

THE ALTERNATION OF VOCAL SOUND OF ENGLISH LOAN WORDS EXPRESSION INTO ARABIC¹

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Abstract

This research describes alternation of vocal sound, contrastive study of vocal sound from English into Arabic. The objects of the research are Arabic dictionaries such as *Al-Mawrid: A Modern English Arabic Dictionary* (2009) by Munir Ba'albaky, *Munawwir Digital Program Version 1.1 Al-Wustho Digital Publishing* (Munawwir, 2010), *Atlas English-Arabic* (Team of Atlas Dictionary, 2005), online newspaper *Al-Ahram* and *Al-Jazeera* published from 1st to 30th June 2011. However, the formal objects are expression of science and technology, covering 10 field of study; astronomy, biology, pharmacy, physics, geography, health, chemist, math, farming, and information communication technology. The distributional method and identity method apply in the data analysis.

The research concludes that the alternation of vocal sound of loan word expression from English into Arabic is likely close to the original sound including both the pitch position of tongue and the effects of consonant sounds prior and latter of the vocal sounds. On the other hand, there are several alternation of vocal sounds which are not identical in the case of pitch points of tongue nor the effects of consonant sound prior to and latter from the vocal sounds. Thus, the sound alternation tends to be arbitrary such as the sound [ɛ] into [u:], sound [æ] into [u] and sound [ə] into [u:].

Key words : vocal sound alternation, expressions of English loan words, articulation point.

A. Introduction

Language is a mean of communication produced by human articulation organs. In communication, there is a process of sending and receiving messages. The intense interaction among speakers seemingly promote language contacts, and one of the result of such process is language assimilation.

The borrowing process of foreign language into Arabic has occurred far before the revelation of Al-qur'an when Arabic has been modified by other languages

such as Habsyah, Greek, Latin, Ibrani, Suryani, Indian, Persian, and Turks (At-Tunjī, 2005: 90). Language assimilation becomes more intensive during the conjunction between West and East starting from Libanon. This country has connected with Eastern countries since the seventh century. The mile stone in the history of modern Middle East is the expedition of Napoleon to Eigyp in the year of 1798. This exspedition promoted *Egyptology* that develop the consequitive relation between Eigyp and Arab world since the nineteenth century (Chejne, 1996: 104). Such relation finally affected the words used in Arabic. The process of assimilation is indispensable during social life, economics, technology, and politics. Based on data, English load word expressions are mostly borrowed in the fields of pharmachy, phisycs, and chemistry. The reason behind that phenomenon is that the expressions are the terms based on convention of international scholars to ease communication.

The development of Arabic language from the assimilation of English expressions results some consequences due to language characteristics such as English sounds that do not exist in Arabic. After English expressions are borrowed into arabic, the sounds follow the patterns in Arabic. Based on the previous explanation, this article tries to analyse the alternation of vocal sound from English into Arabic and describes the characters of the alternation.

B. Theoretical Framework

1. Theory of Language Interaction

Language interaction is an exchange process of two languages by the natives. From this process, there is a transfer of language elements into another language from all aspects including word borrowing from one into another language (Hockett, 1958: 402-406). The borrowing and influencing process are irresistible. The influence of a language into another one is diffusion and culture acculturation (Weinreich, 1953:5). If it is analyzed from acculturation indication, the elements of a foreign language will actually be accommodated and integrated into the target language without losing its foreign characteristics. This is the cause of the transformation in the vocabulary of the target language. Crowley (1987: 191-200) argues that the factors of transformation of certain language includes: 1)

anatomy and ethnic character; 2) climate and geography; 3) substratum; 4) local identification; 5) functional need; 6) simplification; and 7) structural pressure.

In terms of word borrowing, Haugen (1950:286) defines it as: “attempted reproduction in one language of patterns previously found in another” Moreover, he clarifies that the result of borrowing becomes *loanwords*, *loan blends* or *hybrids*, and *loan shifts*. *Loan shifts* covers *loan translations* and *semantic borrowings*. Meanwhile, *loanwords* is the result of morphemic import without morphemic substitution but with or phonemic ones. *Loan blends* is a combination of substitution and morphemic import, but the structure follows the form of original words. *Loan blends* is also called *hybrids*; a borrowing combination that has different structure from the original word. *Loan blends* can be divided into three types namely 1) *blended stem*; 2) *blended derivative* (suffixes of original words replace the target language); and 3) *blended compound* (Haugen, 1950: 219).

2. The Principles of Vocal Alternation in Arabic Institution

Arabic countries have *Majma‘ al-Lughah* that is basically intended to manage the growing and development of Arabic as part of knowledge language and scientific studies. In the 26th congress of 1959, *Majma‘* Cairo made 23 principles to internalize letters and sounds of Greek and Latin into Arabic. Meanwhile, in the 30th congress of 1963, it created principles of vocal and sound alternation (Khasārah, 2008: 238). The vocal alternation can be seen in the following table.

Table 1. The principles of vocal alternation

Arabic Articulation	Samples of Foreign Words	Sound Comparison in Arabic	Latin Sounds	
مسينيون	massignon	فَتْحَة	A	1.
هيجو , هوجو	hugo	ي, و	U	2.
جب	hugo	كَسْرَة	I	3.
لالاند	laland	ا	A	4.
لوقوا	louvois	و	Ū	5.
أسكولى	ascoli	ي	I	6.
أكسفورد	oxford	و (ضَمَّة مُفَحَّمَة)	O	7.

فولتير	voltaire	ي (بإمالة)	ei, ai	8.
نيتشه	nitzshe	ة (في نهاية الكلمة)	E	9.
لوبي:	lybia	و	Y	10.

C. Research Method

1. Primary Data

This research limits the scope focusing on the English loanwords in the field of science and technology. The writer opts those fields of study because they belong to the most developed field from many different angles. The material object of this research is the Arabic dictionary such as: *Al-Mawrid: A Modern English Arabic Dictionary* (2009) by Munir Ba'albaky, *Munawwir Digital Program Version 1.1 Al-Wustho Digital Publishing* (Munawwir, 2010), *Atlas English-Arabic dictionary* (team of Atlas dictionary, 2005), online newspaper *Al-Ahram* and *Al-Jazeera* that are published from 1 to 30 June 2011. However, the formal objects are words of science and technology, covering 10 fields of study; astronomy, biology, pharmacy, physics, geography, medical, chemist, math, farming, and information communication technology. The reasons behind those ten fields of study are 1) those fields become the foundation of science such as math, biology, physic, and chemist; 2) Those fields generally have a conjunction with human life such as astronomy, pharmacy, medical, farming, and geography; 3) The third reason relates to the globalization era in which information from all over the world can be immediately accessed by using information communication technology. In this case, language functions as a communication tool that its development is influenced by the development of science and technology.

2. Data Collection

The first step in this research is data collection of loanwords in the field of science and technology. In relation to that, the data collection number of either loan or non-loanwords are 1824 items derived from the field of astronomy (320), geography (101), farming (46), biology (282), physic (224), chemist (149), medical (258), math (210), pharmacy (101), and technology information system

(133). The data is populated by reviewing and taking a note on the assumption that the words originated from English. Respectively, the researcher checks up their articulation in the dictionary of Merriam Webster Atlas *English-Arabic* (2005). To get the phonemic transcription data from English words, the writer occupies interview technique from English and Arabic native speakers. At the end, the final data are input and tabulated in a computer.

3. Data Analysis

At this stage, the writer applies distributional method to analyze the data. The distributional method is an analysis method that uses language elements or the correlation between its language phenomena as the determiner. The description of this method is visible in the analysis technique of deconstruction upon its smallest lingual particles. This method is occupied to analyze the sound transformation of English words into Arabic one based on phonemic transcription certified by IPA (The International Phonetic Alphabet). The method deconstructs the sound transformation from English into Arabic. To reveal all issues involving English and Arabic, the writer occupies the method of translational similarity. This method is used to compare research elements which is analyzed in Arabic by using the matching tools of English elements.

D. Analysis of Sound Alternation

Based on the data collection, the writer will explain about the analysis of vocal sound alternation of English expressions into Arabic based on IPA (International Phonetic Alphabet). Basically, Arabic has 28 consonants and 6 vocals (Abbound, 1996:2). Among the 28 consonants, there are 15 consonant that have similar sounds in English namely [d], [w], [b], [n], [ð], [t], [f], [j], [m], [θ], [s], [z], [ʃ], [k], [dʒ]. Based on the data, the sounds [b], [d], [f], [h], [k], [l], [m], [n], [r], [t], [w], [z], [j], [ŋ] from English expressions do not change their sounds in Arabic including pre, mid, and post word distribution.

The vocal sound alternation of English loan word expression into Arabic will give the details in the following discussion:

1. Pre vocal sound alternation [i] into [i:], [ijjah].

Sound alternation [i] into alternated sounds can be best described in the following table:

Table 2. Sound symbol [i]

Original sound	Arabic Sound Alternation		
	Sound	Symbol	Description
[i]	[i:]	ي + َ	[i] Pre upper vocal sound is firm, not round with additional duration of suprasegmentally phoneme.
	[ijjah]	ية + َ	[i] pre upper vocal sound is firm, not round [j] approximate consonant sound of palatal voice [a] pre lower vocal sound is loose, not round [h] fricative glottal consonant vocal

Sound [i] amid the word *gasoline* [gæsəlin] is articulated with [i:] in the word غازولين [ɣa:zu:li:n]. Sound [i:] is pre upper vocal, firm, not round with additional duration of suprasegmentally phoneme. In the word غازولين [ɣ a:zu:li:n], sound [i] is articulated with [i:] because of pattern adjustment of post syllables; consonant-vocal-consonant (CVC). The additional duration of suprasegmentally phoneme of sound [u] is due to its position before the end of the word, so the vowel synchronization appears as in Arabic sound patterns. Based on the data, sound alternation [i] into [i:] is likely affected by prior consonant sounds that have articulation points in alveolar area. The sample expressions of sound alternation [i] into [i:] are presented in the following table:

Table 3. Sound alternation [i] into [i:]

No	Distribution	English	Phonemic Transcription	Arabic	Orthographic Transcription	Phonemic Transcription	Sound Alternation
1	Mid	astatine	[æstetɪn]	أستاتين	Astātīn	[asta:ti:n]	i → i:
2		panchromatic	[pɛŋkɒmɒtik]	بانكروماتي	bānkurūm ātiy	[baŋkrɔ:mati:jj]	i → i:
3		langley	[læŋli]	لانغلي	Langalī	[lanyali:]	i → i:

The word بانكروماتي in the table does not follow the principle of Arabic phono tactic because the vowel synchronization does not exist in 3 consonant [ŋ], [k], [r] that bound without vocal interruption. On the other hand, the rest of words in the table have followed the principle of phono tactic in which the characters come from different articulation points. They do not appear in the four consecutive vowel characters and have vowel synchronization.

Sound [i] at the end of words is pronounced with [ijjah] as in the word *telescopy* [tɛləskɔpi] into تلسكوبية [tilisku:bijjah] because sound [i] in such circumstance depicts adjective. Thus, it should be pronounced [ijjah] in Arabic. The table below exemplifies the sound alternation [i] into [ijjah]:

Table 4. Sound alternation [i] into [ijjah]

No	Distribution	English	Phonemic Transcription	Arabic	Orthographic Transcription	Phonemic Transcription	Sound Alternation
1	Post	Telescopy	[tɛləskɔpi]	تلسكوبية	Tiliskūbiyyah	[tilisku:bijjah]	i → ijjah

2. Pre vocal sound alternation [ɪ] into [i], [i:], [jah]

Sound alternation [ɪ] into alternated sounds are shown in the table below:

Table 5. Sound symbol [ɪ]

Original sound	Sound Alternation in Arabic		
	Sound	Symbol	Description
[ɪ]	[i:]	ي + <u>ـ</u>	[i:] pre upper vocal sound is firm, not round with additional duration of suprasegmentally phoneme
	[jah]	ية	[j] approximate vocal sound of voice palatal [a] pre lower vocal sound is loose, not round [h] consonant sound of fricative glottal

Sound [ɪ] in the beginning of word *yttērbic* [ɪtərbik] is articulated with [i:] in the word إيتريومي [i:tarbiju:mI]. Sound [i:] is pre upper vocal. It is firm and not round with additional duration of suprasegmentally phoneme. In the word إيتريومي [i:tarbiju:mI], sound [ɪ] is pronounced with [i:] because both of them belong to pre vocal sound and the mouth shape is not round. Their difference is in the pitch position of tongue and its stricture. Sound [ɪ] is in the tongue position of upper below. Meanwhile, sound [i:] is in the tongue position of upper high. Sound [ɪ] belongs to semi close stricture. Whereas, sound [i:] is close stricture. Based on the data, sound alternation [ɪ] into [i:] is likely affected by the prior consonant sound that has the articulation point in alveolar area including pre and mid distribution. The following table enlists the sample words of sound alternation [ɪ] into [i]:

Table 6. Sound alternation [ɪ] into [i:]

No	Distribution	English	Phonemic Transcription	Arabic	Orthographic Transcription	Phonemic Transcription	Sound Alternation
1	pre	yttērbous	[ɪtərbɔs]	إيتريومي	ītarbiyūmī	[i:tarbijɔ:mI]	ɪ → i:
2		ytttric	[ɪtrik]	إيتريومي	ītarbiyūmī	[i:tarbijɔ:mI]	ɪ → i:
3		yttrium	[ɪtriəm]	الإيتريوم	ītaryūm	[i:tərju:m]	ɪ → i:

Sound [ɪ] amid the word *helicon* [həlɪkan] is pronounced with [i:] in the word هليكون [hali:ku:n]. Based on the data, sound alternation [ɪ] into [i:] is likely affected by prior consonant sound that has the articulation point in alveolar area including pre and mid distribution. The following table exemplifies the sound alternation [ɪ] into [i]:

Table 7. Sound alternation [ɪ] into [i:]

No	Distribution	English	Phonemic Transcription	Arabic	Orthographic Transcription	Phonemic Transcription	Sound Alternation
1	Mid	harmonic	[harmanɪks]	هرمونيقا	harmūnikā	[hɔrmu:ni:ka:]	ɪ → i:
2		electronic	[ələktranɪk]	ألكتروني	aluktrūnī	[aluktru:ni:]	ɪ → i:
3		chlorophyll	[klɔrəfɪl]	كلوروفيل	kalūrūfīl	kalu:ru:fi:l	ɪ → i:

Sound [ɪ] at the end of words is pronounced with [jah] as in the word *clinically* [kli:nɪkællɪ] into إكلينيقية [ikli:nikijjah] because sound [ɪ] at the end of such word shows adjective. Thus, it should be pronounced with [jah] in Arabic. The following sample describes the sound alternation [ɪ] into [jah]:

Table 8. Sound alternation [ɪ] into [jah]

No	Distribution	English	Phonemic Transcription	Arabic	Orthographic Transcription	Phonemic Transcription	Sound Alternation
1.	Post	clinically	[kli:nɪkællɪ]	إكلينيقية	iklīnīkiyyah	[ikli:nikiya:]	ɪ → jah

3. Pre vocal sound alternation [e] into [i], [a], [a:].

Sound alternation [e] into alternated sounds can be best described as in the following table:

Table 9. Sound symbol [e]

Original Sound	Sound Alternation in Arabic		
	Sound	Symbol	Description
[e]	[i]	ـِ	[i] pre upper vocal sound is firm, not round
	[a]	ـَ	[a] pre lower vocal sound is loose, not round
	[a:]	ـِ+ـَ	[a] pre lower vocal sound is loose, not round with additional duration of suprasegmentally phoneme

Sound [e] amid the word *technology* [teknɒlədʒɪ] is pronounced with [i] in the word تكنولوجيا [tiknu:lujja:]. Sound [i] is pre upper vocal, and it is firm, not round. In the word تكنولوجيا [tiknu:ludʒija:], sound [e] is pronounced with [i]

because it is distributed in the middle of the word. Vocal [e] does not exist in Arabic, so it is pronounced with the identical one of sound [e] in English i.e. [i]. Both sound [e] and [i] belong to pre vocal. Their difference lies on the pitch points of tongue and stricture. Sound [e] relates to the upper mid position of tongue. Meanwhile sound [i] occurs in the upper position of tongue. Sound [e] belongs to semi close stricture. While, sound [i] is in the group of close stricture. Based on the data, sound alternation [e] into [i] is likely affected by the prior consonant sound that has the articulation point in alveolar area. The samples of sound alternation [e] into [i] are shown in the table below:

Table 10. Sound alternation [e] into [i]

No	Distribution	English	Phonemic Transcription	Arabic	Orthographic Transcription	Phonemic Transcription	Sound Alternation
1	Mid	ergosterol	[ərgosterol]	أرغوستيرول	urgūstirūl	[urghostirɔ:l]	e → i
2		television	[teləvizhən]	تلفزيونية	Tilifizyūniyyah	[tilifizju:nija:]	e → i
3		technology	[teknɒlədʒɪ]	تكنولوجيا	tiknūlūjiyā	[tiknu:lujija:]	e → i

Sound [e] amid the word *cable* [kəbəl] is pronounced with [a] as in the word كَبْل [kabl]. Sound [a] is pre lower vocal, and it is loose, not round. In the word كَبْل [kabl], sound [e] is articulated with [a] because of the pattern adjustment of the word فَعْلٌ and distributed in the middle of the word. Vocal [e] does not exist in Arabic, so it is articulated with the identical one of sound [e] from English expression; [a]. Sound [e] and [a] belong to pre vocal sound. Their difference is on the pitch points of tongue and stricture. Sound [e] belongs to the upper mid vocal position of tongue and semi close stricture. Meanwhile, sound [a] is a vocal with a lower position of tongue and open stricture. Based on the data, sound alternation [e] into [a] is likely affected by the latter consonant sound that has the articulation point in the area of bilabial. The following table shows the sound alternation [e] into [a]:

Table 11. Sound alternation [e] into [a]

No	Distribution	English	Phonemic Transcription	Arabic	Orthographic Transcription	Phonemic Transcription	Sound Alternation
1	Mid	cable	[kəbəl]	كَبَل	Kabl	[kabl]	e → a

Sound [e] amid the word of *vanadic* [vənədik] is articulated with [a:], in the word فاناديومي [fa:na:dijumI]. Sound [a:] is pre lower vocal. It is loose and not round with additional duration of suprasegmentally phoneme. In the word فاناديومي [fa:na:dijumI], sound [e] is articulated with [a:] in order to adjust the syllable patterns CV in the prior sound *va* [və] that is articulated with فا [fa:] in the same pattern of CV. Sound [e] and [a:] belong to pre vocal sounds. Based on the data, sound alternation [e] into [a:] is likely affected by the prior and latter sounds that have the articulation point in the area of alveolar. The sample expressions below show the sound alternation [e] into [a:]:

Table 12. Sound alternation [e] into [a:]

No	Distribution	English	Phonemic Transcription	Arabic	Orthographic Transcription	Phonemic Transcription	Sound Alternation
1	Mid	hydrate	[həjdret]	هَيْدْرَات	Hidrāt	[hədra:t]	e → a:
2		vanadic	[vənədik]	فاناديومي	fānādiyūmī	[fa:na:dijumI]	e → a:
3		radiological	[rədiələdʒɪkəl]	راديولوجي	rādiyūlū jiy	[ra:dijɔ:lu:dʒI]	e → a:

4. Pre vocal sound alternation [ɛ] into [i], [i:], [a], [a:], [u], [u:].

Sound alternation [ɛ] into alternated sounds can be depicted in the following table:

Table 13. Sound symbol [ɛ]

Original Sound	Sound Alternation in Arabic		
	Sound	Symbol	Description
[ɛ]	[i]	ا or ي	[i] pre upper vocal sound is firm, not round
	[i:]	ي + ₋	[i] pre upper vocal sound is firm, not round with additional duration of suprasegmentally phoneme
	[a:]	ا + ₋	[a] pre lower vocal sound is loose, not round with additional duration of suprasegmentally phoneme
	[a]	أ or إ	[a] pre lower vocal sound is loose, not round
	[u:]	و + ₋	[u] post upper vocal sound is loose, round with additional duration of suprasegmentally phoneme

Sound [ɛ] in the beginning and amid English words are articulated with [i] in Arabic. Sound [i] is part of pre upper vocal. It is firm, not round. In the expression *eczema* [ɛksəmə] articulated into اِكْزِمَا [ikzi:ma:], sound [ɛ] becomes [i] because it begins the word, and such vocal does not exist in Arabic. Therefore, it is articulated with the identical one of sound [ɛ] in English; [i]. Sound [ɛ] and [i] belong to pre vocal sounds. Their difference is on the pitch points of tongue and stricture. Sound [ɛ] is in the group of pre vocal with mid position of tongue and semi stricture. While, sound [i] is pre vocal with upper position of tongue and close stricture. Based on the data, sound alternation [ɛ] into [i] is likely affected by the latter consonant sound that has the articulation point in alveolar area. The following samples represent the sound alternation [ɛ] into [i]:

Table 14. Sound alternation [ɛ] into [i]

No	Distribution	English	Phonemic Transcription	Arabic	Orthographic Transcription	Phonemic Transcription	Sound Alternation
1	pre	estrogen	[ɛstrədʒən]	إستروجين	īstarūjīn	[īstaru:dʒi:n]	ɛ → i
2	mid	heliograph	[hɛljugrəf]	هليوغراف	hilyūgrāf	[hilju:ɣra:f]	ɛ → i
3		heliometer	[hɛlyumitər]	هليومتر	hilyūmitr	[hilju:mitr]	ɛ → i
4		helium	[hɛliəm]	هليوم	hilyūm	[hilju:m]	ɛ → i

Sound [ɛ] amid the word *chemist* [kɛmɪst] is pronounced with [i:] in the word كيميائي [ki:mija:I]. Sound [i:] is upper vocal sound. It is firm, not round with additional duration of suprasegmentally phoneme. In the word كيميائي [kalu:liʃtu:l], sound [ɛ] is articulated with [i:] because its distribution is in the middle of the word and such vocal does not exist in Arabic. Consequently, it is pronounced with the identical one of sound [ɛ] in English; [i:]. Based on the data, sound alternation [ɛ] into [i:] is in the tendency of being affected by the latter consonant sound that has the articulation point in bilabial area. In the following table, there are samples of sound alternation [ɛ] into [i:]:

Table 15. Sound alternation [ɛ] into [i:]

No	Distribution	English	Phonemic Transcription	Arabic	Orthographic Transcription	Phonemic Transcription	Sound Alternation
1	Mid	chemism	[kɛmɪzəm]	كيميائية	kīmiyā'iyya h	[ki:mija:ijjah]	ɛ → i:
2		chemurgy	[kɛmurjɪ]	كيمارجيا	kīmiyārujiyā	[ki:mija:rɔjj a:]	ɛ → i:
3		rubella	[rʊbɛlə]	روبيلا	Rūbīlā	ru:bi:la:	ɛ → i:

Sound [ɛ] amid the word *centigram* [sɛntɪgræm] is articulated with [a] in the word السنتيغرام [as-sənti:grɔ:m]. Sound [a] is part of pre lower vocal sound. It is loose and not round. In the word السنتيغرام [as-sənti:grɔ:m], sound [ɛ] is pronounced with [a] because its distribution is in the middle of words and vocal [ɛ] does not appear in Arabic. So that, it is articulated with the identical one of sound [ɛ] in English; [a]. Both sound [ɛ] and [a] belong to pre vocal sound. Their difference is in the pitch point of tongue and stricture. Sound [ɛ] is in the group of pre vocal with the middle position of tongue and semi open stricture. Whereas, sound [a] is part of pre vocal, lower position of tongue, and open stricture. Based on the data, sound alternation [ɛ] into [a] tends to be affected by prior and latter consonant sounds that have the articulation point in the area of alveolar. The following table displays the samples of sound alternation [ɛ] into [a]:

Table 16. Sound alternation [ɛ] into [a]

No	Distribution	English	Phonemic Transcription	Arabic	Orthographic Transcription	Phonemic Transcription	Sound Alternation
1	mid	celluloid	[sɛlələjd]	سليوليد	saliyūlīd	[salju:li:d]	ɛ → a
2		cellulose acetate	[sɛljələs æsətet]	سلولوز	salūlūz	[salu:lu:z]	ɛ → a
3		centime	[sɛntajm]	سنتيم	Santīm	[sənti:m]	ɛ → a

Sound [ɛ] amid the word *caliche* [kɛliɟ] is pronounced with [a:] in the word كاليش [ka:li:f]. Sound [a:] is pre lower vocal, and it is loose, not round with additional duration of suprasegmentally phoneme. In the word كاليش [ka:li:f], sound [ɛ] is articulated with [a:] to adjust the word pattern of فاعيل and the distribution of sound [ɛ] is in the middle of the word. Sound [ɛ] does not exist in Arabic, so it is articulated with the identical one such as [a:]. Sound [ɛ] and [a:] belong to pre vocal. Based on the data, sound alternation [ɛ] into [a] is likely affected by prior and latter consonant sounds that have articulation points in alveolar area. The following table exemplifies sound alternation [ɛ] into [a:]:

Table 17. Sound alternation [ɛ] into [a:]

No	Distribution	English	Phonemic Transcription	Arabic	Orthographic Transcription	Phonemic Transcription	Sound Alternation
1	Mid	Astatine	[æstɛtin]	أستاتين	astātīn	[asta:ti:n]	ɛ → a:
2		Astatic	[æstɛtik]	لا إستاتي	lā-istātiyy	[lɑ:ista:ti]	ɛ → a:
3		cyanamid	[seingmaid]	سياناميد	siyānāmīd	[sija:na:mi:d]	ɛ → a:

Sound [ɛ] amid the word *electron* [əlɛktran] is articulated with [u] in the word ألكترون [aluktru:n]. Sound [u] is part of post upper vocal sound. It is loose and round. In the word ألكترون [aluktru:n], sound [ɛ] is pronounced with [u] because its distribution is amid the word and such vocal does not appear in Arabic. Thus, it is pronounced with [u]. Sound [ɛ] is pre vocal with mid position of tongue, semi open. Meanwhile, sound [u] is post vocal with upper position of

loose round tongue. Although sound [ɛ] and [u] are not identical, the sound alternation still occurs. The reason is that sound [u] belongs to post vocal. Simultaneously, it is followed by sound [k] that is part of velar or post consonant. Thus, sound [ɛ] in the word *electron* [əɫɛktran] shed backward and it is pronounced with [u] following the post consonant sound [k]. The samples of sound alternation [ɛ] into [u] are presented in following table:

Table 18. Sound alternation [ɛ] into [u]

No	Distribution	English	Phonemic Transcription	Arabic	Orthographic Transcription	Phonemic Transcription	Sound Alternation
1	Mid	electron	[əɫɛktran]	الِكْترون	aluktrūn	[aluktru:n]	ɛ → u
2		electrum	[əɫɛktrum]	الِكْتروم	aluktrūm	[aluktru:m]	ɛ → u

Sound [ɛ] amid the word *cholesterol* [kəɫɛstərɒl] is articulated with [u:] in the word كُولِستِرول [kalu:listiru:l]. Sound [u:] is part of post upper vocal sound. It is loose and round with additional duration of suprasegmentally phoneme. In the word كُولِستِرول [kalu:listiru:l], sound [ɛ] is pronounced with [u:] because its distribution is in the middle of the word and vocal [ɛ] does not available in Arabic. Therefore, it is pronounced with [u:]. Sound [ɛ] is in the group of pre vocal with middle position of tongue, semi open. Whereas, sound [u:] belongs to post vocal and the tongue position is upper, loose, and round with additional duration of suprasegmentally phoneme. Based on the data, sound alternation [ɛ] into [u:] tends to be affected by prior and latter consonant sound that have articulation points in the area of alveolar. The following table presents samples of sound alternation [ɛ] into [u:]

Table 19. Sound alternation [ɛ] into [u:]

No	Distribution	English	Phonemic Transcription	Arabic	Orthographic Transcription	Phonemic Transcription	Sound Alternation
1	Mid	cholesterol	[kəɫɛstərɒl]	كُولِستِرول	kalūlistirūl	[kalu:listiru:l]	ɛ → u:
2		cellulosic	[sɛɫjələsɪk]	سُولُولُوزِي	sūlūlūziy	[su:lu:lu:zɪ]	ɛ → u:

5. Pre vocal sound alternation [æ] into [a], [a:], [u]

Sound [æ] is part of pre lower vocal. Having assimilated into Arabic, such sound is articulated into three alternated sounds. The sound alternation [æ] is described in the following table:

Table 20. Sound symbol [æ]

Original Sound	Sound Alternation in Arabic		
	Sound	Symbol	Description
[æ]	[a]	أ or -	[a] pre lower vocal sound is loose, not round
	[a:]	إ or ا +	[a:] pre lower vocal sound is not round with additional duration of suprasegmentally phoneme
	[u]	ؤ	[u] post upper vocal sound is loose, round

Sound [æ] in the beginning word *astatine* [æstɛtɪn] is pronounced with [a] in the word الأستاتين [alʔasta:ti:n] because this vocal is not available in Arabic. Thus, it is pronounced with the identical one of sound [æ] of English word; [a]. Both sound [æ] and [a] are part of pre vocal sounds. Their difference is in the pitch point of tongue and stricture. Sound [æ] belongs to pre vocal with lower position of tongue and nearly open stricture. While, sound [a] is in the group of pre vocal with lower position of tongue and open stricture.

Sound [æ] amid the word *calcium* [kælsiəm] is also pronounced with [a] in the word الكالسيوم [alkalsiju:m]. Based on the data, if it is distributed in the beginning of words, sound alternation [æ] into [a] tends to be affected by latter consonant sound that has articulation point in the area of alveolar. If it is distributed in the middle of words, sound alternation [æ] into [a] is likely affected by the prior and latter sound that have articulation point in alveolar area. The following table shows the samples of sound alternation [æ] into [a]:

Table 21. Sound alternation [æ] into [a]

No	Distribution	English	Phonemic Transcription	Arabic	Orthographic Transcription	Phonemic Transcription	Sound Alternation
1	Pre	astatine	[æstətɪn]	أستاتين	astātīn	[asta:ti:n]	æ → a
2		avidin	[ævidən]	أفيدين	aqīdīn	[a:qi:di:n]	æ → a
3	Mid	calcium	[kælsiəm]	كلسيوم	kalsiyūm	[kalsiju:m]	æ → a
4		calciferol	[kælsifrɒl]	كلسيفرول	kalsīfar ūl	[kalsi:faru:l]	æ → a
5		calcite	[kælsajt]	كلسيت	kalsīt	[kalsi:t]	æ → a
6		tandem	[tændəm]	تندم	Tandam	[tandam]	æ → a

Sound [æ] in the beginning word *azote* [æzɒt] is articulated with [a:]. In the word آزوتيمية [a:zu:ti:mijjah], sound [æ] does not exist in Arabic, so it is pronounced with the identical one of sound [æ] in English; [a:]. The addition of suprasegmentally sound is due to the pattern adjustment of the word فاعولية. Based on the data, if it is distributed in the beginning of words, sound alternation [æ] into [a:] tends to be affected by latter consonant sound that has articulation point in the area of alveolar. If it is distributed in the middle of words, sound alternation [æ] into [a:] is likely affected by prior and latter consonant sounds in alveolar area.

Sound [æ] amid the word *calamine* [kæləmajn] is pronounced with [a:] in the word كالامين [ka:la:mi:n]. In this case, sound [æ] is articulated with [a:] to adjust the sound of latter syllables i.e. la [lə] that is pronounced with ل, [la:] and follows the syllable pattern of CV. Therefore, the articulation is slighter in Arabic sound pattern in order to diverse vowels. The table below provides samples of sound alternation [æ] into [a:]

Table 22. Sound alternation [æ] into [a:]

No	Distribution	English	Phonemic Transcription	Arabic	Orthographic Transcription	Phonemic Transcription	Sound Alternation
1	Pre	azote	[æzɒt]	آزوتيمية	āzūtīmiyyah	[a:zu:ti:mijjah]	æ → a:
2		azotemia	[æzɒtɪmiya]	آزوتيمية	āzūtīmiyyah	[a:zu:ti:mijjah]	æ → a:
3	Mid	californium	[kælfɔrnɪju:m]	كاليفورنيوم	kalīfurniyūm	[ka:li:furniju:m]	æ → a:

4		centigr am	[sentəgræ m]	سنتيغرام	santigrām	[sənti: ɣrə:m]	æ → a:
5		gallon	[gælən]	الغالون	gālūn	[ɣɔ:lu:n]	æ → a:
6		gas oline	[gæs ɔlin]	الغازولين	gāzūlīn	[ɣ:ɔzu:li:n]	æ → a:
7		gram	[græm]	غرام	garām	[ɣra:m]	æ → a:
8		granite	[grænət]	غرانيت	garīnīt	[ɣarɔ:ni:t]	æ → a:
9		halogen	[hælədʒən]	هالوجين	hālūjīn	[ha:lu:dʒi:n]	æ → a:

Sound [æ] in the beginning of English words turns into [u], as in the word *astrolabe* [æztro-leb] that is assimilated into أسطرلاب [usʔurla:b]. Sound [u] is part of post vocal, upper position of tongue, loose round. Although sound [æ] and [u] are not identical, the alternation among them is still in the relation to the second syllable طُر [tʔur]. Besides, there is sound affixation [u] in the second syllable [tʔur] to separate two consonant [tr]. Thus, the vowels are synchronized. The shift from [u] into second syllable containing similar sound [u]; both of them are upper vocal, post, high, and round, is articulated slighter in Arabic sound pattern. Based on the data, if it is distributed in the beginning of words, sound alternation [æ] into [u] tends to be affected by the latter sound that has the articulation point in the area of alveolar or post alveolar. The following table describes the sample of sound alternation [æ] into [u]:

Table 23. Sound alternation [æ] into [u]

No	Distribution	English	Phonemic Transcription	Arabic	Orthographic Transcription	Phonemic Transcription	Sound Alternation
1	Pre	as-tro- labe	[æztro-leb]	أسطرلاب	usʔ urlāb	[usʔurla:b]	æ → u
2		apogee	[æpədʒi]	أوج	u:dʒ	[u:dʒ]	æ → u

Sound [æ] amid the word *saccharin* [sækərən] is pronounced with [u] in the word سكرين [sukkari:n]. Sound [u] is part of post upper vocal, loose and round. In the word سكرين [sukkari:n], although sound [æ] and [u] are not identical, the sound alternation occurs due to sound [u] belongs to post vocal. After this sound, there is sound [k] that belongs to velar plosive consonant or post consonant. So

that, sound [æ] in the word *saccharin* [sækərən] shed backward to pronounce [u], and sound [æ] follows the post consonant sound of double [k]. The samples of sound alternation [æ] into [u] are in the following table:

Table 24. Sound alternation [æ] into [u]

No	Distribution	English	Phonemic Transcription	Arabic	Orthographic Transcription	Phonemic Transcription	Sound Alternation
1	Mid	saccharin	[sækərən]	سُكَّرِين	sukkarīn	[sukkari:n]	æ → u
2		saccharin e	[sækərəjn]	سُكَّرِي	sukkariy	[sukkarɪ]	æ → u
3		saccharos e	[sækərəs]	سُكَّرُوز	sukkarūz	[sukkaru:z]	æ → u

6. Pre vocal sound alternation [a] into [a:], [u] and [u:].

Sound alternation [a] into alternated sounds is described in the following table:

Table 25. Sound alternation [a]

Original Sound	Sound alternation in Arabic		
	Sound	Symbol	Description
[a]	a:	اَ	[a] pre vocal sound is loose, not round with additional duration of phoneme
	u	أَ	[u] post upper vocal sound is loose, round
	u:	أُ	[u] post upper vocal sound is loose, round with additional duration of suprasegmentally phoneme

Sound [a] amid the word *kilowatt* [kɪlowət] is pronounced with [a:] in the word كيلوواط [ki:lɔ:wɑ:t̪]. Sound [a:] is part of pre lower vocal that is loose, not round with additional duration of suprasegmentally phoneme. In the word كيلوواط [alki:lɔ:wɑ:t], sound [a] is articulated with [a:] to adjust the syllable pattern of CVC. Then, sound [a] provides suprasegmentally phoneme because it posits before the end of the word. Therefore, the synchronized vowels appear. Based on the data, if it is distributed in the middle of words, sound alternation [a] into [a:] tends to be affected by prior consonant sound that has articulation point in the area of approximant labial and after dental. The following table shows the samples of sound alternation [a] into [a:]:

Table 26. Sound alternation [a] into [a:]

No	Distribution	English	Phonemic Transcription	Arabic	Orthographic Transcription	Phonemic Transcription	Sound Alternation
1	Mid	kilo watt	[kɪlɔ wʌt]	كيلوواط	kīlūwālṭ	[ki:lu:wa:t]	a → a:

Sound [a] in the beginning of word *octane* [aktən] is pronounced with [u], in the word أُكْتَيْن [uktain]. Sound [a] is part of pre lower vocal. It is loose, not round. Although sound [a] and [u] are not identical, the sound alternation still occurs. Such condition exists because sound [u] belongs to post vocal. After this sound, there is sound [k] that is plosive velar or post consonant. Sound [a] in the word *octane* [aktən] is shed backward into sound [u] following post consonant [k]. Sound [a] is pre vocal, lower position of tongue, and open while vocal [u] is post vocal, upper position of tongue, loose, and round. The following table enlists the samples of sound alternation [a] into [u].

Table 27. Sound alternation [a] into [u]

No	Distribution	English	Phonemic Transcription	Arabic	Orthographic Transcription	Phonemic Transcription	Sound Alternation
1	Pre	octane	[aktən]	أَكْتَيْن	Uktain	[uktain]	a → u

Sound [a] amid the word *robot* [ro:bat] is pronounced with [u:] in the word رُوبوت [ru:bu:t]. Sound [u:] is part of post upper vocal, loose, round with additional duration of suprasegmentally phoneme. In the word رُوبوت [ru:bu:t], sound [a] is pronounced with [u:] in the last syllable due to the syllable pattern adjustment of CVC. Although sound [a] and [u:] are not identical, the sound alternation still occurs because of the first syllable of رُ [ru:]. The second sound [u:] is the support of the first sound [u:] in the first syllable, so the vowels are synchronized. Based on the data, sound alternation [a] into [u:] tends to be affected by the prior and latter sounds that has the articulation point in the area of alveolar or before it. The following table contains the samples of sound alternation [a] into [u:]:

Table 28. Sound alternation [a] into [u:]

No	Distribution	English	Phonemic Transcription	Arabic	Orthographic Transcription	Phonemic Transcription	Sound Alternation
1	Mid	barometer	[bərəmætər]	بارومتر	Bārūmitr	[ba:ru:mitr]	a → u:
2		oceanographer	[oʃənəgrəfər]	أوقيانوغرافي	Ūqiyānūgar āfī	[u:qiya:nugh rɔ:fl]	a → u:
3		proton	[prɒtən]	بروتون	Burtūn	[barɔ:tu:n]	a → u:
4		robot	[rɒbət]	روبوت	Rūbūt	[ru:bu:t]	a → u:

7. Mid vocal sound alternation [ə] into [i], [i:], [a], [a:], [u:].

Sound alternation [ə] into alternated sounds are best described as in the following table:

Table 29. Sound alternation [ə]

Original Sound	Sound Alternation in Arabic		
	Sound	Symbol	Description
[i]		ـِ	[i] pre upper vocal sound is firm, not round
[i:]		ـِي+	[i] pre upper vocal sound is firm, not round with additional duration of suprasegmentally phoneme
[a]		ـِ or ـَ	[a] pre lower vocal sound is loose, not round
[a:]		ـِ+	[a] pre lower vocal sound is loose, not round with additional duration of suprasegmentally phoneme
[u:]		ـُو+	[u:] post upper vocal sound is loose, round with additional duration of suprasegmentally phoneme

Sound [ə] amid the word *barometer* [bərəmætər] is pronounced with [i] in the word بارومتر [ba:ru:mitr]. Sound [i] is part of pre upper vocal. It is firm and not round. In the word بارومتر [ba:ru:mitr], sound [ə] is pronounced with [i] to adjust Arabic syllable patterns. In the case of word فِعْلٌ, vocal [ə] is distributed amid the word, and it does not exist in Arabic. Therefore, this sound is articulated with [i]. Sound [ə] belongs to mid vocal with mid position of tongue and semi close. Whereas, sound [i] is part of pre vocal with upper position of tongue, firm, not round. Although sound [ə] and [i] are not identical, the sound alternation is affected by prior consonant sound i.e. [m] that has articulation point in bilabial

area and latter consonant sound i.e. [t] that has articulation point in the area of alveolar. The samples of sound alternation [ə] into [i] are enlisted in the following table:

Table 30. Sound alternation [ə] into [i]

No	Distribution	English	Phonemic Transcription	Arabic	Orthographic Transcription	Phonemic Transcription	Sound Alternation
1	Mid	barometer	bəramətər]	بارومتر	Bārūmitr	[ba:ru:mitr]	ə → i

Sound [ə] amid the word *centigram* [sɛntəgræm] is pronounced with [i:] in the word سَنْتِيغْرَام [sənti:gra:m]. Sound [i:] is upper vocal. It is firm, not round with additional duration of suprasegmentally phoneme. In the word سَنْتِيغْرَام [sənti:gra:m], sound [ə] is articulated with [i:] because it is distributed in the middle of the word and vocal [ə] is not available in Arabic. Thus, it is articulated with sound [i:]. Sound [ə] belongs to mid vocal with mid position of tongue, semi close. While sound [i:] is part of pre vocal with upper position of tongue, firm, not round with additional duration of suprasegmentally phoneme. Based on the data, if it is distributed in the middle of words, sound alternation [ə] into [i:] tend to be affected by the prior consonant sound that has articulation point in the area of alveolar. The following table shows the samples of sound alternation [ə] into [i:]

Table 31. Sound alternation [ə] into [i:]

No	Distribution	English	Phonemic Transcription	Arabic	Orthographic Transcription	Phonemic Transcription	Sound Alternation
1	Mid	ionosphere	[ajanəsfer]	أيونوسفير	Ayūnusfir	[aju:nusfi:r]	ə → i:
2		cyanine	[seijanən]	سيانين	Siyānīn	[sija:ni:n]	ə → i:
3		xylem	[zailəm]	زلييم	Zliiyim	[zi:lijim]	ə → i:

Sound [ə] in the beginning of word *electron* [ələktran] is pronounced with [a] in the word أَلِكْتْرُون [aluktru:n]. Sound [a] belongs to pre lower vocal. It loose, not round. In the word أَلِكْتْرُون [aluktru:n], sound [ə] is pronounced with [a] because vocal [ə] is not available in Arabic. Therefore, it is pronounced with [a]. Sound [ə]

is part of mid vocal with mid position of tongue, semi close. Meanwhile, sound [a] belongs to pre vocal, lower position of tongue, open. Based on the data, if it is distributed in the beginning of words, sound alternation [ə] into [a] tends to be affected by latter consonant sound that has articulation point in the area of alveolar. If it is distributed in the middle of words, sound alternation [ə] into [a] is likely affected by prior sound; alveolar, and latter one; bilabial or vice versa. The following table shows the samples of sound alternation [ə] into [a]:

Table 32. Sound alternation [ə] into [a]

No	Distribution	English	Phonemic Transcription	Arabic	Orthographic Transcription	Phonemic Transcription	Sound Alternation
1	Pre	electron	[əlektran]	ألكترون	aluktrūn	[aluktru:n]	ə → a
2	Mid	cholesterol	[kəlestərɒl]	كلولسترول	kalūlistirūl	[kalu:listiru:l]	ə → a
3		tandem	[tændəm]	تندم	tandam	[tandam]	ə → a

Sound [ə] amid the word *tandem* [tændəm] is pronounced with [a] in the word التندم [attandam]. Sound [a] belongs to pre lower vocal, loose, not round. In the word تندم [tandam], sound [ə] is articulated with [a] because it is distributed amid the word and vocal [ə] does not exist in Arabic. So that, it is pronounced with [a]. Sound [ə] is part of mid vocal with mid position of tongue, semi close. While sound [a] is in the group of pre vocal, lower position of tongue, and open.

Sound [ə] amid the word *oceanography* [oʃəngrəfi] is articulated with [a:] in the word أوقيانوغرافيا [u:qiya:nughra:fijja:]. Sound [a:] belongs to pre lower vocal, loose, not round with additional duration of suprasegmentally phoneme. In the word أوقيانوغرافيا [u:qiya:nughra:fijja:], sound [ə] is pronounced with [a:] because its distribution is in the middle of the word and vocal [ə] does not appear in Arabic. Thus, it is articulated with [a:]. Based on the data, if it is distributed in the middle and at the end of words, sound alternation [ə] into [a:] tends to be affected by prior

sound that has articulation point in alveolar area. The samples of sound alternation [ə] into [a:] are described in the following table:

Table 33. Sound alternation [ə] into [a:]

No	Distribution	English	Phonemic Transcription	Arabic	Orthographic Transcription	Phonemic Transcription	Sound Alternation
1	Mid	(volcanic) basalt	[valkænik+bəʊsɒlt]	بركانية بازلتية	burkāniyyah/bāzaltīyyah	[burka:niyyah ba:zalti:jjah]	ə → a:
2		vanadic	[vənɛdɪk]	فاناديومي	fānādiyūmī	[fa:na:dijumɪ]	ə → a:
3	post	influenza	[ɪnfluɛnzə]	نفلوزا	infaluwanzā	[ɪnfuluwanza:]	ə → a:
4		andromeda	[ændrəməd ə]	اندروميديا	andrūmīdā	[andrū:mi:da:]	ə → a:

Sound [ə] amid the word *gallon* [gælən] is pronounced with [u:] in the word غالون [ɣa:lu:n]. Sound [u:] belongs to post upper vocal, loose, round with additional duration of suprasegmentally phoneme. In the word غالون [ɣa:lu:n], sound [ə] is articulated with [u:] to adjust the patten of فاعول. Such articulation occurs because sound [ə] is distributed in the middle of the word and vocal [ə] does not exist in arabic. Thus, it articulated with [u:]. Sound [ə] belongs to mid vocal with mid position of tongue, semi close. Whereas, sound [u:] is part of post vocal with upper position of tongue, loose, not round with additional duration of suprasegmentally phoneme. Based on the data, if it is distributed in the middle of words, sound alternation [ə] into [u:] tends to be affected by latter consonant sound that has articulation point in alveolar area. The samples of sound alternation [ə] into [u:] are shown in the following table:

Table 34. Sound alternation [ə] into [u:]

No	Distribution	English	Phonemic Transcription	Arabic	Orthographic Transcription	Phonemic Transcription	Sound Alternation
1	Mid	cellulosic	[sɛljələsɪk]	سولولوزي	sūlūlūziy	[su:lu:lu:zɪ]	ə → u:
2		calcium	[kælsiəm]	كلسيوم	kalsiyūm	[kalsiju:m]	ə → u:
3		zircon	[zɜrkən]	زركون	zirkūn	[zirku:n]	ə → u:
4		carotene	[kəɾətɪn]	كاروتين	kārūtīn	[ka:ru:t:n]	ə → u:

8. Post vocal sound alternation [ʊ] into [u:].

Sound [ʊ] amid words is articulated with [u:] such in the word *tellurite* [tɛlɔrit] that is articulated with [u:] in the word تَلُوريت [talu:ri:t]. Sound [ʊ] belongs to post vocal amid the sound [u] and [o]. in the case of word تَلُوريت [talu:ri:t], sound [ʊ] is articulated with [u:] because sound [ʊ] does not exist in Arabic. It is distributed in the middle of the word, so it is articulated with the identical one of sound [ʊ] in the English i.e. [u:]. Sound [ʊ] and [u:] belong to post vocal. The difference of both sound is the pitch position of tongue and stricture. Sound [ʊ] belongs to vocal with low upper position of tongue and semi stricture. Meanwhile, [u:] is part of vocal with upper position of tongue, close stricture with additional duration of phoneme. Based on the data, sound alternation [ʊ] into [u:] is likely affected by latter consonant sound that has articulation point in alveolar area. The samples of sound alternation [ʊ] into [u:] are described as follows:

Table 35. Sound alternation [ʊ] into [u:]

No	Distribution	English	Phonemic Transcription	Arabic	Orthographic Transcription	Phonemic Transcription	Sound Alternation
1	Pre	-					
2	Mid	stereoscopic	[stɜrə:skɔpɪk]	إستريوسكوبي	istaryuskūbi y	[istarjuskɔ:bi j]	u → u:
3		fluorspar	[flɔrspar]	فلورسبار	falürsbār	[falu:rsba:r]	u → u:

9. Post vocal sound alternation [o] into [u], [u:].

Sound alternation [o] into alternated sounds is explained in the following table:

Table 36. Sound alternation [o]

Original sound	Sound alternation in arabic		
	Sound	Symbol	Description
[o]	u	و	[u] bunyi vokal atas belakang kendur bundar
	u:	أو	[u:] bunyi vokal atas belakang kendur bundar dengan penambahan durasi fonem suprasegmental

Sound [o] in the beginning of word *oceanographer* [oʃənagrəfər] is articulated with [u:] in the word أوقيانوغرافيّ [u:qiʃa:nuɣrɔ:fɪ]. Sound [u:] belongs to post upper vocal, loose, round with additional duration of suprasegmentally phoneme. In the word أوقيانوغرافيّ [u:qiʃa:nuɣrɔ:fɪ], sound [o] is articulated with [u:] because sound [o] is not available in Arabic. It is distributed in the beginning of the word and articulated with the identical one of sound [o] in English i.e. [u:]. Both sound [o] and [u:] belong to post vocal. Their difference is in the case of pitch position of tongue and stricture. Sound [o] is part of post vocal with mid position of tongue and semi close stricture. While, [u:] is in the group of post vocal with upper position of tongue, close stricture with additional duration of suprasegmentally phoneme. Based on the data, sound alternation [o] into [u:] tends to be affected by later sound; uvular sound, if it is distributed amid the words. The samples of sound alternation [o] into [u:] are enlisted in the following table:

Table 37. Sound alternation [o] into [u:]

No	Distribution	English	Phonemic Transcription	Arabic	Orthographic Transcription	Phonemic Transcription	Sound Alternation
1	Pre	ohm	[om]	أوم	ūm	[u:m]	o → u:
2		ohm age	[om edʒ]	أوميّة	ūmiyyah	[umijjah]	o → u:
3		ohm meter	[om mitər]	أومتر	ūmitr	[u:mitr]	o → u:

Sound [o] amid the words of English is articulated with [u] or faded, as in the word *as-tro-labe* [æstrɔːləb] articulated with [u] in the word أسطرلاب [uʃʃʊrla:b]. Sound [u] belongs to post upper vocal, loose, round. In the word

أسْطُرْلَاب [ust^ʰurla:b], sound [o] is articulated with [u] because it adjusts the syllable pattern of CV, the prior phoneme i.e. *as* [æz] that is articulated with أُسْ [us]. Sound [o] is distributed in the middle of words, and such sound does not appear in Arabic. So that, it articulated with the identical one of sound [o] in English i.e. [u:]. Sound [o] and [u:] belong to post vocal. Their difference is the pitch position of tongue and stricture. Sound [o] is part of post vocal with upper mid position of tongue and semi close stricture. Whereas [u:] is part of post vocal with upper position of tongue, close stricture with additional duration of suprasegmentally phoneme. Based on the data, if it is distributed in the middle of words, sound alternation [o] into [u:] tends to be affected by latter sound; uvular consonant. The samples of sound alternation [o] into [u] are described in the following table:

Table 38. Sound alternation [o] into [u]

No	Distribution	English	Phonemic Transcription	Arabic	Orthographic Transcription	Phonemic Transcription	Sound Alternation
1	Mid	as-tro-labe	[æztrɔ-leb]	أَسْطُرْلَاب	ust ^ʰ urlāb	[ust ^ʰ urla:b]	o → u
2		volcano	[valkeno]	بُرْكَان	burkān	[burkan]	o → u
3	Post	dynamo	[dajnmɔ]	دِنَام	dinām	[dina:m]	o: dileapkan

Sound [o] amid the words of English is articulated with [u:] such in the word *chrome* [krɔm] articulated with [u:] in the word كُرُوم [krɔ:m]. Sound [u:] belongs to post upper vocal, loose, round with additional duration of suprasegmentally phoneme. In the case of word كُرُوم [krɔ:m], sound [o] is articulated with [u:] because it follows the post syllable pattern of CVC. The additional duration of suprasegmentally phoneme in sound [u] is due to its distribution at the end of the word, so there is synchronized vowels as in the sound patterns of Arabic. Based on the data, sound alternation [o] into [u:] tend to be affected by prior consonant sound of alveolar. In the following table, there are samples of sound alternation [o] into [u:]:

Table 39. Sound alternation [o] into [u:]

No	Distribution	English	Phonemic Transcription	Arabic	Orthographic Transcription	Phonemic Transcription	Sound Alternation
1	Mid	chrome	[kɹɒm]	كروم	kurūm	[kru:m]	o → u:
2		ergosterol	[ərgɒstɛrɒl]	أرغوستيرول	urgūstirūl	[urɣosturu:l]	o → u:
3		iodoform	[ajədɒfɔrm]	يودوفورم	yūdūfūrm	[ju:du:fu:m]	o → u:
4		telephone	[tɛləfɒn]	تلفون	tilifūn	[tilifu:n]	o → u:

E. Conclusion

Sound alternation of English loan words into Arabic is based on Arabic phono tactic. From 39 vocal sound alternation, there are 16 sound with different positions of tongue (41%), and 23 sound with identical positions of tongue (59%). In the case of mid vocal, it is articulated with pre or post vocal because Arabic solely owns pre and post vocal.

Based on the data, vocal sound alternation of English loan words into Arabic is identically close to the original sounds not only in case of pitch points of tongue but also the effects of consonant sounds prior to and latter from vocal ones. However, there are also arbitrary vocal sound alternation. They are not identical neither in the case of pitch points of tongue nor the effects of consonant sound prior to and latter from vocal sound. The sample of such case is sound alternation [ɛ] into [u:] that tends to be affected by prior and latter sound consonant that has articulation point in alveolar area. Another sample is sound alternation [æ] into [u] that is likely affected by latter consonant sound that has articulation point in the area of alveolar or post alveolar. The last sample is sound alternation [ə] into [u:]

that is likely to be affected by latter consonant sound that has articulation point in alveolar area.

Based on the analysis, it is clarified that the tendency of vocal sound alternation of English words into Arabic are as follows:

No.	English sound	Word distribution	Tongue position	Sound alternation into Arabic	Tongue position	Arabic symbol
1	[i]	mid	pre vocal	[i:]	pre vocal	harakat <u>ِ</u> and ي
2	[i]	Post	pre vocal	[ijjah]		harakat <u>ِ</u> and ية
3	[ɪ]	Pre	pre vocal	[i]	pre vocal	اِ
4	[ɪ]	Mid	pre vocal	[i:]	pre vocal	harakat <u>ِ</u> and ي
5	[ɪ]	Post	pre vocal	[jah]		ية
6	[e]	Mid	pre vocal	[a:] or [i]	pre vocal	harakat <u>ِ</u>
						harakat <u>ِ</u> and ا
7	[ɛ]	pre, mid	pre vocal	[i]	pre vocal	اِ
						or harakat <u>ِ</u>
8	[ɛ]	mid	pre vocal	[a:] or [a] or [i:]	pre vocal	harakat <u>ِ</u> and ا
						harakat <u>ِ</u>
						harakat <u>ِ</u> and ي
9	[æ]	pre	pre vocal	[a] or [a:] or [u]	pre vocal	اِ
						اِ
						اِ
10	[a]	pre	pre vocal	[u]	post vocal	اِ
11	[a]	mid	pre vocal	[a:] or [u:]	pre vocal	harakat <u>ِ</u> and ا
						harakat <u>ِ</u> and و
12	[ə]	pre, mid	mid vocal	[a]	pre vocal	اِ

13	[ə]	Mid	mid vocal	[a:] or [u:] or [i:]	pre vocal	harakat َ and ِ harakat ُ and ِ harakat ِ and ِ
14	[o]	mid	post vocal	[u:]	post vocal	harakat ُ and ِ
15	[ʌ]	Mid	post vocal	[a] or [a:]	pre vocal	harakat َ harakat َ and ِ
16	[ɑ]	Mid	vocal	[a] or [u:]	pre vocal	harakat َ harakat ُ and ِ
17	[o]	Pre	post vocal	[u:]	post vocal	harakat ُ and ِ
18	[o]	mid	post vocal	[u] or [u:]	post vocal	harakat ُ harakat ُ and ِ
19	[ɔ]	mid	post vocal	[u] or [u:] or [a]	post vocal	harakat ُ harakat ُ and ِ harakat َ
20	[ɒ]	pre	post vocal	[u:]	post vocal	harakat ُ and ِ

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