

The phonemic inventories for consonants in SAE contains twenty four consonant phonemes (Wells, 1990), which could be represented in the following table.

Table 1.2: The Phonemic Inventory of Consonants in SAE

English	Bilabial	Labio-dental	Dental	Alveolar	Post-alveolar	Palatal	Velar	Glottal
Plosive	p b			t d		k g		
Affricative				ʧ ʤ				
Nasal	m			n			ŋ	
Fricative		f v	θ ð	s z	ʃ ʒ			h
Approximant				ɹ		j	w	
Lateral approximant					l			

1.3.2 English syllable patterns

English has a complex syllable structure as its canonical syllable pattern is usually cited as (C)(C)(C) V (C)(C)(C)(C), which means that onsets and coda are both optional in English language (Wells, 1990).

The full expansion of this complex pattern can be seen in limited numbers of words like:

"strengths" /stɹɛŋkθs/

But it is easier to find words that either begin with three consonants or end with four.

Example:

"Splash" / splaʃ / CCCVC

"Texts" /tɛksts/ CVCCCC

Therefore, English is classified as a complex language.

For coda structure, as stated in Wells (1990), English allows a variety of syllable coda. The following table shows the sequences of consonantal segments which can occur in English coda.

Table 1.3: The Sequences of Consonant Segments in English Coda

Lateral approximant + plosive/ affricate/ fricative/ nasal	/lp/, /ld/, /lk/, /lʃ/, /lf/, /ls/, /lm/, /ln/	Help, bold, milk, plush, golf, else, palm, kiln
Lateral + Two consonants	/lfϴ/, / lpt/ , /lps/ , /lmz/	Twelfth, sculpt, pulps, calms
Rhotic /r/ + Plosive/ affricate/ fricative/ nasal/ lateral	/rp/, /rt/, /rdʒ/, /rtʧ/, /rf/, /rʃ/, /rϴ/, /rn/, /rm/, /rl/	Harp, art, large, arch, dwarf, march, north, porn, arm, snarl.
Rhotic /r/ + Two consonants	/rpt/ , / rmz/, /rts/ , /rst/	Harped, arms, quarts, horst.

Nasal + plosive/ affricate/ fricative	/mp/, /nt/, /nʧ/, /mf/, /mϴ/,/ŋϴ/	Lamp, pent, punch, triumph, warmth, length.
Nasal + Two consonants	/mpt/ , /mps/ , /ndϴ/, /nϴs/	Pumped, glimpse, thousandth, months
Fricative + Plosive/ fricative	/ft/, /sp/, /fϴ/, /ϴs/, /ðz/	Left, crisp, twelfth, myths, clothes.
Plosive + Fricative/ plosive	/pϴ/, /ps/, /ts/ , /kt/, /pt/	Path, claps, dots, act, adopt.
Plosive + Two consonants	/kϴs/ , /kst/, / pst/	Sixth , next, eclipsed

However, English language prohibits the glottal fricative /h/ to occur in word-final coda as well as the occurrence of glides in syllable coda. Moreover, the English language requires that the two consonants involved in coda cluster to be similar in voicing feature. For example, in the word/dʌts/ the two obstruent consonants involved in coda position /t/ and /s/ are voiceless.

1.4 Background of Classical Arabic Language

Classical Arabic and Qur`anic Arabic are both related to each other because Qura`nic Arabic is written in Classical Arabic (CA). Therefore, most Muslims consider Classical Arabic as a sacred language in which they recite their prayers, regardless of what accent of Arabic they use in their daily life. The Modern Standard Arabic (MSA) is directly descended from Classical Arabic and is widely used nowadays in writing and formal speeches, for example, radio broadcasts, official TV programmes of non-entertaining content, newspapers, and schools` text books. Thus, few distinctions exist between CA and MSA, and both are known in Arabic as (al-Fus-ha), which means the clearly spoken version of Arabic language or the language of eloquence (Wells, 2002).

1.4.1 Classical Arabic Morphology

Classical Arabic is known for its use of vowel segments to modify a base. The base in CA consists of a group of consonant segments. For example:

Ki**t**a**b** *'book'*

Ku**t**u**b** *'books'*

Ka**t**a**b**a *'he wrote'*

Ka**t**a**b**at *'she wrote'*

Ka**t**i**b** *'writer'*

Ku**tt**a**b** *'writers'*

Ma**kt**a**b**ah *'library'*

Ya**kt**u**b**u *'he wrote'*

Ki**t**a**b**ah *'writing*'

Ki**t**a**b**at *'writings'*

Ma**kt**a**b** ‘office’

In all these words, there is a relationship with the concept of ‘writing’. All of them involve the group of consonants /k, t, b/. This group of consonant segments is the root of all the above words. For grammarians, the root carried the basic meaning (Brown, 2000), which is in this example is "writing". All the above words are modifying this root /ktb/with vowel epenthesis in different ways.

1.4.2 Classical Arabic Phonology

- ***The Vowel System of Classical Arabic***

Classical Arabic has three long vowels /ū, ī, ā/ and three short vowels /u, ɪ, a/ demonstrated in the following table. In Arabic syntax, the vowel phonemes /u, ɪ, a/ are used as marks for the case of the nouns: nominative, genitive, and accusative, respectively.

Table: 1.4: The Vowel System in Classical Arabic

Vowels	**Short**		**Long**	
High	/ ɪ /	/u/	/ī/	/ū/
Low	/a/		/ā/	

There are two diphthongs in Arabic which consist of a combination of short /a/ and the semivowels /j/ and /w/. For example:

/aj/ in the word /bajt/ 'house'

/aw/ in the word / ʔawd/ 'return'

So, it can be considered that the Arabic vowel system is one of the simpler vowel systems in the languages of the world.

- ***The Consonant System of Classical Arabic***

In Classical Arabic and Modern Standard Arabic, there are twenty eight consonant phonemes. There are eight stops, thirteen fricatives, one affricate, two nasals, two semi-vowels, one lateral and one trill. All these consonantal phonemes can be illustrated in the following table (Watson, 2002).

Table 1.5: The Phonemic Inventory of Consonants in Classical Arabic

Arabic	Bilabial	Labio-dental	interdental	dental	Pharyngealized dentals	Alveolar	Palatal	velar	uvular	pharyngeal	glottal
Stops	b ب			t ت d د	ṭ ط ḍ ض			k ك	q ق		ʔ ء
fricative		f ف	Θ ث ð ذ		ṣ ص ð̣ ظ	s س z ز	ʃ ش	x خ ɣ غ		ʕ ع ħ ح	h هـ
affricate							ʒ ج				
Trill						r ر					
lateral						l ل					
nasal	m م					n ن					
Semi-vowel	w و						j ى				

Note: the orthographic symbols used in Arabic are provided next to the phonemic symbols.

1.4.3 Classical Arabic Syllable Patterns

There are five syllable patterns in Arabic language:

a. **CV** **/bɪ/ ‘by’**

b. **CVC** **/mɪn/ ‘of, from’**

c. **CVV** **/lɪɪ / ‘to me’**

d. **CVVC** **/baab/ ‘door’**

e. CVCC /baħr/ 'sea'

In terms of heaviness, the heaviness scale of Hindi (Prince and Smolensky, 1993, p.40) corresponds to that of Arabic language:

Heaviness scale of Arabic:

CVVC, CVCC > CVV, CVC > CV

- **Super heavy (CVVC,CVCC)**
- **Heavy (CVV,CVC)**
- **Light (CV)**

Moreover Arabic language applies restrictions on the sequence of consonantal segments involved in CVCC structure depending on the place of articulation of the consonants involved as well as on whether these homorganic consonantal segments are similar in terms of other features such as manner of articulation or voicing and devoicing (Watson, 2002). For example, the combination of interdentals /ϴ, ð/ + alveolars /s, z/ is not allowed to occur word-finally in Arabic language.

1.4.4 The Qur`anic Arabic

The main source for Arabic data in this research is the Qur`anic Arabic (QA). It is the language of the Holy Quran which is considered to be the standard version of Arabic language. Furthermore, Holy Qur'an and The pre-Islamic poems were the only two sources of literary Arabic available at the very early stages of Islamic period. Thus, these two literary sources play a major role "in the standardization and the development of the Arabic language" (Versteegh, 1997, p.53). Haywood and Nahmad in 1965 dated the classical Arabic to the 6th century A.D as the language of the Qur'an and the great writers such as Al-Mytanabbi and Ibn Khaldun. They claim that although there is a modern version of Arabic (Modern Standard Arabic) emerged, the differences between

this Modern Arabic and the Classical Arabic/Qur`anic Arabic are very "infinitesimal" and limited to the spoken language only. Concerning the syllable structure, the two versions of Arabic (Classical Arabic & Modern Standard Arabic) apply the same rules with no differences at all. So, the written language (the language of the school textbooks, newspapers, etc) still follows the Classical Arabic rules. "In their attitude towards other languages, the speaker of Arabic took it for granted that there could be no alternative to the Arabic language" (Versteegh, 1997, p.71).

1.4.4.1 The Syllable in Classical/Qur'anic Arabic

As stated previously, there are five syllable patterns available in Arabic language CV, CVV, CVC, CVVC and CVCC, in which C stands for consonant sound, V stands for short vowel sound and VV stands for long vowel sound. For heaviness scale, the heaviness scale produced by Hindi (Prince and Smolensky, 1993, p.40) is applicable for the five Arabic syllable patterns:

CVVC, CVCC > CVV, CVC > CV

The syllable in classical/ Qura`nic Arabic does not begin with consonant cluster. There are evidences coming from the English loanwords into Arabic which contain a syllable of this type (CC-). These foreign words receive additional vowel segments either before or after the first consonant in the cluster when they are commenced into Arabic in order to follow the classical Arabic rules of syllabification (see Wright, 1967, p. 24).

On the other hand, the syllable should not end in a consonant cluster which has to be separated by inserting a vowel segment between the two consonant of the cluster or to be followed by a short vowel segment to resyllabify the structure. However, this general rule is not absolute for all phonological environments in Arabic language. The

exceptional situation is in a pause position where the (–CC) cluster appears word-finally in the language.

Thus, in general, one can observe that all the syllable patterns in Arabic have onset. However, three of these patterns only (CVC, CVVC and CVCC) contain coda, so they are known as closed syllables, while the remaining two syllables (CV and CVV) are classified as open syllables. The syllables CVC, CVV, and CVVC can occur initially, medially, and finally. However, the CV pattern cannot occur finally or in isolation because it consists of a short vowel which is deleted in phrase final position. On the other hand, the fifth pattern CVCC can occur in phrase final position or in isolation only.

1.4.4.2 Phonological Processes Affecting the Syllable Structure in Classical/Qur'anic Arabic (QA)

- ***Prothesis***

According to Crowley and Bowern (2010), the process of prothesis is defined as the addition of a particular type of sound segment to the beginning of a word. Because the general rule in QA states that the word should not begin with a consonant cluster (CC), the complex onsets in the underlying representation of QA is solved by adding a glottal stop /ʔ/ followed by a short vowel /ɪ,ɑ/.

For example:

Table 1.6: Input and Output Forms of the Word /mraʔah/ in Qur'anic Arabic

Input	Output	Gloss
mra. ʔah	ʔ ɪ m. ra. ʔah	'woman'

Taking into consideration the fact that no word in Arabic begins with a cluster of consonants, the addition of the Arabic definite article which consists of /l/ segment to any noun would result in a cluster of consonants. For example:

Table 1.7: Input and Output Forms of the Word /qalam/ in Qur`anic Arabic

Indefinite	Definite	Gloss
.qa.lam.	*.lqa.lam.	'the pen'

Again, to satisfy the general rule stated previously, a glottal stop followed by a short vowel is inserted to resyllabify the structure, as in table 1.7

Table 1.8: Resyllabification of the Word /lqa.lam/

Indefinite	Definite (ungrammatical form)	Definite (grammatical form +resyllabification)	Gloss
.qa.lam.	*.lqa.lam.	ʔal.qa.lam.	'the pen'

- ***Apocope***

According to Crowley and Bowern (2010), apocope, pronounced as [əpɔkəpi], is defined as the loss or omission of one or more segments at the end of a word. This particular phonological process is concerned with the coda structure which is under investigation in this research. In QA, only the short vowels of the words are deleted when these words occur at the phrase final position or in pause situation. The omission of such vowels causes a reduction on the number of the syllables of a word because the

remaining consonant joins the preceding syllable after the deletion of the vowel. In this situation when the preceding syllable is an open one, which has no coda (such as CV and CVV), the joining consonant will be the coda of this syllable. See the example in the following table.

Table 1.9: Apocope Applied in the Word /zaɪtūnɪ/ in Qur'anic Arabic

Input	After the deletion of the short vowel	After resyllablfication	Gloss
.zaɪ.tū.n ɪ.	.zaɪ.tū.n.	.zaɪ.tūn.	'olive'

If the preceding syllable is a closed one, which has coda (such as CVC and CVVC), the joining consonant results in a formation of a consonant cluster in the syllable. See the example in the following table.

Table 1.10: Apocope Applied in the Word /ʔlfadʒrɪ/ in Qur'anic Arabic

Input	After the deletion of the short vowel	After the resyllabification	Gloss
ʔl.fadʒ.r ɪ	ʔl.fadʒ.r	ʔl.fadʒr.	' the dawn'

- ***Tanween 'nunation'***

This is a phenomenon demonstrated in spoken language but does not appear in written language. It is the process of adding /n/ sound plus one of the short vowels / ɪ, a, u/ to the indefinite noun in non-final position of the sentence (see Versteegh, 1997, p.82). Thus, in a pause situation, the nunation 'tanween' disappeared (or not functioned). So, operating the nunation 'tanween' leads to the resyllabification of the

word. The following example shows how a word is syllabified with and without tanween.

Table 1.11: Tanween Applied in the Word /mısk/ in Qura`nic Arabic

No tanween in a Pause situation	With Tanween in non-pause situation	Gloss
.m ɪ sk.	m ɪ s.kun.	'musk'

Note: This word in verse (26) of sura Al-Mutaffifin 'Defrauding' from Chapter 30 got two possible ways to pronounce it; either with a pause as / m ɪ sk/ or without a pause as / m ɪ s.kun/ .

So, the word / m ɪ sk/ which means 'musk' has two ways to pronounce it. In the first possible pronunciation of the word, as it precedes a pause, it is composed of only one syllable /m ɪ sk/ CVCC. In the second possible pronunciation, in which the process of tanween is applied, it consists of two syllables /mıs. kun/ CVC. CVC. The resyllabification of the word into two syllables is due to the process of tanween which consists of adding the /n/ sound along with a short vowel (in this example it is / u/). This happens only if the word is not followed by a pause.

When the word / m ɪ sk/ occurs in the phrase final position followed by a pause, it consists of one syllable only CVCC. This is the result of prohibition of the process of tanween in the final position of the phrase or the sentence. Thus, in this case where the /n/ of tanween process is not allowed, the short vowel which usually comes with it is also prohibited. In other words, the short vowel is no longer protected by the /n/ for tanween process; therefore, the short vowel is deleted and the coda cluster in the syllable CVCC is formulated.

1.5 Theoretical Background of Optimality Theory

Optimality Theory (OT) is basically a constraint-based theory as it functions on constraint interaction. This theory was first proposed by Alan Prince and Paul Smolensky in the 1990s, and it has been broadly known by John McCarthy. The theory suggests that constraints are universally presented in all languages as they are forming a significant part of Universal Grammar (UG) that presents the innate language knowledge in the brain.

1.5.1 OT: Basic Concept

Optimality theory is a development of Chomsky`s Generative Grammar (1965). Both theories focus on the requirement of universal principles. However, OT differs from previous generative models in many ways. Unlike the theory of generative Grammar which assumes that the constraints are inviolable, OT assumes that universal constants are violable. Thus, every constraint is part of Universal Grammar (UG) but, according to OT, these constraints are not equally active in all languages. Therefore, ranking of constraints is language-specific which is never violated in one language may be violated in a second language (Kager, 1999, p. 11).

The main idea of Optimality Theory (Prince and Smolensky, 1993) is that the surface structures of a language resulted from conflicts between competing constraints. These structures are optimal as they incur the least minimum violations of a set of violable constraints ranked in a hierarchy. There are two important functions under OT framework. These are Generator (GEN) and Evaluator (EVAL). The universal function GEN generates unlimited number of candidate for a certain input. Then, these candidates are passed onto EVAL, a hierarchy of relevant well-formedness constraints, to be evaluated. Based on the Minimal Violation Principle of OT, the winner candidate

violates the least high-ranking constraint, which is the optimal output. The whole process can be schematized in Figure 1.3, according to Kager. (1999, p.8)

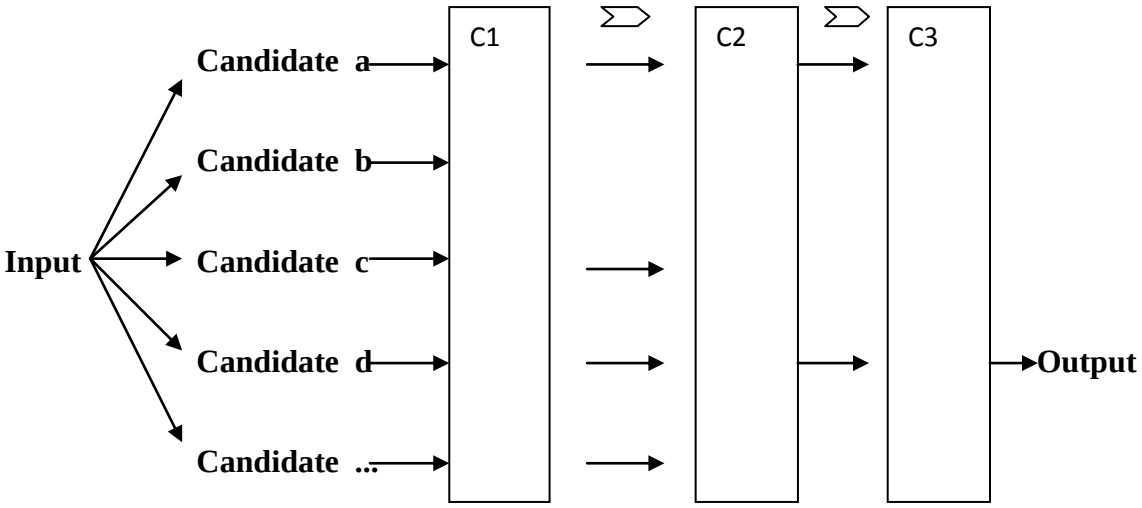

Figure 1.3 Input and Output Mechanism in OT

To illustrate the evaluation mechanism in OT, it can be assumed that a grammar consisting of three constraints C1, C2 and C3 in CON which are ranked in the way that C1 and C2 are dominating C3 (C1, C2>> C3). The object of generation GEN provides three possible outputs (cand1, cand2, cand3) which undergo the process of evaluation operated by EVAL. The evaluation process is usually presented in a tableau form. In this tableau the optimal candidate, after evaluation, indicated by a pointing hand ☞. The following tableau gives an example of how a constraint-based analysis is represented in OT.

/input/	**C1**	**C2**	**C3**
a. ☞ cand1			*
b. cand2	*!		
c. cand3		*!	

Tableau 1. 1: Ranking Value and the Choice of the Optimal Output

At the top of Tableau 1.1, the three relevant universal constraints are presented in respected order starting from left to right following the constraint hierarchy or ranking. When a candidate violates a constraint, the violation is indicated by asterisks (*). When a violation is fatal – a candidate is violating the dominant constraint- an exclamation mark along with the asterisks (*!) indicate the fatal violation.

The examination of the three candidates in the previous tableau while considering the constraint hierarchy indicates that candidate (b) and (c) violate constraint C1 and C2 which are the dominant highly ranked constraints. Therefore, these two candidates incur fatal violations (*!) of the two highly ranked constraints. Meanwhile, candidate (a) is the winner candidate for representing the optimal output for the demonstrated constraint hierarchy. Although it does not satisfy all the three constraints, candidate (a) represents the optimal output because it keeps the violation to the minimum by violating the bottom-ranked constraint C3 while satisfying the higher-ranked constraints C1 and C2.

1.5.2 Optimality Theory Constraints

Constraints involved in OT are universal, however the ranking of these constraints is language specific. There are two main Constraint Families, each family contains infinite sub-constraints. These are the Faithfulness Family and the Markedness Family. These two families are also considered as "two forces which are engaged in a fundamental conflict in every grammar" (Kager, 1999, p. 5). It is the operation of the markedness constraints that integrates the Optimality Theory into the Markedness Differential Hypothesis.

Markedness implies that there are some structures in a language are more marked than others and are thus not allowed to come on the surface. For example, two of the most common markedness constraints in the language are ONSET and NOCODA:

ONSET: Every syllable must have an onset

NOCODA (*CODA): No syllable should have coda.

Under the framework of OT, Markedness sub-constraints are universal. However, different phonological systems of different languages rank these constraints differently therefore, languages allow or disallow some structures from being the optimal output. Thus, as the marked structures should be avoided, they are forced to undergo process like deletion, epenthesis or alternation.

On the other hand, faithfulness constraints require that the output and the input to be similar (Kager, 1999, p.10). This requires that the output hold the properties of its basic lexical form. There are three major Faithfulness Constraints such as identity, dependence, and maximality (1999, p. 29).

- **IDENTITY (IDENT):** The elements in the input and output should be identical. This implies that insertion, deletion and featural changes of any segments in the input are allowed in the output.
- **DEPENDENCE (DEP):** Every element in the output has its correspondence or counterpart in its input. So, insertion is not allowed.
- **MAXIMALITY (MAX):** Every element in the input has its correspondence or counterpart in the output. So, deletion is not allowed.

According to McCarthy (2008), OT is the most suitable framework to investigate syllable structure as he states that:

> *OT supplies a framework for applying the constraint- based analysis and applying the constraints` interactions and evaluating the representations that are necessary part of any theory of syllable structure or phrase structure. This is the reason why it has been possible to apply OT to phonology.* (2008, p. 15)

1.6 Interlanguage

1.6.1 Interlaguage Phonology

Since the notion of a foreign accent produced by non-native speakers is an old one, there are many studies that explore the occurrence of interlanguage phonology and the errant pronunciations of L2. Studies like Lombardi (2000), Monahan (2001) and Rungruang (2008) are some of many other recent studies constructed in the field of linguistics that investigate the interlanguage errors produced by non-native speakers of L2.

Interlanguage phonology came into spotlight since the 1970s with studies such as Selinker`s (1972) "Papers in Interlanguage" and Eckman`s (1977) "Markedness and the Contrastive Analysis Hypothesis". Eckman claimed that the features of interlanguage phonology should not be viewed as a direct resultant of L1 transfer but rather they might be caused by the markedness of the structure. Until today, the notion of interlanguage phonology receives significant attention by the researchers in the field of linguistics. This can be observed in a research constructed on studying L2 English of Japanese speakers (Hideki, 2004). Most of the studies on interlanguage phonology addressed the question of whether L2 learners' errant pronunciation is caused by the negative transfer from their L1. In other words, L2 learners` pronunciation errors are caused by strategies, features, and rules from their mother tongue which are transferred erroneously into their L2 production. The other possible factor or stimulus for such errant production could be due to the universal principle of markedness or similarities in the phonological structures between L1 and L2. Nevertheless, the effect of L1 transfer to the target language is indeed one of the most significant issues discussed in Second Language Acquisition (SLA).

However, many researchers follow Eckman (1977) who examined the influence of universal principle of the markedness of syllable structures on the structuring of interlanguage phonology. Vennemann (1988) overtly explains the universal principle of syllable structures and proposes the “Head Law and Coda Law". The Head Law proposes that the most preferred structure of a syllable head is that “the closer the number of speech sounds is to one "(p. 13). On the other hand, the Coda Law proposes that the most preferred structure of syllable coda is that “the smaller the number of speech sounds in the coda” (p. 21). This means that a single consonant (C) is the most optimal output for onset and a Zero C is the optimal output for coda. Accordingly, the CV syllable structure (where C stands for consonant and V stands for vowel) is the core syllable across-linguistically. As a result, any form displaying complexity in syllable structure is less favoured and regarded as a universally marked form cross-linguistically and is more difficult to acquire. Blevins (1995) also provided strong evidence that shorter or simplex syllable margins are most preferred across-linguistically as the phonological processes of epenthesis and deletion are used by many languages to reduce complex codas and onsets. According to Crowley and Bowern (2010), epenthesis is defined as a sound "change by which a vowel is added in the middle of a word to break up two consonants in a cluster" (p.31). On the other hand, deletion is a type of sound change which created by eliminating a sound segment for the sake of simplifying a structure (Belvins, 2004).

1.6.2 Interlanguage Hypothesis

Interlanguage is a system indicating the intermediate status between the native language (NL) and target language (TL). It is a system on its own constructed as a result of L2 learners` best attempts to provide order and structure in response to the linguistic stimuli surrounding them. Selinker (1972) defines interlanguage as a production developed by L2 learners indicating the systematic knowledge of an L2 which is

independent of both learners` native language (NL) and the target language they are learning. The term ‘interlanguage’ has been used with different but related notions:

1- Interlanguage refers to the series of interlocking system which characterizes acquisition process.
2- Interlanguage refers to the system that is observed as a single stage of development in L2 acquisition process.
3- Interlanguage refers to a particular L1/L2 combination.

There are many other terms used for interlanguage such as Nemser (1971) “approximative system” referring to a system at successive stages of proficiency, and Corder (1967) “transitional competence” indicates that L2 learners are moving along a continuum in the process of language learning starting from zero to native speaker`s proficiency (Ellis, 1994, p.710).

1.6.3 Contrastive Analysis Hypothesis (CAH)

It is worth to consider that the previous notion of interlanguage was associated with the Contrastive Analysis Hypothesis (CAH) which defines interlanguage as a result of comparison between learners’ NL and target language (TL). Lado (1957) described the system of Contrastive Analysis which operates in a step-by-step comparison of the L1 and L2 in terms of phonology, grammar, writing system and culture. He claimed that the basic assumption in CAH is transfer. He stated that “individual tends to transfer the forms and meaning and the distribution of forms and meaning of their native language and culture to the foreign language and culture” (Lado, 1957, p.2). CAH claimed that the main cause for difficulty in acquiring L2 is the interference of the first language`s (L1) rules and system with the second language`s (L2) rules and system.

Many researchers applied CAH to studies in interlanguage phonology. One of these researchers is Broselow (1984) who proposed the Syllable Structure Transfer

Hypothesis in a research which applies CAH to syllable structures. The Syllable Structure Transfer Hypothesis implies a prediction that if speakers` L1 does not allow consonant cluster in its output, difficulties in pronouncing such consonant clusters in L2 are expected. Consequently, the learners will transfer the strategies to simplify the consonant clusters from their L1 to the target language they are learning.

As CAH proved to be inefficient -especially the strong version of this hypothesis- for many reasons, people lost their interests in comparing two languages to predict the structures of interlanguage (Brown, 2000). Thus, interlanguage is defined as a system on its own and independent of both L1 and L2.

1.6.4 Markedness Differential Hypothesis (MDH)

Twenty years after the Contrastive Analysis Hypothesis was introduced, Eckman (1977) proposed an alternative hypothesis, known as Markedness Differential Hypothesis (MDH). Both of these hypotheses consider L1 interference in the process of second language acquisition. However, the Markedness Differential Hypothesis differs from the CAH as it considers the "relative degrees of difficulty by means of principles of Universal Grammar" (Brown, 2000, p.214). Eckman argued that marked forms in a language are harder to acquire than the unmarked forms. Moreover, MDH implies that the degrees of markedness correspond to the degrees of difficulty.

The universal principle in MDH exists in the concept of markedness itself, which regarded as universal rather than language-specific. According to this hypothesis, marked structures are cross-linguistically acquired later than its unmarked counterparts or any other unmarked forms. Nevertheless, if a marked form exists in a language, its unmarked counterpart exists too but not vice versa. Thus, MDH together with the universal principles of the Universal Grammar (UG) are proposing "a more

sophisticated understanding of difficulty in learning a second language" than the previously formulated CAH (Brown, 2000, p.214).

According to the Markedness Differential Hypothesis, the complex codas as well as the complex onsets are more marked than simple syllable coda as well as the simple syllable onset. The speakers of L1, which allows neither complex codas nor complex onsets, may have difficulty in learning L2 structures containing complex codas and complex onsets. On the other hand, learners of L1 which consists of complex codas and complex onsets are expected to have no difficulty learning structures in L2 which allows simple syllable patterns only. So, if L1 allows marked forms (i.e complex codas and onsets) to occur in the output, it is evident that learners are transitting from more complex marked structures in their L1 to less complex marked ones in L2.

1.7 Objectives of the Study

This study aims to:

1.7.1 Investigate the paradoxical situation that leads to the formation of optimal syllable structure, which consists of coda consonant cluster, CVCC in Arabic.

1.7.2 Illustrate how the interlanguage coda cluster produced in Arabic speakers` L2 English could be analyzed by using Optimality Theory framework to examine the simplification strategies used in simplifying these complex structures of English.

1.7.3 Examine whether the appearance of CVCC syllable pattern in Arabic results in no complicatedness for Arabic native speakers in pronouncing such form in English.

1.8 Research Questions

The study tries to answer the following questions within the framework of Optimality Theory:

1. How an OT analysis can account for the existence of CVCC syllable pattern in Arabic language?
2. What are the simplification strategies employed by the Arabic speakers in order to simplify the different types of English coda clusters (-cc / -ccc / -cccc) in their interlanguage pronunciation?
3. How does the occurrence of -CC cluster in Arabic language affect Arabic speakers in producing such structure in the English language?

1.9 Significance of the Study

The study examines the phonological problem experienced by many Arabic students when they speak in English language. The participants chosen for this study are the undergraduate students who have spent a minimum of six years studying English at intermediate and high schools and rely on English language in their BA courses. The findings of this study will give insights to ESL instructors to improve their teaching of pronunciation skill (especially of English consonant clusters) to Arabic native speakers. If ESL instructors consider that their students will come across some problems in pronouncing some English syllable patterns, they can be more focused on guiding the students how to correct the errors in their pronunciation of English coda consonant clusters. Furthermore, the study investigates how the L2 learners of English may employ simplification strategies to reduce and simplify English complex coda consonant clusters as a result of the effect of the universal markedness of complex syllable clusters. The proposition is that instructions on English coda consonant clusters

can be helpful to speakers of other languages, even speakers of languages that allow the occurrence of complex clusters in coda position.

1.10 Scope and Limitation of the Study

The study investigates the problematic English coda consonant clusters which Arabic speakers encounter when pronouncing English words or phrases. This study involves a constraint-based analysis of the interlanguage production of English coda clusters produced by native speakers of Arabic within the framework of Optimality Theory. The study concerns the word-final complex coda clusters only; however other types of consonant clusters, like word-initial and word-medial consonant clusters are not under investigation because they are not within the scope of this thesis. The sample of the study is a group of 30 undergraduate students of age 19 and above, whose mother tongue is Arabic and who have been exposed to English language learning for a minimum of six years in formal settings. The interlanguage productions examined in this study consists of the pronunciations of those intermediated Arabic learners of English only. It is not within the scope of this thesis to investigate the pronunciation of neither beginner L2 learners nor advanced L2 learners of English.

1.11 Conclusion

In conclusion, this study aims at finding out the problematic English complex coda clusters for the native Arabic speakers of English as their L2 learners and the origin and the choice of the simplification strategies used by them in repairing such complex structures of English. In order to fulfil the objectives of the study, the researcher tries to answer the research questions stated above. Due to this, the researcher presents various studies constructed in the field of Second Language Acquisition and the review of the relevant literatures that are related to the concept of interlanguage and Optimality Theory.

CHAPTER TWO

Review of Related Literature

2.0 Introduction

In this chapter, previous studies conducted within the domain of SLA concerning the interlanguage notion as well as studies demonstrating OT analysis are reviewed. Furthermore, the researcher investigates how the previous studies relate to the current dissertation.

2.1 The Notion of Interlanguage

Selinker (1972) discusses the concept of interlanguage concerning the language forms that the learners of L2 produce while expressing or negotiating meanings in contact with native speakers of the L2. He posited that relevant data would be a result of behavioural events which would help one to understand those psycholinguistic processes and structures that exist behind attempted meaningful performance in a second language. Thus, the data resulting from the classroom drills is not a meaningful performance and of no interest from the learning perspective and the theory of second language learning.

"A major sort of observable data from meaningful performance situation… are: (1) utterances in the learner`s native language (NL) produced by the learner; (2) IL utterances produced by the learner; and (3) TL utterances produced by the native speakers of that TL. These three sets of utterances or behavioural events are… the psychologically relevant data of second language learning…" (1972, p.28)

By identifying these three sets of utterances in a certain theoretical framework and gathering related data for each of these three systems, the investigator in SLA is ready to investigate the processes underlying the formation of IL behaviour.

When one attempts to learn a second language, a certain psychological structure latent in the brain is activated. Moreover, this language latent structure, as Lenneberg called, is the biological counterpart to Universal Grammar and is transformed by the infant into the realized structure of a particular grammar in accordance with certain maturational stages.

In this paper, Selinker makes an important assumption that the adults who succeed in achieving native speaker competence have reactivated the latent language structure, and these L2 learners are forming a small percentage of five present only, while learners who fail to achieve absolute success in L2 (i.e. the native speaker's competence) are representative of the vast majority of second language learners.

Selinker focused his analyses upon interlanguage data (IL);

> "i.e. the utterances which are produced when the learner attempts to say sentences of the TL. This set of utterances for most learners of a second language is not identical to the hypothesized corresponding set of utterances which would have been produced by native speakers of the TL... Since we can observe that these two sets of utterances are not identical …, one would be completely justified in hypothesizing … the existence of a separate linguistic system based on the observable output which results from a learner`s attempted production of a TL norm. This linguistic system we will call interlanguage (IL)." (p.27)

Selinker suggested five main processes or strategies significant to SLA, namely, "language transfer, transfer of training, strategies of second language learning, strategies of second language communication and overgeneralization of TL linguistic material" (p. 28).

For language transfer process, the learner tends to keep in his fossilized NL linguistic items, rules and subsystem in his IL relative to a certain TL, "no matter what the age of the learner or amount of explanation and instruction he receives in TL"(p.28). These fossilized structures are known as errors because they are violating the linguistic rules in the TL. For example, "French uvular /r/ in their English IL, English rhythm in the IL relative to Spanish, German time-place order after the verb in the English IL of German speakers" (P.28).

However, the transfer of training process is different than the previous one. For example the Serbo-Croatian speakers have difficulty "at all levels of English proficiency… with the *he/she* distinction, producing in their English IL *he* on almost every occasion wherever *he* or *she* would be called for according to any norm of English. In this example, there is no language transfer since the distinction between *he/she* does exist in Serbo-Croatian as it is in English, but there is still a difficulty for those learners. Thus, this case which cause the IL form is due to the transfer of training process: "textbooks and teachers in this interlingual situation almost always presents drills with *he* and never with *she*" (P.30).

Overgeneralization process is demonstrated when the TL rules is over generalized and extended to an environment which seems to be logical for the learners to apply but it is not according to the norm of the TL. For example, "the Indian speaker of English who produces the collocation *drive a bicycle* in his IL performance, as in 2: 2. After thinking little I decided to start on the *bicycle* as slowly as I could as it was not possible to drive fast" (p.30).

For the strategy of second language learning there is a process or a strategy which is usually used by second language learners called "simplification". The learners commonly tend "to reduce the TL to a simpler system" (p31). For example, the

avoidance of "grammatical formatives such as articles, plural forms, and past tense forms" (p.31).

The same process -simplification process- would be a result of a communication strategy "due to (a) past experience" which affected the learner of L2". For example, English L2 learner may think that concentrating about the grammatical rules while trying to express meanings in his conversation with the native speakers of English may affect his utterances to "be hesitant and disconnected, leading native speakers to be impatient with him" (p.32). Thus, such speaker may think that using definite articles or plural forms is not necessary for the kind of conversation he is involved in.

The seminal work of Selinker (1972) serves as being the basic historical aspect of the Interlanguage Hypothesis. Much of the later contributions made in this field of research concerning Second Language Acquisition are dependent on Selinker`s research on IL since the 1970s. Gass and Selinker (2008) presented an introductory course in Second Language Acquisition where they shed light on the interlanguage concepts, along with other concepts like “fossilization” and “language transfer”, dependent on this previous work of Selinker dated to (1972). It is noticed that the Interlanguage Hypothesis discussed in the 1970s had been updated in many of the recent works and studies contributed to the research field of Second Language Acquisition.

2.2 CAH and MDH Assumptions on Simplification Strategies in Interlanguage

Tarone (1980) investigated the pronunciation of English complex consonant clusters by the native speakers of Portuguese, Cantonese and Korean who learn English as their L2. The study investigated the simplification strategies used by those speakers to simplify the complex syllable structures in L2. She claimed that the simplification strategies used by L2 speakers cannot be solely due to L1 transfer if this L1 has the

same complex structure and its speakers still make errors in pronouncing such structure in their L2.

The assumptions proposed in CAH and the MDH is done by choosing to compare L2 English pronunciation of speakers of languages, like Portuguese and Cantonese, which are mainly CV languages, to the pronunciation of speakers of a language, like Korean, which exhibits complex syllable structures to occur at syllable margins. Unlike Cantonese and Portuguese, Korean language is similar to English as both allow complex syllable structures to exist. By including the Korean native speakers in her investigation, Tarone proved that simplifying complex syllable onsets and coda in L2 is not merely a result from L1 transfer as the Korean speakers do perform simplification strategies on L2 English complex cluster despite the fact that their L1 consists of such complex structures. There are similar percentage of the error in pronouncing L2 (English) complex syllable margins among speakers of Korean, Portuguese and Cantonese. The percentage of errors performed by Korean speakers reached 21%, while the percentage of the errors performed by the Portuguese and the Cantonese were 21.5% and 18.5%, respectively. The simplification strategies used by those speakers to simplify L2 English complex syllable margins included both epenthesis and deletion processes.

Tarone (1980) indicated that errors performed by L2 English speakers in pronouncing complex syllable structures could not merely be considered as a result effected by L1 transfer , and thus CAH is not sufficient in accounting for such errant production. The result which indicated that even speakers of L1 –like Korean- which consists of complex syllable margins performed errors in pronouncing these complex syllable structure in a similar error rate of those speakers of L1s – like Portuguese and Cantonese - which prohibit the occurrence of complex syllable structure, support what Tarone stated as a strong version of Eckman`s (1977) MDH. It assumes that speakers of

L1 encounter difficulty in producing L2 English complex syllable margins not because that their L1 prohibits the existence of these complex structures, but because these structures are universally regarded as marked forms. Thus, in the strong version of MDH the universal principle of markedness takes the privilege over L1 transfer effect.

Both epenthesis and deletion processes used to simplify the complex syllable margins could be an evidence that L2 learners are using the same strategies common to simplify the complex syllable structures in L1 acquisition process among children. Learners of L1 who are under three years of age tend to apply the deletion process to reduce the complex syllable structures and hence simplify its pronunciation. Thus, as the speakers of L2 English applied deletion as a simplification strategy in simplifying L2 English complex syllable margins, it would be a clue supporting the argument that L2 learners are using aspects from L1 acquisition process.

Eckman (2008) claimed that there are methodological issues surrounding MDH in the field of L2 phonological acquisition highlighting the fact that a relation exists between the MDH and CAH. "The MDH is completely programmatic with the Contrastive Analysis Hypothesis in two important ways" (p.105). First, issues about L2 learning difficulty is discussed in both hypotheses, and second, both hypotheses are referring to the differences between NL and TL as being a responsible factor for such difficulty.

However, MDH and CAH do not equally treat the importance of the NL- TL differences in contributing to L2 phonological difficulty. For MDH, the differences between NL and TL are not paramount in the context of L2 phonological difficulty, while for CAH, these differences are forming sufficient contribution to such difficulty in L2 phonological acquisition. Thus, MDH assumes that another factor exists along

with NL-TL differences which contribute to the difficulty in acquiring phonological forms in L2 which is known as the typological markedness.

Eckman (2008) claimed that one of the evidences supporting the MDH assumption is termed as the "directionality of difficulty". This occurs when learners of two different L1s are trying to learn the other`s language, in which learners of one language experiences more difficulty than the other. The best example for directionality of difficulty is represented in the voice contrasts in the coda syllables exist in English and German. The differences between the two languages are that English exhibits voice contrast in obstruents in all the three positions of the word (initially, medially and finally), while German displays the contrast only word-initially and medially. Accordingly, German speakers of L2 English encounter more difficulty in pronouncing English syllable codas involving voice contrasts than what happened with the English speakers learning German as L2.

This research does not compare speakers of different L1s in order to investigate the assumption proposed by the MDH. This tries to examine the assumption made by MDH by examining if the existence of a biconsonantal cluster -CC in the syllable pattern CVCC in Arabic would result in having no difficulty for Arabic speakers in pronouncing such structure in their L2 English. So, my study is comparing the interlangauge pronunciation of this type of English consonant cluster (biconsonantal cluster –CC) to the interlanguage pronunciation of the other types of English consonant cluster (triconsonantal cluster –CCC and quadriconsonantal cluster –CCCC), which do not exist in the speakers` native language (Arabic). Moreover, the study investigates whether the Arabic speakers transfer their L1 strategies in simplifying L2 English complex coda consonant clusters.

2.3 Optimality Theory on Interlanguage Data

Kim (1999) analyzed some features of Korean accented English. These features include "vowel epenthesis, segment modification (stop voicing, devoicing, nasalization, etc.), and ambisyllabicity" (p.1). The features of Korean-English interlanguage are the results of language transfer which is the most important factor in L2 learners` errors.

Moreover, he stated that three phonological features of Korean language are definitely different from those of English language. One of these phonological features is that, unlike English language, Korean language does not allow consonant clusters. As a result, Korean learners of English tend to insert a vowel. One of the examples of IL pronunciation he stated in this research, which is so much related to a feature going to be described in my research, is:

Mint [min.tu]

The constraints to be considered for this particular case according to OT analyses are:

***COMPLEX [*COM]** (Prince & Smolensky 1993)

No more than one C or V may associate to any syllable position node.

MAX (McCarthy, 1995)

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

DEP (McCarthy, 1995)

Every element of the output has a correspondent in the input. (No insertion of a segment)

The constraint ranking seems to be {*COM, MAX}>> DEP as depicted in Tableau 2.1 as the L2 learners are using vowel epenthesis to re-syllabify the structure of the word.

/mintʰ/ mint	*COM	MAX	DEP
[min]		*!	
[mintʰ]	*!		
☞ [min.tʰu]			*

Tableau 2.1: Ranking Value and the OT Analysis of the Word /mintʰ/ in Korean-English Interlanguage

This study investigates similar issue about the Arabic accented English. The phonological case/problem shown in Tableau 2 about the word *"mint"* has a parallel situation in Arabic language. In Arabic, there is a paradoxical situation in which the structure CVCC appears. This exacting cluster (biconsonantal cluster –CC) , which is found in a particular environment has been repaired in Arabic by adding a vowel segment to break the word /baħr/ , which has a syllable structure of CVCC, into two syllable /baħ.ru/ and has a syllable structure of CVC.CV. Moreover, the features of the interlanguage production, which are analyzed in this study would be different from the Korean accented English. As, Arabic is a CV type of language, Arabic second language learners of English (especially the beginners) tend to simplify the English complex consonant clusters. The simplification of these English complex structure would indicate sort of L1 transference in their production of the TL (English). Therefore, the features of Arabic-English interlanguage which are under investigation would be different, according to the L1 (Arabic) phonological system. Moreover, the study investigates such interlanguage errant production through examining the universal principles proposed by MDH which assumes that the universal principle of markedness plays a significant role in the construction of interlanguage syllabification.

Lombardi (2000) investigated the interlanguage phonology of L2 sound substitutions within the framework of OT. She attested that what is known as an obvious transfer and a non-obvious transfer of L1 in L2 sound changes, particularly the substitution of English interdentals, and to argue that OT is providing a satisfactory analysis for this type of data. She focused on the following:

- the changing of the English [Θ] into [t] which shows a preference of the unmarked segment over the marked one, and
- the changing of English [Θ] into [s] which shows faithfulness to the original manner of articulation, which is fricative.

The first case, where [t] substitution occurs, is parallel to what is happening in child language acquisition in which the unmarked manner (Stops) is preferred, as the stops are to be acquired before the fricatives. Thus, in this case the markedness constraints ranked higher than the faithfulness ones as a result of having no *stop/fricative* distinction in ESL learners` L1 sound system. Accordingly, the substitution of [Θ] into [t] should be viewed as a result of the universal effect of markedness. Stop substitution should be considered as primary, universal approach based on the fact that stops are less marked compared to fricatives. Therefore, we can state that the grammar of the interlanguage production of those ESL speakers consists of initial ranking supplied by UG.

In contrast, she claimed that the second case, where [s] substitution occurs, is different since it does not follow the constraints` ranking of child language acquisition, but it shows evidence of L1 transfer effect for the required ranking. Accordingly, those ESL learners, who use fricative replacement, must have *stop/fricative* distinction in their L1 sound system that results in re-ranking. So, ESL speakers who display fricative substitution in their interlanguage pronunciation of the English fricative interdental /Θ/

show more overt transfer effect as their L1 phonology provoked a change from the default ranking of markedness and faithfulness constraints.

Lombardi`s study explicitly clarified how OT analysis explains the origin of interlanguage errant production concerning English interdentals substitution. Thus, the study could be relevant to the current study which uses OT as a theoretical framework for analyzing the interlanguage production of English complex coda clusters by Arabic speakers. The main objective is to explain the origin and the choice of simplification strategies used by those speakers to simplify such structures.

Rungruang (2008) examined the coda structure of English loanwords in Thai. The most important feature of Thai language regarding coda structure is that Thai has a basic syllable structure of CVC, "with coda limited to certain types of consonantal phonemes, which are [p,t,k,ʔ,m,n,n,w,j]". The English simple codas, which consist of a single consonant such as fricatives, liquids and voiced stops, are substituted by limited codas in Thai language (the nine single consonant). However, the complex codas are considered to be marked forms in the term of OT. Thus, the English loanwords which consist of complex codas undergo a process of simplification to reduce them into one consonant only in Thai. This is possible because "Thais adapt English postvocalic consonant clusters, especially two-consonant clusters, to one consonant" (2008, p.83).

For the complex coda structures, Rungruang divided them into five groups in order to clarify the simplification strategies demonstrated in borrowings for each group.

The first group (illicit coda deletion)

- rt → t
- rk → k
- rm,lm → m

- nz,ns,nʤ,nʧ → n
- ts → t
- ks → k

The second group (less salient consonant deletion)

- mp → m
- nt → n
- ŋk → ŋ

The third group (excess consonant deletion)

- kt → k
- pt → p

The fourth group (stop replacement)

- rtʃ → t
- rd → t
- sk → t
- dz → t
- st → t
- ft → p

The fifth group (segmental replacement)

- lt → n,w
- ld → n,w
- lk → w
- lv → w
- lf → p,f

Rungruang proposed that segmental saliency motivates the behaviour of the cluster simplification process, the analysis on examples from each group shows how segmental saliency may be accommodated. This means that, if the consonant exists in the phonemic inventory of Thai, the proceeding consonant in the cluster is deleted. To explain clearly, “the term /bɛŋ/ ‘bank’, [n] is allowed in coda, and it is a very salient consonant. The following consonant [k] is deleted" (p.87). However, if the consonant is not found in the phonemic inventory, it is eleminated and the proceeding consonant is selected. "For example, in the word /wɔm/ 'warm', [r] is not allowable in coda. It is not salient, so the next consonant [m] is retained.

To examine the concept of salience and simplification strategies, Rungruang demonstrates a constraint based analysis in the frame work of OT.

For the first group in which “the problematic coda clusters lead to segmental deletion" (p.88), there are two main constraints involved, which are:

*COMPLXCOD : codas are simple

*CC] (Kager, 1999, p.97)

Together with another two constraints, MAX-IO and CodaCon, play an important role:

Consider the word /tʰɣr m/ 'term' in tableau 2.2

/ tʰɜ r m/ term	*COMPLEXCOD	CodaCon	MAX-IO
1. [tʰɣɣrm]	*!		
☞ 2. [tʰɣɣm]			*
3. [tʰɣɣ]		*!	*

Tableau 2.2: Ranking Value and OT Analysis of the Word /tʰɣr m/ in Thai English Loanwords

The second group demonstrates a stop followed by a nasal sound. In this group of examples, the previous constraint, which is basic here *COMPLEXCODA still has a significant role to eliminate the coda cluster to only one consonant. The constraint MAX-IO is important also as there is segmental deletion. However a new constraint appear to dominate MAX-IO "and to make /-mp/→ [-p] less optimal. Thus, a new faithfulness constraint is proposed:

MAX-C/V: Do not delete a consonant that is adjacent to a vowel.

(Côte, 2000, p.183)

/pəmp/ pump	*COMPLEXCODA	MAX-C/V	MAX-IO
1. [pa`amp]	*!		
☞ 2. [pa`am]			*
3. [pa`ap]		*!	*
4. [pa`a]		*!	**

Tableau 2.3: Ranking Value and the OT Analysis of the Word /pəmp/ in Thai English loanwards

The examples of the third group contain coda clusters consisting of voiceless stop followed by another voiceless stop. In all these examples the "postvocalic segment is preserved." Consider the word: /kʰɒnsɜpt/ *Concept* in tableau 2.4

/kʰɒnsɜpt/ Concept	*COMPLEXCODA	MAX-C/V	MAX-IO
1. [kʰɔnse`pt]	*!		
☞ 2. [kʰɔnse`p]			*
3. [kʰɔnset]		*!	*

Tableau 2.4: Ranking Value and the OT Analysis of the Word /kʰɒnsɜpt/ in Thai English

The fourth group seems to be different from the above as there are two strategies have been used to repair the coda cluster. For this group the examples are evident that there are stop replacement and segment deletion. "Thus, the unfamiliar segment is replaced by the familiar one in the Thai phonological system" and the consonant cluster is reduced into a single consonant.

Consider the word /kʰɑɑrd/ card in tableau 2.5

/kʰɑɑrd/ card	*COMPLEXCODA	CodaCon	MAX-C/V	MAX-IO
1. [kɑɑ`rd]	*!	*		
☞ 2. [kɑɑ`t]			*	*
3. [kɑɑ`r]		*!		*
4. [kɑɑ`d]		*!		*
5. [kɑɑ`]			*	*!*

Tableau 2.5:Ranking Value and the OT Analysis of the Word /kʰɑɑrd/ in Thai English Loanwords

The fifth group shows more complication in repairing the coda clusters. A generalization is made as follows: when the input contains a sequence of a lateral followed by either a stop /d, t, k/ or a voiced labiodentals fricative /v/, the edge is deleted. A postvocalic [l] is replaced by a phonetically similar segment. However, it is the other way around with a cluster /-lf/. That is, the postvocalic [l] is dropped, but the edge either retained or replaces by a phonetically similar segment.

Consider the word /vælv/ valve in tableau 2.6 in the next page.

/vælv/valve	*COMPLEXCODA	CodaCon	MAX-C/V	MAX-IO	IDENT-IO (nasal)
1. [waalv]	*!	*			
☞ 2. [waaw]				*(v)	
3.[waalw]	*!				
4.[waan]				*(v)	*!
5. [waav]		*!	*	*(l)	
6. [waal]		*!		*(v)	

Tableau 2.6: Ranking Value and the OT Analysis of the Word /vælv/ in Thai English Loanwords

In relation to the current study, a similar idea on simplifying the complex English coda clusters will be investigated. However two things are different here. First, loanword phonology differs from the phonology of the interlanguage. Loanwords are accurately adjusted to the phonological system of the L2, but interlanguage productions are not. Thus, IL may show features independent from the NL or the TL. Second, Arabic language does not have limited range of phonemes in the coda position of a word. Thus, unlike Thai speakers, there is no problem for Arabic speakers in pronouncing any English phoneme in single coda position, except for the sound /v/ and /p/ which do not exist in the Arabic phonemic inventory.

Hideki (2004) examined the simplification strategies used by Japanese EFL learners on complex English onset and coda clusters within the framework of OT. An analysis of interlanguage production of Japanese speakers as a set of ranked universal constraints, one can explain both the origin of simplification/repair strategies and speakers` choice of each strategy. This paper, particularly, discusses the notion of "the emergence of the unmarked". Hideki argued that the markedness effects which are not present in either the NL or the TL are found in the IL data.

The markedness issue discussed has been applied to L2 phonology. This is because grammar contains a set of universal constraints in which the ranking is language specific. The common assumption is that, at the very early stage of the acquisition, markedness constraints dominate the faithfullness constraints. However, those markedness constraints are involved in gradual demotion at the later stages of acquisition of a grammar and ranked below the faithful ones. Hideki provides examples from the study conducted on Mandarin speakers of English. The constraint set involved in these examples are:

NO OBS CODA: syllable codas may not contain obstruent.

MAX (C) : No deletion of consonant.

DEP (V): No insertion of vowels.

To see the different ranking of the constraints in the earlier and the later stages of grammar acquisition, an OT analysis is obligatory.

Analysis of /vɪg/

a. English natives.

Input: vɪg	MAX (C)	DEP (V)	NO OBS CODA
☞ a. vɪg			*
b . vɪ	*!		
c . vɪ.g		*!	

Tableau 2.7: Ranking Value and the OT Analysis of the Word / vɪg/ in English

b. Mandarin speakers favouring deletion

Input: vɪg	NO OBS CODA	DEP (V)	MAX (C)
a . vɪg	*!		
☞ b. vɪ			*
c . vɪ.g		*!	

Tableau 2.8: Ranking Value and OT Analysis of the Word/ vɪg/ in Applying Deletion in Mandarin-English Interlanguage.

c. Mandarin speakers favouring epenthesis

Input: vɪg	NO OBS CODA	MAX (C)	DEP (V)
a. vɪg	*!		
b. vɪ		*!	
☞ c. vɪ.g			*

Tableau 2.9: Ranking Value and the OT Analysis of the Word / vɪg/ in Applying Epenthesis in Mandarin-English Interlanguage

- Initial Mandarin Ranking:

  NO OBS CODA >> MAX (C) >> DEP (V).

- TL (English) Ranking :

  MAX (C) >> DEP (V) >> NO OBS CODA

The constraint ranking of the interlanguage of those speakers is gradually developed as they become more proficient in English until it comes to be fairly accurate to TL ranking.

To examine this grammatical model, Hideki employed a constraint-based analysis on the interlanguage syllabification of Japanese speakers of English. The set of constraints relevant are:

a. Markedness constraint

- ***COMPLEX**: no more than one consonant or vowel may be associated to any syllable position node.

b. Faithfull constraints

- **MAX-IO**: Every segment of the input has a correspondent in the output (no deletion)

- **DEP-IO**: Every segment of the output has a correspondent in the input (no insertion).

The different ranking of these constraints may result in different simplification strategies which are employable for the interlanguage phonological structures.

It is found that the English complex onsets are repaired by Japanese EFL learners by inserting a vowel segment. This is a fulfilment of the markedness constraints *COMPLEX. As learners prefer epenthesis to deletion in repairing the complex onset, then MAX- IO constraint dominates DEP-IO constraint.

Analysis of *glow* in tableau 2.10

/glou/	*COMPLEX	MAX-IO	DEP-IO
a. glou	*!		
☞ b. gelou			*

Tableau 2.10: Ranking Value and the OT Analysis of the Word /glou/ in Japanese-English Interlanguage

In repairing the English complex coda structure, it reveals that Japanese ESL learners prefer to delete a segment and reduce the cluster to one consonant only. Thus, DEP-IO dominates MAX-IO constraint while the markedness constraint *COMPLEX remains to be the highest constraint among them.

Analysis of *gold* in tableau 2.11

/gɔ:ld/	*COMPLEX	DEP-IO	MAX-IO
a. gɔ:ld	*!		
☞ b. gɔ:d			*

Tableau 2.11: Ranking Value and the OT Analysis of the Word /gɔ:ld/ in Japanese-English Interlanguage

This current research concentrates on simplifying the English complex coda clusters by Arabic ESL learners, both strategies – vowel epenthesis and segment deletion- which are involved in simplifying English coda clusters. In other words, unlike Japanese ESL learners who simplify English complex codas by deleting segments to reduce the cluster to one consonant, Arabic speakers of English use different strategies along with the segmental deletion to simplify such clusters of English.

Monahan (2001) discussed the aspects of Brazilian Portuguese (BP) speakers' production of English. A comparison was made between the syllable construction and constraints ranking of the BP language and the interlanguage syllabification ranking produced by BP native speakers when speaking in English. Moreover, a comparison of interlanguage ranking of constraints with the TL (English) ranking was also examined. The data collected were English sentences containing syllable structures found in English language but not in BP language read by native speakers of BP.

As BP language prefers the simple unmarked CV syllable pattern, Monahan emphasized the three processes in BP language that were analyzed, such as:

- epenthesis,
- assimilation of nasality and nasal deletion, and
- lateral gliding in coda position.

These processes seem to be transferred into interlanguage pronunciation of BP native speakers when they speak English.

He argued that in order to investigate the transference of these BP phonological processes as well as the BP ranking of constraints into interlanguage production, an OT analysis is a must. After employing the OT analyses on interlanguage data and comparing it with NL (BP) and the TL (English), there were two important results, which are:

- There are certain phonological alternations (especially for nasality and lateral gliding) which are motivated by the native language unmarked syllable structure. This is evident that the ranking were transferred from the NL to IL errant production.
- However, the advanced L2 learners provide evidence of having "the richness of the input forms" as they did not delete the nasals and utter the complex coda correctly. In other words, those advanced learners do not have any difficulties in pronouncing the complex English clusters and achieve a native-like pronunciation.

Similarly, this current research investigates the concept of transference from L1 (Arabic) to interlanguage production of the TL (English) by Arabic ESL speakers. As PB language speakers perform different phonological alternations enthused from their NL, they prefer a CVC pattern when pronouncing complex English clusters. This is also evident among Arabic speakers of English. One of the phonological processes performed in Classical Arabic to fix the accidental coda cluster CVCC, which is the paradoxical case in the language, is the insertion of a vowel segment to resyllabify the pervious monosyllabic pattern into bisyllabic pattern CVC.CV. However, this phonological process is restricted to a certain phonological environment in Classical Arabic. Thus, this research investigates whether this type of phonological alternation is transferred to the Arabic-English interlanguage errant production.

2.4 Syllable Structures and Syllabification in OT

Fèry (2003) examined the interaction held between markedness and faithfulness constraints within the framework of OT. She examined the restrictions on syllable structures of French Language which makes it a representative language in explaining

the interaction between the two types of universal constraints within the framework of OT. However, the analysis was focused on coda syllables only.

In order to conduct an OT analysis on the coda syllable structure, a list of attested constraints was made to prove that the unordered nature of these constraints lead to "differences between languages and thus to typological diversity" (p. 2). The constraints involved in examining the core syllable in French, are of two types:

a) Constraints requiring faithfulness of the output to its corresponding input, which are:
    - MAX: No deletion of segments
    - DEP(ə): NO schwa epenthesis
b) Constraints requiring the surfacing of unmarked forms, which are:
    - NUC: Syllable has nuclei
    - NoCoda: Syllable has no coda

Tableau 2.12 for the word *sol* 'ground' displays the interaction of the above constraints.

/sçl/	MAX	DEP(ə)	NUC	NoCoda
☞ a. .sçl.				*
b. . sç.	*!			
c. .sç.lə		*!		
d..sç.l			*!	

Tableau 2.12: Ranking Value and the OT Analysis of the Word /sçl/ in French

Tableau 2.12 shows that candidate (a) is the optimal which preserves the /l/ segment as the coda at the expense of satisfying the higher ranked constraint MAX. Candidate (b) and (c) are eliminated because of their violations of the higher ranked constraint MAX and DEP (ə) by deletion and insertion of segments, respectively.

However, "candidate (d) is suboptimal because there is a syllable without a nucleus which is dispreferred" (p.13).

On the other hand, Fery claimed that when a word such as *calme* which has a final consonant, this consonant cannot be part of the “phonological coda because of the restrictions on the number of rime position" (p.14). To account for such situation, additional constraints must be considered such as:

a. SONHIER: Syllables must obey the sonority Sequencing Principle.
b. BIMOR: increase the number of moras in a single syllable into two.
c. PARSE-SEG: segments must be parsed into syllables.

All the three specific markedness constraints are ranked higher than the previous ones, particularly MAX and DEP (ə). The following tableau demonstrates how a sequence of two consonant segments is resyllabified across word boundaries in French.

Tableau 2.13 for *calme* 'quiet'

/kalm/	SONHIER	BIMOR	PARS -SEG	MAX	DEP(ə)	NUC	NoCoda
σ σ  a. ☞kal.m						*	*
σ σ  b. .ka.lm	*!						
σ  c. .kalm.		*!					**

σ  d. .kal.m			*!				*
σ  e. .kal.				*!			*
σ σ  f. .kal.mə					*!		*

Tableau 2.13: Ranking Value and the OT Analysis of the Word /kalm/ in French

As a result for resyllabifying the sequence of segments across word boundaries in French, Fèry claimed that as semisyllables are constructed "to become onsets of following word initial onsetless syllables, this is also true of simple codas in words without semisyllables." (p.15). According to Cho and King (2003), the properties of a semisyllable is that it has no nucleus, no coda as well as no stress, accent or tone, and it is found only at the end margins. They also proved that the interaction held between faithfulness and markedness constraints is what accounts for the existence of semisyllables and the variations between languages in the admission of semisyllables.

Fèry's study concluded that the more specific constraints are ranked higher in language than the less specific constraints. As a result, those specific costraints overrule the effect of unmarkedness role by acting towards markedness. At the end of her study, a generalization was made:

> " the more specific constraints we find, the less probable that the general ones will play be active in determining the optimal candidates, and the less we see the effects of the emergence of the unmarked" (p.29).

Fèry's (2003) study can be useful in the current study because it proves the adequacy of OT in investigating problematic issues concerning syllable structures and syllabification. In a very similar way, the current study research investigates the problems occurred in Arabic language on syllable structure. The constraint-based analysis and interaction between the universal constraints in examining the appearance of CVCC syllable structure, consisting of a complex coda cluster, in Arabic language will be investigated.

Alber and Plag (1999) investigated the emergence of a syllable structure in Sranan, which is an English-based Creole language. In this investigation, they examined the contributions of superstrate (English language), substrate (African languages) and universal principles in the construction of Sranan Creole syllable structure.

They claimed that Creoles prefer the simple CV syllable pattern. Therefore, Creoles tend to use deletion process and vowel epenthesis process to simplify words of complex syllable structure that are taken from the lexifier. They applied OT analysis to answer questions concerning the choice of each strategy in a particular case. In other words, they examined the factors governing "the choice of epenthesis as against deletion or vice versa" (p.3).

To achieve their goals, they drew a systematic comparison of Sranan words with their English etyma, while presenting a constraint-based analysis for examining the restructuring of syllables in creolization. The systematic comparison was needed to detect the deformed patterns of deletion and epenthesis that lead to the construction syllable structure s in Sranan.

Alber and Plag (1999) claimed that Sranan displays strict restrictions on the type of consonants involved in simple coda in the way that only nasals can be codas. Thus, word-final simple English coda consonants been repaired by applying vowel epenthesis

rather than segmental deletion. For example: the English word *because* being simplified as /bikasi/ in Sranan. In this case, the structural constraint CodaCond, which allows nasals only to be codas, and the faithfulness constraint MAX, which prohibits deletion of segments, are ranked higher than the faithfulness constraint DEP that bans epenthesis.

However, when the word-final coda consists of consonant cluster, deletion process is applied to simplify the structure. For example: the English word *haste* becomes /hesi/ in Sranan. In this case, the deletion has been operated on the second consonant as a result of the faithfulness contiguity constraints NO SKIP, which bans deletion of internal segments, and NO INTRUDE, which bans epenthesis of segments in word-internal position, been highly ranked. These contiguity constraints resemble Max and DEP in requiring faithfulness to the base in the output.

They concluded that the two processes affecting the Sranan`s syllable structures result from the interaction between structural and faithfulness constraints. They argued that when the universal structural constraints are highly ranked, the emergence of the unmarked simple syllables observed. On the other hand, when the structural constraints that are transferred from the substrate language, the effect is that the "aspects of African grammar are imposed on English base words"(p. 39). However, when the faithfulness constraints are ranked highly in the hierarchy, the English output is preserved and thus, the Creole would be identical to the superstrate.

Alber and Plag`s study could be related to this thesis if Creole is considered as a form of interlanguage, as argued in Plag (2008). In this case, a similar investigation is being demonstrated in the current research which examines the choice of simplification strategies used by L2 learners of English to simplify the complex English coda clusters. The phenomena of applying simplification strategies in both Creoles and Interlanguage

result from the interaction between faithfulness constraints and markedness constraints to achieve the optimal output.

Fèry and Vijver (2003) presented a book explaining the OT role in examining problematic issues in syllable formations. They shed light on certain properties in OT to investigate its ability in providing an adequate analysis on issues concerning syllabification and syllable structures. They claimed that, studies applying OT in their analysis of syllable structures of languages are using a theoretical framework that is shifted away from bare representations of the previous derivational rules toward constraints and the interactions held between them in the course of a particular grammar.

In order to prove that the older derivational approach to phonology is insufficient in providing a refined explanations of many problems concerning syllable structures, and to confirm the reliability of OT, they provide an example of *hiatus* avoidance in three different languages. These languages are Hawaiian, French and German. Hiatus can be defined as “the phonetic result of the immediate adjacency of vocalic syllable peaks" (p.5). Hiatus is resolved in the grammar of these three languages through insertion of consonant segment between the two vowel segments, glide formation, and deletion of one vowel segment to reduce the structure.

According to OT, *HIATUS is a markedness constraint, a part of Universal Grammar, existed in every language. However, the different ways used by different languages to repair hiatus depends mainly on the ranking displayed by each language of this markedness constraint with respect to other faithfulness ones. Accordingly, it can be said that languages which allow hiatus to appear in the output are ranking faithfulness constraints. These constraints on the vowels involved in the hiatus higher than the markedness constraint *HIATUS, which eliminates hiatus from surfacing. On

the contrary, languages that avoid hiatus are ranking those faithfulness constraints lower than the markedness constraint *HIATUS. The faithfulness constraints involved in the analysis of hiatus are:

- DEP(C): Consonant epenthesis is prohibited.
- MAX (V): Vowel deletion is prohibited.

The three examples presented in Fèry &Vijver can be summarized as:

1) Hawaiian Language: Hiatus is freely allowed to occur in the output. So, the markedness constraint *HIATUS is ranked below the faithfulness constraints DEP(C) and MAX (V). Thus, the ranking is :

   MAX (V), DEP(C)>> *HIATUS

2) German Language: Hiatus is resolved by inserting consonant segment between the two vowel segments. So, the faithfulness constraint DEP(C) is ranked below the markedness constraint *HIATUS and the other faithfulness constraint MAX (V). Thus, the ranking is:

   MAX (V), *HIATUS>> DEP(C)

3) French Language: Hiatus is being simplified by deleting one of the vowel segments involved. So, the faithfulness constraint MAX (V) is ranked below the markedness constraint *HIATUS and the other faithfulness constraint DEP(C). Thus, the ranking is:

   DEP(C), *HIATUS>> MAX (V)

Unlike the previous derivation rules, in which hiatus simplification takes a form of ordered rules, OT and its constraints provide a clear analysis of the different ways used to avoid hiatus.

The results gained from Fèry and Vijver (2003) have some relation to the current thesis. The relation between the two studies could be summarized as that the same

notion about the language-specificity in ranking the universal constraints is being discussed in both studies. My research is investigating how the Arabic language is avoiding the coda consonant cluster from surfacing in the output. The simplification strategies used in Arabic language are demonstrating a specific ranking of the markedness constraint *ComplexCoda, which prohibits coda cluster from surfacing, against other faithfulness constraints, which are preserving the faithfulness of the output toward the input.

CHAPTER THREE

Methodology

3.0 Introduction

This chapter consists of two sections. Section 3.1 discusses the collection of Arabic data from the Holy Qur'an, while Section 3.2 discusses the collection of interlanguage data from the recording of the participants` readings in the study.

3.1 Arabic Data Collection

The Arabic data used for this study are words which contain the CVCC syllable pattern. This type of data is required in order to apply a constraint-based analysis to investigate the existence of CVCC syllable pattern in Arabic language.

3.1.1 Data Collection Procedure

The researcher focused on a single chapter of the Holy Quran (Chapter 30) and examined the words that contain the CVCC syllable structure. For pronunciation accuracy, the researcher recorded and listened to a tape recorded reading/reciting of a particular chapter of the Holy Quran (See Appendix A) by one of the professional or popular reciters.

3.1.2 Rationale of Choosing Qur'anic Arabic (QA) as Data

QA has been chosen as a source for the Arabic data in this study because it is the language of the Holy book of all the Arabic Muslim subjects participated in this research. Despite the fact that Arabic nowadays has many dialects, and that the participants in this study speak different Arabic dialects, all of them had been taught in standard Arabic in school since the first degree; and eventually mastered it.

The data were collected to apply the Constraint-based analysis on the data. The researcher will examine and analyze how the CVCC structure appears in Arabic

language which prohibited the existence of a consonant cluster within a single syllable. Such analysis provides an answer to the first research question. In addition, the collected data will help to explain the effect of L1 in L2 production and to examine the role of markedness and the prediction made by the MDH. Consequently, a comparison between the constraint ranking of L1 and those of the L2 interlanguage production performed by the participants will be made. In other words, the study is investigating whether presence of the structure CVCC Arabic language would result in having no difficulty for the subjects to produce the same structure in L2 (English) or not.

3.2 Interlanguage Data Collection

In order to apply a constraint-based analysis to the pronunciation of English complex coda clusters produced by Arabic speakers' phonological data from the Arabic students at English Language Center Schools (Known as ELS) in Malaysia was collected. This is to examine the simplification strategies used by Arabic students and to investigate the prediction proposed by MDH.

To analyze how the Arabic speakers deal with the complex coda consonant clusters in their L2 English, sufficient data must be collected. Arabic students who attended English classes in ELS were asked to participate in the study by reading the list of English words and sentences that contain the complex coda consonant clusters. The data collected were used to calculate the percentage of the total error productions for each type of English complex coda clusters and the percentage of the related error patterns in pronouncing each type of these clusters. Such analysis is needed to discover which one of the three simplification strategies is mostly preferred in simplifying each type of English complex coda clusters. The study focuses on the forms collected inorder to prove how OT could be a suitable framework in analyzing such forms and examining the re-ranking of the universal constraints in the interlanguage grammar.

3.2.1 Subjects

All thirty subjects were Muslim Arabic students who studied at the English language institute (ELS) in Malaysia Kuala Lumpur in order to improve their English before attending college to continue their Bachelor degree. All subjects were in the intermediate level according to the proficiency level of English in the ELS during the data collection. All subjects studied English minimally for six years in school before attending the ELS institute. The subjects` ages range between 19 to 23 years old. Of the thirty subjects participated, three of them were females and twenty seven were males.

3.2.2 Data Collection Procedure

The researcher obtained permission from the academic director at the ELS institute after presenting a purpose letter from University Malaya (see Appendix B). After getting the approval, the researcher wrote a letter to the subjects explaining the purpose of the study, the procedure of the data collection and asked them to participate (see Appendix C). The subjects were approached individually and given a list of words and sentences to read (See Appendix D) and asked to write their names on the top of the sheet in order to make it easier for the researcher to transcribe the pronunciation of each subject. Each participant was given about two minutes to check the list in order to be familiar with it before the reading task. The recording started by stating the subjects' names before reading. The reading task was about 4 to 8 minutes and was recorded using a digital audio recorder.

The sentences and the words were transcribed, and those that contain all the three types of complex coda clusters (bisonsonantal coda cluster -CC, triconsonantal coda cluster -CCC and quadriconsonantal coda cluster -CCCC) were selected. Examples of the three types of coda clusters are illustrated in Table 3.1.

Table 3.1: English complex coda clusters

Type of coda consonant (word-final) cluster	Examples from the reading list **(consonant clusters in bold)**
Biconsonantal Cluster -CC	Cra**ft**, pro**ved**, du**sk**, fi**lm**, mi**lk**, clea**ned**, ro**bbed**, wa**shed**, mu**gs**, hu**gged**
Triconsonantal Cluster -CCC	Mi**lts**, ami**dst**, ma**sks**, dwa**rfs**, mi**lked**, twe**lfth**, almo**nds**, ye**lped**
Quadriconsonantal Cluster -CCCC	Conte**xts**, insti**ncts**, te**mpts**, twe**lfths**, spri**nkles**, scra**mbled**.

3.2.3 Data Transcription

The researcher transcribed the prepared lists of words and sentences with reference to the American English pronunciation in Cambridge Advanced Learners` Dictionary - version with a CD-ROM. The CD provides audio recordings of the pronunciation of every word in both American and British English. Then, the recorded 2,070 tokens collected from the participants` reading, were played back and the data were then transcribed by the researcher.

CHAPTER FOUR

Data Analysis

4.0 Introduction

This chapter presents the analysis of the collected data. There are two main sections in this chapter. Section 4.1 discusses the OT analysis of Arabic words, which consist of CVCC syllable pattern. Section 4.2 presents the OT analysis of the recorded interlanguage pronunciations of the English words, which consist of word-final complex coda clusters.

4.1 Arabic Data OT Analysis and Tableaux

The observations and the processes applied on coda syllable clusters in Classical/Qur'anic Arabic (see Chapter 1) can be accounted for by the following constraints and their interactions.

There are many constraints concerning the coda clusters in QA.

- **Markedness constraints:**

a) ***ComplexCODA** (Prince and Smolensky,1993)

Coda must be simple and consists of only one consonant.

b) *[v -long]] ϕ

A short vowel is prohibited at the phrase final position.

c) *C [v+high]$

Short high vowel is prohibited in an open syllable. (Abu-Mansor, 1994)

This markedness constraint is ranked lower in QA because obeying it would lead to the formation of a consonant cluster. However, it is fulfilled only when the short high vowel is deleted in order to satisfy the other markedness constraint *[v, -long]] ϕ. The deletion of the short high vowel operates only at the end of

the phrase. Thus, the constraint *C [v+high]$ is activated only in a specific phonological environment.

d) *Phrase-final Nunation

Nunation ‘Tanween’ is banned at the phrase final position.

- **Faithfulness Constraints:**

e) MAX-IO (McCarthy and Prince ,1995)

Input segments must have output correspondents (No deletion of segment)

f) DEP-IO (McCarthy and Prince ,1995)

Output segment must have input correspondents (No insertion of segment)

After defining each constraint, it can be seen that the fulfilment of constraints (b and d) would result in the violation of the constraint (a) *ComplexCODA. The satisfaction of the constraint (b) *[v, -long]] ϕ leads to complex coda cluster because the deletion of a short vowel leads to the formation of complex coda cluster. In addition, the satisfaction of the constraint (d) *Phrase-final ‘tanween’ leads to complex coda cluster because the process of tanween which can protect the short vowel from elimination is prohibited in phrase final position.

However, the constraint (a) *ComplexCODA is highly ranked and considered to be the most dominant constraint in classical Arabic only when it occurs initially or medially. Later on, in one of the following tableaux, we will observe how this markedness constraint is violated in word-final position –in a paradoxical situation-, despite the fact that it is ranked highly in the hierarchy.

The following example shows how the constraint*COMLEXCODA dominates the constraint*C [v+high]$:

{ʔila ʔahlihim} “To their families”

(Chapter 30, Surat AL-Mutaffifin‘Defrauding’ , verse 31)

ʔahlɪhɪm	***ComplexCODA**	**MAX-IO**	***C [v+high]$**
☞ a. ʔah.lɪ.hɪm			*
b. ʔahl.hɪm	*!	*!	

Tableau 4.1: Ranking Value and the OT Analysis of the Word / ʔahlihim/ in Arabic

In this tableau, candidate (a) constructs three syllables (CVC.CV.CVC). It has two closed syllables intervened by an open syllable which has a short high vowel /ɪ/ as its nucleus. This candidate, which is the optimal candidate, presents violation of the constraint *C [v+high]$ at the expense of satisfying the highly ranked constraint *ComplexCODA. On the other hand, candidate (b) satisfies the constraint *C[v+high]$ at the expense of violating the highly ranked constraint *ComplexCODA besides its violation of the faithfulness constraint MAX-IO by deleting a segment; thus, it fails to be the optimal candidate. It is clear enough that the first syllable of the candidate (b) has the structure of the fifth pattern of the syllable inventory in Classical Arabic (CVCC). This syllable pattern which consists of coda cluster is prohibited initially and medially in classical Arabic. In other words, the violation of the constraint *ComplexCODA is prohibited in word`s initial and middle positions in Classical Arabic. Thus, candidate (a), which satisfies *ComplexCODA, becomes the winner (optimal output) over candidate (b), which violates the *ComplexCODA.

Tableau 4.2 presents how the constraints interact with one another when the fifth syllable pattern CVCC occurs in non-pause situation (i.e. not followed by a pause).

{wa ʔila ʔalʔardi kaifa sutiħat}

(Chapter 30, Surat al Ghasyah, verse 20)

ʔalʔardɪ	*ComplexCODA	MAX-IO	*C [v+high]$	*[v, -long]] ɸ
a. ʔal.ʔard	*!	*!		
☞ b. ʔal.ʔar.dɪ			*	*

Tableau 4.2: Ranking Value and the OT Analysis of the Word / ʔalʔardi / in Arabic

Tableau 4.2 shows that candidate (b) violates both *C [v+high]$ and *[v, -long]] ɸ at the expense of satisfying the highly ranked constraints *ComplexCODA and MAX-IO in classical Arabic. The constraint *ComplexCODA is classified as the dominant in this example as the word does not precede a pause and does not occur in phrase-final position. The syllable structure CVCC which consists of coda cluster is not allowed when the word comes in non-pause situation even if the structure CVCC comes in word- final position. Therefore, the addition of short high vowel /ɪ/ is obligatory in non-pause situation which entails that the constraint *ComplexCODA is the most dominant constraint.

However, there are optimal forms which clearly violate *ComplexCODA despite the fact that it is the dominant constraint and highly ranked in classical Arabic. Tableau 4.3 clarifies such output which is caused by the deletion of a final short vowel as presented in the following page.

{walfadʒr}

(Chapter 30, Surat ʔalfadʒr ‘the down’, verse 1)

walfadʒr	***ComplexCODA**	**DEP-IO**	***C [v+high]$**	***[v, -long]] ɸ**
☞ a. wal.fadʒr	*!			
b.wal.fadʒ.rɪ		*!	*	*

Tableau 4.3: Ranking Value and the OT Analysis of the Word / walfadʒr / in Arabic

The deletion of the final short vowel that comes in phrase final position is obligatory in classical Arabic which entails that candidate (b), which preserves its final short vowel, cannot be the optimal form in this phonological situation. In other words, candidate (b) is not faithful to the input as it violates the highly ranked faithfulness constraint DEP-IO by inserting a short vowel to the end of the third syllable. On the other hand, candidate (a) which consists of the structure CVCC in its second syllable, satisfies the low ranked constraints *[v, -long]] ɸ and *C [v+high]$ (both constraints can be mentioned as *Phrase-final high short vowel) as well as the highly ranked faithfulness constraint DEP-IO at the expense of violating the equally highly ranked constraint *ComplexCODA. However, candidate (a) is the most optimal output for two reasons: First, it succeeds to keep constraint violation to the minimum by violating only the constraint *ComplexCODA unlike candidate (b) which violates three constraints. Second, the CVCC syllable pattern is allowed in this phonological environment (i.e. phrase-final position) which explains why the violation of the highly ranked constraint *ComplexCODA dose not eliminate candidate (a) from being the optimal output in this paradoxical situation.

Along with the final high short vowel deletion in phrase-final position, there is another situation that contributes to the violation of the constraint *ComplexCODA and henceforth the formation of CVCC syllable pattern. This situation is the result of failure to apply the process of tanween 'nunation' which protects the short vowel from deletion which, accordingly, protects the constraint *ComplexCODA from being violated. Tableau 4.4 shows how the constraint *ComplexCODA is violated for the sake of satisfying the new constraint *Phrase-final Nunation.

{xitamuhu mısk}

(Chapter 30 of Sura Al-Mutaffifin 'Defrauding', verse 26)

mısk	***ComplexCODA**	**DEP-IO**	***Phrase-final Nunation**	***[v, -long]] Φ**
a. mıs.kun.		*!	*	*
b. mıs.ku.		*!		*
☞ c. mısk.	*!			

Tableau 4.4: Ranking Value and the OT Analysis of the Word / mısk / in Arabic

NOTE: the word 'mısk' here had been examined in a pause situation (i.e. followed by a pause).

Tableau 4.4 reveals that candidate (a) is not the optimal output because it violates a high ranked faithfulness constraint DEO-IO as well as it preserves the /n/ for tanween 'nunation' along with its protected short vowel /u/ in a pause situation which is the situation that does not allow the process of tanween to function. In other words, tanween process is prohibited in both phrase-final and pause situations. Candidate (b) also fails to be the optimal output as it violates DEP-IO and because it preserves the final short vowel which is disallowed in pause situation. The winner here is candidate (c) which is

the optimal output for two reasons: First, it wins to keep constraint violation to the minimum by violating the markedness constraint *ComplexCODA only, unlike the other two candidates (a) and (b). Second, the CVCC pattern is allowed in this phonological situation (pause) where the Phrase-final tanween cannot function. This phonological situation explains why candidate (c) wins to be the optimal output despite its violation of the highly ranked markedness constraint in the grammar *ComplexCODA.

4.1.1 Discussions and Predictions

Since the structure CVCC which contains a word-final biconsonantal cluster exists in Classical Arabic, the prediction of CAH would state that Arabic native speakers who are learning English as their L2 will not experience significant difficulty with English coda consonant clusters consisting of two consonant sounds. Therefore, following CAH prediction, those learners should not use deletion or epenthesis to simplify or reduce the word-final biconsonantal cluster -CC because in the classical version of their mother tongue (Arabic) such structure is allowed.

However, Ostapenko`s (2005) argues that speakers of English L1 have difficulty in acquiring Russian syllable onsets although both languages allow complex consonant clusters in onset position. The findings provide evidences which negate the prediction made by the CAH. The CAH prediction would state that the native speakers of English will have no difficulty in acquiring the Russian complex onsets because their L1(English) allows the complex onsets to occur on the surface structure. Therefore, this prediction made by the CAH does not match the results of Ostapenko `s (2005) study where the English speakers tend to exhibit different ways to simplify the Russian complex onsets by producing vowel epenthesis, reducing the consonant cluster or

substituting consonant segments even within syllables allowable in their native language.

Ostapenko`s (2005) study, like Tarone (1980), does not only suggest that L1 transfer is not the main responsible factor in L2 errors but it also supports Eckman's (1977) MDH. In fact, the English speakers` error in the production of Russian complex onsets suggests that markedness is an essential factor in the complexity that L2 learners come across in acquiring such a structure, despite the existence of this structure in their L1. Tarone (1980) and Ostapenko (2005) who support the stronger version of MDH which provide a prediction that L2 learners will experience some difficulty in acquiring forms and structures that are universally marked even though they appear in the speakers` L1.

Since Arabic contains biconsonantal clusters (CVCC) word-finally, CAH prediction states that Arabic speakers should experience no difficulty in acquiring the English structure. However, if markedness structure is considered, there is a need to follow the MDH prediction that Arabic speakers will have difficulty in producing the English complex coda consonant cluster in CVCC structure. Such difficulty is possible even though it exists in their L1 (Arabic) consisting of more complex coda clusters containing three consonants -CCC and four consonants -CCCC.

4.2 Interlanguage Data Analysis

The goal of this section is to explain the phonological findings of interlanguage pronunciation of English complex coda clusters performed by the native speakers of Arabic. This section provides an OT analysis of the interlanguage pronunciations of the three types of complex coda clusters –CC, -CCC, and –CCCC of Arabic speakers. There are three phonological processes used in order to repair or simplify such complex coda consonant clusters such as vowel epenthesis, consonant segment deletion and consonant segment substitution. These processes are analyzed within the framework of

Optimality Theory to explain the origin and the choice of simplification strategies in the interlanguage structures.

4.2.1 Results

A summary of the result of the subjects` pronunciations of English coda complex clusters is shown in the following table.

Table 4.1: L2 Learners` Pronunciations of the English Word-final Complex Consonant Coda Clusters

			Error Patterns		
Type of coda cluster	**Total errors/ attempts**	**%errors**	**Epenthesis**	**Deletion**	**Substitution**
-CC	408/1080	53.8%	37.7%	8.8%	7%
-CCC	438/780	56%	28%	22%	5%
-CCCC	169/210	80%	35%	39%	6%

The table displays the number of instances of total errors as well as error patterns by category such as epenthesis, deletion and substitution. The table shows that the subjects have difficulty with in producing three types of English coda clusters. The error rates reach 53.8% in –CC cluster, 56% in –CCC cluster and 80% in –CCCC cluster. From the 53.8% of errors in pronouncing the –CC cluster, 37.7% of them are in epenthesis error pattern, 8.8% are in deletion error pattern, and only 7% are in substitution error pattern. From the 56% of errant pronunciations of –CCC type of coda cluster, 28% of them are epenthesis error pattern, 22% are deletion error pattern, and only 5% of them are

substitution error pattern. Finally, from the 80% of error productions of the –CCCC coda cluster, 35% of the errors are epenthesis error pattern, 39% of them are deletion error pattern, and only 6% of them are substitution error pattern.

It can be observed that as the cluster becomes more complex, the subjects have more difficulty pronouncing them. In terms of error patterns, there is a preference to insert a vowel segment to break up the cluster in their productions of both –CC and –CCC English coda clusters, whilst there is a preference to delete segments to reduce the cluster in their production of –CCCC English coda cluster.

Although L1 interference is regarded as the prominent cause for L2 errant pronunciations, the data in this study suggests that not only L1 interference would be the cause for L2 pronunciation difficulties but also the principle of markedness plays a significant role in such difficulty encountered by L2 learners. Thus, a more refined analysis is required to achieve a better understanding by following the analytical pattern of Optimality Theory. Within the framework of OT, constraints are considered to be universal while their ranking is language specific. It is possible to afford an account of syllable repair or simplification strategies through the process of reranking the universal constraint taking into account the effect of L1 and the principle of markedness form.

4.2.2 Interlanguage Pronunciations` OT Analysis and Tableaux

In order to reach a refined understanding discussed in the previous section and to explain the origin of simplification strategies used by Arabic speakers in their L2 (English) to simplify the three types of English complex coda clusters , and their choice of each strategy; an OT analysis must be conducted using a set of universal constraints. Thus, it is essential to consider a set of markedness and faithfulness constraints impeded in the harmony evaluator, where the candidates' features are evaluated.

The constraints used for the analysis of vowel epenthesis, segment deletion and segment substitution done by the Arabic native speakers in their Interlanguage English are:

Markedness Constraints:

***ComplexCODA** (Prince and Smolensky, 1993)

Codas must be simple (No complex coda)

***CC](dental+alveolar)**

This constraint disallows the combination of dentally segments and alveolar ones in a coda cluster. For the brevity it is better to call this markedness constraint ' **CodaCon'** constraint.

***V+high, +short]**

This constraint disallows the insertion of a high short vowel in coda position.

Faithful Constraints:

MAX-IO (McCarthy and Prince,1995)

Input segments must have output correspondents (No deletion of segment)

MAX (C/V___)

The deletion of the consonant segment adjacent a vowel sound is prohibited (No deletion of salient segment).

DEP-IO (McCarthy and Prince, 1995)

Output segment must have input correspondents (No insertion of segment)

IDENT-IO (place) (Kager, 1999)

The specification for place of articulation of an input segment must be preserved in its output correspondent. (Kager, 1999, p. 45)

The analysis below discusses the interlanguage productions of each type of English complex coda clusters to show how the reranking of the universal constraints above yields the different simplification strategies which are allowed in the structure of interlanguage phonology. As indicated in chapter 3, Arabic does not allow complex coda clusters generally, whilst the cluster CVCC is the only cluster which is accidentally allowable in Arabic language. So, except for the –CC coda cluster, Arabic language is ranking the markedness constraint *ComplexCODA highly in its grammar.

The collected data suggests a set of ranking which demonstrates a clear violation of three types of faithfulness constraints (DEP-IO, MAX-IO and IDENT-IO (place)) in three different situations. The violation of these faithfulness constraints is done in order to satisfy the markedness ones which result in simplifying L2 complex structures. First, complex coda clusters are repaired in terms of vowel epenthesis, which is a serious violation of the faithfulness constraint DEP-IO. Second, complex coda clusters are repaired in terms of segment deletion to reduce the cluster, which is a serious violation of the faithfulness constraint MAX-IO. The third case is developed as the complex coda clusters are repaired in terms of segmental substitution, which is a serious violation of the faithful constraint IDENT-IO (place). So, in all three cases or situations, it can be seen that the markedness constraint *ComplexCODA dominates DEP-IO, MAX-IO and IDENT-IO (place) respectively.

4.2.2.1 Epenthesis

From the table (8), it is clear that the subjects prefer inserting a vowel segment than deleting a consonant or substituting it to simplify both the biconsonantal coda cluster -CC and the triconsonantal coda cluster –CCC, as the error rates concerning the

epenthesis error pattern for these two types of complex clusters are 37.7% out of 53.8% and 28 % out of 56% respectively.

An OT analysis of the pronunciation of a –CC coda cluster in the word "film" in Tableau 4.5

/fɪlm/	*ComplexCODA	MAX-IO	*V+high, +short]	DEP-IO
a. /fɪlm/	*!			
b. /fɪm/		*!		
c. /fɪl.mɪ/			*	*
☞ d. /fi.lɪm/				*

Tableau 4.5: Ranking Value and the OT Analysis of the Word /film/ in Arabic-English Interlanguage

In tableau 4.5 candidate (a) fails to be the optimal output as it violates the most highly ranked markedness constraint in the interlanguage grammar *ComplexCODA. Candidate (b) satisfies the markedness constraint at the expense of violation the equally ranked faithfulness constraint called MAX-IO by deleting a consonant segment to reduce the coda cluster. Candidate (c) also fails to be the optimal output as it violates two constraints DEP-IO as well as *V+high,+short] by inserting a high short vowel to the end of the word.

NOTE: We can consider the failure of candidate (c) to emerge to the surface as being the result of the direct transfer from L1. In Classical Arabic, the indefinite words (i.e. the words which are not preceeded by the prefix /ʔal-/) can not end with high short vowel. Thus, if we assume that the Arabic speakers being influenced by their mother tongue, they will never simplify the complex coda clusters in L2 by inserting a high short vowel to the end of the word to resyllabfy its structure because of the absence of

the prefix /ʔal-/. Moreover, this particular English word / fɪlm/ is being adopted in Modern Arabic and it is pronounced as / fɪlɪm/ and never been pronounced as /fɪl.mɪ/.

As a result, candidate (d) wins to be the optimal output in the interlanguage grammar as it satisfies the markedness constraint *ComplexCODA by violating the lower ranked faithfulness constraint namely called DEP-IO only by applying the process of vowel epenthesis to break up the –CC coda cluster.

An OT analysis of the pronunciation of a –CCC coda cluster in the word “lumps” in Tableau 4.6

/lʌmps/	***ComplexCODA**	**MAX-IO**	**DEP-IO**
a. / lʌmps/	*!		
b. / lʌps/	*!	*	
c. / lʌpɜs/		*	*
☞ d. / lʌm.pɜs/			*

Tableau 4.6: Ranking Value and the OT Analysis of the Word / lʌmps/ in Arabic-English Interlanguage

In tableau 4.6, candidates (a) and (b) are ruled out as they violate the most highly ranked markedness *ComplexCODA. Candidate (c) fails to be the optimal candidate as it violates MAX-IO which is equally ranked with the constraint *ComplexCODA by deleting a consonant segment to reduce the –CCC cluster into –CC cluster, and it also violates another faithfulness constraint called DEP-IO by inserting a vowel segment to break up the reduced cluster. As a result, candidate (d) becomes the optimal output as it kept the constraint violation to the minimum. Candidate (d) satisfies the highly ranked markedness constraint at the expense of violating the lowest ranked faithfulness constraint DEP-IO by inserting a vowel segment to resyllabify the word`s structure into two syllables (CVC.CVC).

The interlanguage ranking in this case (for epenthesis process) is:

***ComplexCODA>>MAX-IO>>DEP-IO**

4.2.2.2 Deletion

Table 4.1 clarifies that the subjects prefer consonant deletion strategy to reduce the coda cluster –CCCC rather than using vowel epenthesis or segmental substitution strategies. The subjects` rates for the deletion error pattern in pronouncing the quadriconsonantal cluster –CCCC reaches 39% out of 80% while they recorded only 8.8% out of 53.8% and 22% out of 56% for such error pattern in their pronunciations of the other two types of complex coda clusters (-CC and –CCC respectively).

The criterion that dominates the behavior of cluster simplification process in terms of segmental deletion is the segmental saliency. This implies that the less salient segment (Consonant) in the complex cluster is deleted. Cote (2000) suggests that "the perceptual salience of a segment is a function of the quantity and quality of the auditory cues that signal its presence in the speech stream" (2000, p.136). Accordingly it can be assumed that the consonant adjacent to the vowel is the most salient segment in the cluster. Thus, in deletion process, the first consonant in the cluster is the one that is preserved as it is preceded by the vowel segment which is the nuclei of that syllable.

An OT analysis of the pronunciation of a –CCCC coda cluster in the word “instincts” in Tableau 4.7

/ɪnstɜŋkts/	*ComplexCODA	MAX-IO	DEP-IO
a. / ɪnstɜŋkts /	*!		
b. / ɪnstɜŋkɜts /	*!	*	*
c. / ɪnstɜŋkɜt/		*	*
☞ d./ ɪnstɜŋ/		*	

Tableau 4.7: Ranking Value and the OT Analysis of the Word /ɪnstɜŋkts/ in Arabic-English Interlanguage

In Tableau 4.7, Candidate (a) is wiped out because of its fatal violation of the highly ranked constraint *ComplexCODA. Even though candidates (b) and (c) violate the faithfulness constraints MAX-IO and DEP-IO by deleting consonant segments and inserting vowel segment, candidate (b) even violates the highest ranked constraint namely *ComplexCODA. Thus, candidate (b) is eliminated. Candidate (c) is also eliminated because of its failure to keep violation of the constraints to the minimum by violating two constraints MAX-IO and DEP-IO compared to candidate (d). Candidate (d) which is the winner reflects one of the major characteristics of the architecture of OT that the violation of constraint must be kept to the minimum. Thus, candidate (d) is the optimal output as it violates the lower ranked faithfulness constraints MAX-IO only for the expense to satisfy the most highly ranked markedness constraint in the interlanguage grammar namely *ComplexCODA. So, the interlanguage ranking in this case (for the deletion process) is:

***ComplexCODA>>MAX-IO, DEP-IO**

However, it can be considered that the 22% for the deletion error pattern out of the 56% of the total errors in pronouncing the –CCC cluster significant ; and thus is worth

to conduct an OT analysis to discover the constraint ranking regarding this type of simplification strategy being applied in repairing the complex –CCC English coda cluster. So we can say that the subjects simplify 22% of the –CCC cluster by applying consonant deletion process. From the data collected most of the subjects prefer to simplify the /- dϴs/ cluster into /- ds/. Thus, we need to introduce the constraint *CCC which sould be ranked above *ComplexCODA to keep triconsonantal cluster from emerging on the surface. Accordingly *ComplexCODA must be demoted as complex coda is still left on the surface. In other ords, the markedness constraint *ComplexCODA has no function in this situation and should be replaced by another constraint, which is *CCC, as complex structure is still emerging into the surface in the form of biconsonantal cluster –CC.

NOTE: the distinction between the two constraints *CopmlexCODA and *CCC can be stated as: The *CCC constraint prohibits a complex structure in the form of triconsonantal cluster -CCC only from emerging into the output, which means that the biconsonantal cluster -CC is allowed. However, the constraint *ComplexCODA prohibits the complex structures demonstrating both forms of clusters –CCC and –CC from emerging into the output , so no complex cluter is allowed at all according to this particular markedness constraint.

An OT analysis of the pronunciation of a –CCC cluster in the word “hundredths” is in Tableau 4.8.

/hʌndrɜdΘs/	***CCC**	**MAX** (C/V___)	**MAX-IO**	**DEP-IO**
a. /hʌndrɜdΘs/	*!			
b. / hʌndrɜdɪΘs/				*!
c. / hʌndrɜdɪΘ/			*	*!
d. /hʌndrɜΘs/		*!	*	
☞ e. / hʌndrɜds/			*	

Tableau 4.8: Ranking Value and the OT Analysis of the Word /hʌndrɜdΘs/ in Arabic-English Interlanguage

In Tableau 4.8 candidate (a) is ruled out because it violates the most dominant constraint *CCC. Candidates (b) and (c) are eliminated as they violates DEP-IO which is equally ranked with the constraint *CCC as both being dominant constraints. Candidate (d) is also eliminated as it violates the constraint **MAX** (C/V___) which penalizes the deletion of salient segment, which is the consonant sound adjacent to vowel segment , as well as it violates the faithfulness constraint MAX-IO. As a result candidate (e) wins to be the optimal output in the interlanguage grammar as it kept the violation to the minimum and exclusively violates the lower ranked constraint MAX-IO to satisfy the dominant constraint *CCC by deleting a consonant segment to reduce the –CCC cluster into –CC cluster. The ranking in this case is:

***CCC>> MAX** (C/V___)**,MAX-IO>>DEP-IO**

4.2.2.3 Substitution

The use of substitution process by the subjects to simplify the complex coda clusters is the least frequent in the pronunciation of all the three types of English coda cluasters as compared to the other two simplification processes discussed above. From the data

recorded, if the biconsonantal cluster –CC is not simplified by epenthesizing a vowel segment to break up the two consonants in the cluster (like what happened with the word / film / → / filɪm /) , such complex structure is being simplified by the subjects through substituting the sound of one of the segments involved in the structure. In this particular strategy the complex coda is preserved in the form of biconsonantal cluster –CC. Thus, the constraint *ComplexCoda has nothing to do in the analysis of this type of error performing sound substitution and the faithfulness constraint MAX-IO is ranked high as the process of deletions is not applied. In other words, the subjects are simplifying some of the biconsonantal coda clusters –CC by changing the sound of one of the segments involved in the cluster without eliminating the cluster by segment deletion or breaking it by vowel epenthesis.

This simplification strategy is the result of a direct transfere from their L1 Arabic. Arabic language does not allow the combination of dentals and alveolars to occur in the final syllable (i.e. in the coda cluster of the permissible CVCC syllable structure in Arabic language); such as /ɵs/ and /ðz/. Thus, if deletion process is not applied and the English -CC cluster which consists of /ɵs/ or /ðz/ is not being reduced, the dental segments /ɵ/ and /ð/ are substituted by the alveolar segment /t/. In this case, not only the place of articulation changed, but also the manner of articulation as it changed from fricative in / ɵ/ and /ð/ to stop in /t/ .So, Arabic speakers prefer to use substitution as a repair strategy to simplify the pronunciation of such English coda clusters. This means that the faithfulness constraint IDENT-IO (place) plays a significant role in this case because it rules out the output candidate which demonstrates a different place of articulation from the input. Also, the additional markedness constraint CodaCon that is formulated to penalize the combination of the dentals and the alveolars to occur at coda position play a considerable role in this grammar. However, the markedness constraint *ComplexCODA has no significant role in this case as the English coda clusters are

preserved and not being to be reduced by deletion nor broken by epenthesis. Accordingy, the faithfulness constraint MAX-IO is ranked highly as deletion is not applicaple for simplification in this particular situation.

An OT analysis of the pronunciation of a –CC coda cluster in the word “clothes” is in Tableau 4.9.

/ klɔðs/	**CodaCon**	**MAX** (C/V___)	**MAX-IO**	**IDENT-IO (place)**
a. / klɔðs/	*!			
b. / klɔs/		*!	*!	
c. /klɔð/			*!	
☞ d. /klɔts/				*

Tableau 4.9: Ranking Value and the OT Analysis of the Word / klɔðs/ in Arabic-English Interlanguage

In tableau 4.9 , the interlanguage grammar chooses the optimal output or candidate (d) as it satisfies the undominated highly ranked markedness constraint **CodaCon** at the expense of the violation of the lower ranked faithfulness constraint **IDENT-IO**. This clarifies that the lowest ranked constraint is violable. Thus, the dental segment is neutralized in a specific context, which is the coda cluster, as a result of a markedness constraint dominating a faithfulness constraint. In other words, the subjects are simplifying the pronounciation of L2 biconsonantal cluster which consists of dental and alveolar segments by applying substitutions strategy. Below is the ranking:

CodaCon, MAX-C>V, MAX-IO, >> IDENT-IO

4.3 Summary

Optimality theory proves to be a suitable framework to account for phonological behaviors involved in simplifying English complex coda clusters. OT shows how these clusters undergo systematic modifications when they are pronounced by the native speakers of Arabic. The employment of a number of markedness and faithfulness constraints is necessary in the examination of the interaction between these two aforementioned constraints resulting in the achievement of the optimal output. The analysis shows that Arabic speakers of English simplify English complex codas in various ways. The simplification process of epenthesis is mostly favored in simplifying the –CC and –CCC coda clusters; therefore, the subjects are breaking these consonant clusters by inserting a vowel segment to resyllabify the word`s structure. Accordingly, the epenthesis process requires the constraint DEP-IO to be ranked lowest to ensure that vowel insertion is the preferred strategy in simplifying the both –CC and –CCC clusters.

Rather than using vowel epenthesis, the data shows that the Arabic speakers of English prefer to apply the simplification process of deletion in simplifying the –CCCC coda cluster. In simplifying the English –CCCC cluster, the subjects delete consonantal segments to reduce the –CCCC cluster into a –CC cluster and then insert a vowel segment to breakup that reduced cluster. So, these two processes, namely, consonant deletion and vowel insertion, which have been applied to simplify the –CCCC cluster, require that the constraints MAX-IO and DEP-IO to be equally ranked as lowest to ensure that consonantal deletion along with vowel epenthesis are needed to simplify the –CCCC coda cluster. Moreover, the data shows significant number of errors concerning the deletion error pattern in pronouncing the –CCC coda cluster. In pronouncing this particular type of coda clusters, the subjects delete one consonant segment from the cluster only and reduce it into –CC cluster. To analyze this case, the new markedness constraint *CCC is introduced to be the dominant constraint instead of

*ComplexCODA while the constraint MAX-IO is required to be ranked lower to ensure that deletion is the preferred strategy to simplify some of the –CCC coda cluster.

Furthermore, in few instances, the subjects do not simplify the English coda clusters in terms of consonantal deletion nor vowel epenthesis but in terms of segmental substitution. In these instances, the subjects do not reduce the complex clusters nor breaking them up but trying to simplify their pronunciations by consonantal substitution when the cluster consists of disallowed combination of a dental segment and an alveolar. For such a case, the constraint IDENT-IO (place) is required to be ranked lowest to ensure that consonantal substitution is the preferred strategy to simplify the pronunciation of those coda clusters. On the other hand, the constraint *ComplexCODA has no significant role as the cluster is not being reduced nor broken up, while the constraint MAX-IO is ranked high because deletion is not being applied for simplification.

Another observation from the data collected is the length of the consonant cluster which results in increasing the frequency of modification strategies usage; 53.8% of the biconsonanal clusters (-CC) were modified, 56% of triconsonantal clusters (-CCC) were modified and 80% of quadriconsonantal clusters (-CCCC) were modified. From the interlanguage pronunciations performed by the subjects, an increase in the length of coda clusters produced a statistically significant increase in the frequency of simplification strategies applied. This observation is discussed in previous studies which hypothesized that L2 learners would simplify more complex forms that are more marked more frequently than less complex ones that are less marked. Weinberger`s (1987) proved this general hypothesis as he examined English word-final codas produced by native speakers of Mandarin and concluded that the frequency of simplification strategies is affected by the length of the consonants in coda clusters. In short, the observation made in this study and Weinberger`s study prove that the

frequency of the syllable simplification strategies increased whenever markedness effect increased.

4.4 Discussions of the Findings

The major finding of this study is that the markedness plays a significant role in the acquisition of L2 forms which should not be underestimated. Previous studies (Broselow 1984 and Monahan 2001) argued that L1 transfer could be responsible for L2 learners' pronunciation errors when they encounter complex consonant clusters; however, L1 transfer effect could be partially responsible as these errors could be also the result of the universal markedness of such complex syllable structures. When the existence of complex clusters in single syllables is prohibited in languages, the most frequent explanation for the difficulty encountered and the errors produced by the speakers of these languages in their L2 is L1 transfer. On the other hand, if speakers of an L1 allows for complex clusters to occur in single syllables also experience difficulty and produce errors in pronouncing such structure in their L2, that would confirm the supposition that there is another factor other than L1 transfer is responsible - at least partially- for such difficulty and error occurrence.

In order to attest this hypothesis, two types of data were collected which are Arabic data and Interlanguage data. The first type of data was collected from the Holy Qur'an which represents the Classical version of Arabic language. This type of data is needed to examine the syllable patterns exhibited in Classical Arabic Language which proves that the structure CVCC is the only syllable pattern in Arabic that consists of complex coda cluster, and which comes to the surface as a result of an interaction demonstrated between a set of universal constraints. Such structure in Arabic is only allowed to surface in pause position; otherwise it is avoided by either word-final vowel insertion or by applying the process of tanween 'nunation' to resyllabify the structure. The second

type of data is collected from the Arabic students (whose mother tongue is Arabic) who attended the ELS center to learn their L2 English. This type of data is needed to attest the interlanguage pronunciation of the English complex coda clusters produced by Arabic speakers in order to attest both the CAH and the MDH assumptions.

The contrastive Analysis Hypothesis would predict that Arabic speakers should have no difficulties and display fewer errors in pronouncing the English biconsonantal–CC coda cluster, while the other more complex English coda clusters (triconsonantal coda cluster -CCC and quadriconsonantal coda cluster –CCCC) would be more difficult to acquire and henceforth they perform more errors in pronouncing them. However, the result of this study does not support this prediction made by the CAH. Although word-final biconsonantal cluster (-CC) occurs in Arabic language, numerous instances of the pronunciation of this cluster by the subjects display vowel epenthesis to break up this type of English coda cluster (-CC) were found. The Arabic speakers encounter difficulty in pronouncing the English biconsonantal coda cluster–CC although it exists in their L1 just like the difficulty they experienced in producing the other two types of English complex coda clusters (-CCC and –CCCC) which do not exist in their L1. This finding supports the notion that the principle of markedness of forms is the pivotal factor in L2 learners` pronunciation errors rather than L1 transfer.

According to Broselow et al. (1998) the L2 learners are constructing "an interlanguage grammar in which the reranking of constraints may differ from native-language ranking. In this case, markedness effects that are not visible in either the native language or the target language may become visible in the interlanguage data" (1998, p.279). Eckman (1977) solves this controversy as he proposed that both L1 transfer factor and the factor of universal principles of markedness should be considered in investigating interlanguage production of an L2. The theory is adjusted into a central

point position in which both L1 transfer an UG are considered fundamental factors in the process of Second Language Acquisition.

Beyond adding to studies that confirm the MDH and focus on the universal principle of markedness in examining interlanguage phonology, this study also contributes to the theoretical studies applying OT. It also supports and confirms the validity of using OT framework in analyzing interlanguage data because OT clarifies the different roles played by markedness and faithfulness constraints in determining the optimal output forms in the interlanguage grammar. The results of this study show that the unmarked forms is mostly preferred by the subjects, the interlanguage OT grammar is set to favor markedness constraints over faithfulness constraints. In this study the interlanguage grammar displays a constraint ranking which favors markedness constraints over the faithfulness constraints in order to keep complex coda clusters from surfacing:

***ComplexCODA, *CCC >> Faithfulness (MAX-IO, DEP-IO and IDENT-IO)**

NOTE: the previous ranking is applicable only for the simplification processes of segmental deletion and vowel epenthesis where the complex structures consist of complex coda clusters being simplified by eliminating the complex cluster either by deletion or by vowel insertion. On the other hand, the ranking is not applicable for the third type of simplification strategy which consists of segmental substitution because there is no actual elimination of the complex structure (in the form of biconsonantal cluster-CC) which is being simplified only by changing the sound of one segment involved in the cluster while preserving the structure of a –CC cluster.

Furthermore, this study explains how the framework of OT combines very well with the MDH in analyzing the interlanguage phonology.

Focusing on universal principles and providing results supporting that markedness are the major factors behind the formation of interlanguage structures. This study adds

to the studies in the field of second language acquisition which concerns the issue of whether learners of L2 have access to Universal Grammar, which is the system of universal rules and principles of human language acquisition that the individual uses when developing his/her L1. Those who favor the CAH with its transfer-based approach would claim that learners of L2 do not have access to UG as they rely totally on their L1 in their acquisition of L2. This implies the following:

> As L2 learners have no access to UG and that they acquire their L2 through their L1, they have difficulties with those L2 structures that are not revealed in their L1; thus, they display errors as they alter those L2 forms and structures to make it allowable by their L1. On the other hand, if L2 learners have direct access to UG, which accordingly contains the universal markedness and faithfulness constraints as well as the universal markedness principles, then they might display errors when pronouncing universally marked structures even if these structures are allowable in their L1.

The investigation and analysis presented in this thesis provide evidence that despite the marked structure of CVCC exhibited in learners` L1 (Arabic), they still make errors in pronouncing this structure in their L2 (English). This could be interpreted that this study supports the notion that learners of L2 may have direct access to UG and at least indirect access to L1.

Moreover, there is a fact about English consonant clusters in coda position which should be considered. These types of English consonant clusters are, in their entirety, cumbersome even for the native speakers of English (Celec-Murcia, Brinton & Goodwein, 1996). Thus, the English native speakers themselves are using simplification methods to solve these complex structures in order to ease their pronunciation,

especially in connected speech. For example the triconsonantal coda cluster /skt/ in the word *asked* is reduced to biconsonantal coda cluster /st/ in /æst/. It is not surprising that ESL learners use simplification strategies in pronouncing such English clusters. However, the simplification methods used by the native English speakers are accepted by other speakers of English as they are randomly chosen and hence they do not affect the meaning of words. For example, they are not omitting the morphemes which carry meanings significant in the context. On the other hand, ESL learners do not have the command or skills which enable them to be aware of how to use these simplification methods in a complex structure without affecting its meaning.

CHAPTER FIVE

Summary and Conclusion

5.0 Summary

Chapter 1 provides the introduction of the issues discussed in the thesis. These issues involve two hypothesis regarding Second Language Acquisition and interlanguage phonology, which are: CAH (Lado 1957) and MDH (Eckman 1977). The chapter also presents the theoretical background of OT and its constraints and constraints interaction technique along with explanations on the syllable and the syllable structures in English language and Arabic language. In Chapter 2, previous studies are analyzed through OT framework and by discussion relating them to the current study. It also presents studies that demonstrate the OT analysis on issues concerning syllable structure and syllabification to prove the adequacy of OT in analyzing such phonological issues. Chapter 3 provides the methodology of the research. This chapter presents the procedures of data collection such as the Arabic type of data concerning the coda syllable clusters which had been collected from the main source of Classical Arabic (i.e the holy Qur'an), and the interlanguage data which had been collected from the readings of Arabic native speakers of L2 English words containing word-final coda clusters. Chapter 4 provides an OT analysis on Arabic data to examine the paradoxical issue regarding the occurrence of the CVCC structure in Arabic. The chapter also introduces an OT analysis on interlanguage data in order to examine the constraint re-ranking, the simplification strategies used to simplify the English complex coda clusters, and to investigate the effective role of markedness in L2 syllable errant pronunciation. Forms containing word-final coda clusters were emphasized in the analysis, as it was not within the scope of the thesis to cover all other types of consonant clusters. Chapter 5 is the last chapter of the thesis which is constructed to conclude the study. This fifth

chapter provides a conclusion of the result gained from the findings, suggesting implications and ideas for further researches in the field of interlanguage phonology.

5.1 Conclusion

This thesis discusses the interlanguage pronunciations of all the three types of the English complex coda clusters (-CC, -CCC and –CCCC) by the native speakers of Arabic who learn English as their L2. These complex coda clusters undergo multiple types of modification or simplification strategies in order to simplify them. These simplification strategies involved are vowel epenthesis, consonant deletion and consonant substitution. The analysis of the subjects` use of each strategy is conducted within the framework of Optimality Theory to explain the origin and the choice of each strategy as well as examining the role of universal markedness in second language acquisition process.

Previous studies like Broselow`s (1984) following the CAH found that the difficulty experienced and the errors made by L2 learners of a target language were largely predictable based on the syllable patterns and structures exhibited in the learners` native language (L1). According to this hypothesis, the following can be predicted:

> While English allows complex coda clusters, Classical Arabic uses the process of vowel insertion at word-final position or the process of tanween 'nounation' to break up or to avoid consonant cluster; hence, when Arabic speakers encounter English words containing word-final complex coda clusters, they transfer the strategy of word-final vowel insertion and tanween to break up consonant clusters from the classical version of their native language to their L2 (English).

However, the data show that the subjects do not transfer their L1 strategies to avoid the complex coda consonant clusters form surfacing when they try to simplify such structures in L2 (English). One alternative to the CAH regarding the difficulty and pronunciation errors in syllable structures is the MDH which focuses on the universal principles of the markedness of forms. MDH states that the level of difficulty that an L2 learner experiences while acquiring an L2 structure depends on the markedness of that structure. Furthermore, Universal Principles proposed by Eckman (1977) suggests that existence of the complex structure in the speakers` L1 would not eliminate the difficulty experienced by the speakers in acquiring their L2 because it is a universally marked structure. Studies such as Ostapenko`s (2005) where speakers of L1(English) that allows more complex syllable structures still made errors in pronouncing L2 Russian syllable structures just like other speakers of L1s that prohibit the existence of complex syllable structures. Such studies support that markedness plays a major role in interlanguage syllable phonology.

5.2 Implications

5.2.1 Pedagogical Implications

The results of this study may serve as a helpful guide for ESL teachers on how to help L2 learners of English to overcome obstacles that they may encounter in learning in English. The results gained from this study indicates that not all the pronunciation errors due to L1 transfer but also the universal principle of markedness of forms plays a major role in contributing to such difficulty and errant production. The findings of this study helps the ESL instructors to have a better understanding on L2 English learners` errant pronunciation of the complex word-final coda clusters. Moreover, the study serves as a guide for teacher as well as L2 instructors and course designers to consider the UG principles` effect along with L1 transfer`s effect in constructing methods and

materials for teaching in order to improve the pronunciation skills of L2 learners. Thus, the results of this study imply that pronunciation –especially for complex coda clusters- needs to be formally taught to ESL learners. The curriculum must involve pronunciation instruction so that teachers will be prepared to create activities in the class to help ESL students in solving their problems in pronunciation. It is important for English language learners to be aware of the nature of their pronunciation difficulty with consonant clusters. They should also know that inaccurate pronunciation of these structures makes it difficult for the native speakers of English to understand them especially in cases where ESL learners insert segments to break up the clusters or delete segments to reduce them.

5.2.2 Methodological Implications

This Study provides an implication that L2 data which had been previously analyzed following the CAH approach or applying non-OT of analysis to determine whether the framework of OT can provide a more markedness-based explanation for these data. In short, the main implication of this thesis is that the effective role played by the universal principle of markedness in L2 learners' productions of syllable structure should not be underestimated.

5.3 Further researches and studies

Chapter 4 presents an OT analysis which exhibits a hierarchy of constraints that are related in analyzing the interlanguage errors in Arabic speakers` pronunciation of L2 (English) words containing word-final complex coda clusters. Thus, it exceeds the limitation of this thesis to cover Arabic speakers` pronunciation of other types of English consonant clusters, such as word-initial consonant clusters and word-medial consonant clusters. It is suggested that future studies must employ an OT analysis for the other types of consonant clusters that are not covered in this thesis.

Moreover, the OT analysis provided in this study does not involve a comparison between tableaux of interlanguage pronunciations and tableaux of native-like pronunciations of these words in order to establish the difference between the constraint hierarchy for the interlanguage pronunciation and the constraint hierarchy for Standard American English pronunciation. Thus, future studies might be conducted to compare the tableaux of Arabic native speakers` pronunciation of the word-final coda clusters to tableaux of Standard American English pronunciation.

In order to add additional evidence in supporting to the significant role played by markedness in L2 learners production, additional OT analysis of L2 production in a wider variety of languages are recommended to be done. This study focuses exclusively on Arabic speakers learning their L2 (English), but in order to discuss L2 pronunciation of syllable structures cross-linguistically, pronunciations of L2 learners whose first languages come from different language families should be investigated and analyzed.

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APPENDIX A

The Arabic words containing CVCC syllable structure

	After the deletion of the short vowel	After the resyllabification	Gloss
.fas.lɪ	.fas.l	.fasl.	'decision'
.Xal.qu	.xal.q	.xalq.	'creation'
ʔl.ʔar.da	ʔl. ʔar.d	ʔl.ʔard.	'the earth'
ʔn.nax.la	ʔn.nax.l	ʔn.naxl.	'the palm'
.ʃam.su	. ʃam.s	. ʃams.	' the sun'
.mɪs.ku	. mɪs.k	. mɪsk.	'the musk'
.nadʒ.mu	. nadʒ.m	. nadʒm.	'a star'
.sab.rɪ	.sab.r	.sabr.	'patience'
.qad.rɪ	.qad.r	.qadr.	'decree'
ʔl.fadʒ.ri	ʔl.fadʒ.r	ʔl.fadʒr.	' the dawn'

APPENDIX B

Purpose Letter

UNIVERSITY OF MALAYA

UM.T/606/01(a)
20 October 2010

TO WHOM IT MAY CONCERN

Dear Sir/Madam,

RESEARCH FOR MASTER'S STUDENT

This is to confirm that *Mrs. Ala'a Mohammed Amin Turkustani,* Passport No. I 482023 and Matric No. TGB 080043 is a registered student for the programme of Master of English as a Second Language at the Faculty of Languages and Linguistics, University of Malaya. She has been registered since semester I academic session 2008/2009

She is required to write a dissertation to fulfill the requirements of the degree. We would appreciate it very much if she is allowed to carry out a questionnaire survey, conduct interviews and collect data at your place as part of his research work.

We thank you for your cooperation.

Yours sincerely,

DR. JAWAKHIR MIOR JAAFAR
Deputy Dean (Postgraduate Studies and Research)
Faculty of Languages and Linguistics

SNM/nb.

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APPENDIX C

Consent Letter

I am the researcher: **Ala`a Turkustani**, a Master's degree student at the Faculty of Languages and Linguistics, University Malaya.

I would like to ask you for agreeing to participate in a research conducted and presented to University Malaya which is considered to be a partial requirement for the fulfilment of a Master's degree in English as a Second Language.

The research is requiring collecting data which is in a sort of reading recording of lists of words and sentences consisting of certain grammatical categories under investigation, which is under the title of:

Optimality Theoretic Approach in Analyzing Coda Consonant Clusters in Arabic-English Interlanguage.

Hereby, I am, the researcher, adhering to:

1- Save the privacy of each subject participated in the study as he/she has the right to choose any nickname referring to him/her.
2- No one other than the researcher himself and his supervisor will listen to the recordings.
3- All the recordings will be destroyed after finishing the referred study.
4- Every participant is welcomed to have a look at the research results after finishing the study if he/she would like to.

Subject signature: Date:

Researcher signature:

Appendix D

English words contain word-final complex coda clusters

Lumps

Triumphed

Tempts

Shamed

Depths

Harped

Accepts

Verbs

Fifths

Twelfths

Craft

Proved

Waves

Cloths

Breathes

Tenth

Almonds

Hundredths

Milts

Amidst

Chased

Thirsts

Dusk

Amazed

Filmed

Matched

Judged

Washed

Longed

Strengths

Sprinkles

Scrambled

Sixth

Contexts

He changed his clothes before six o'clock.

They watched this film for the twelfth time.

These mugs contain cold milk.

I cocked mashed potato for lunch.

She altered her pants with a skirt.

They`ve been robbed when they camped at the jungle last night.

Our beliefs and instincts guide us through life.

She seemed to be so concerned about him when she hugged him tightly.

He helped her when she was about to fall from the edge of that punch.

Snow-white and the seven dwarfs are nymphs.

Yesterday, the farmer cleaned the field and milked the cows

The dog yelped when I touched its burns.

We wore masks and clothed in black at the party.