

Thesis, MA General Linguistics (Phonetics Track)

Ruth Collins (11311320)

Formalisation of English-Origin Loanword Perception in Hawaiian

University of Amsterdam Faculty of Humanities

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Supervisor: Silke Hamann

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1. Introduction

Hawaiian is a language spoken by a minority of the population of the islands of Hawai'i, with L1 speaker numbers estimated at 2000 according to Ethnologue, with 22000 additional self-reported fluent L2 speakers according to the 2011 US census. Although Hawai'i only became a US state in 1959, having been a US overseas territory since 1898, Hawaiian speakers have had contact with the English language for centuries, beginning with the arrival of Captain James Cook's expedition to the islands in 1778, with the first evidence for English-derived loanwords present as early as 1791 (Schütz 1994: 189). Since then, Hawaiians have been exposed to English through a number of channels, including traders, Christian missionaries, and eventually, American settlers to the islands.

Following the overthrow of the Hawaiian monarchy in 1893 and the instatement of the Republic of Hawai'i (run by Hawaiian-born businessmen of European-American descent, most of whom were the descendants of earlier Christian missionaries to the islands, and backed by the American government) and leading up to the islands' annexation by the US government in 1898, the Hawaiian language was banned in education in 1897. This greatly decreased the language's status and scope within Hawaiian society and paved the way for English to become the dominant language of the islands (the sole exception to this being the privately-owned island of Ni'ihau, where Hawaiian is the primary spoken language and unauthorised visitors are not permitted to enter). Even for those who retain Hawaiian as their home language in spite of this, the ubiquitousness of English is such that many English-origin loanwords have found their way into the language over the centuries. The aim of this thesis is to examine how these loanwords have been integrated into Hawaiian, a language with a vastly different phonological system to that of English. In particular, the focus is on the perception and realisation of fricatives and non-r-coloured vowel-containing words, and how this has changed over the years due to factors such as a shift from orthographical borrowings to perceptual borrowings and the increasing familiarity of Hawaiian speakers with the English language as a whole, formalised within the context of Optimality Theory (OT).

As shall be demonstrated in the following sections, fricatives and vowels have been selected for study in this thesis for these reasons:

- Fricatives are of interest due to their rarity in native Hawaiian phonology (only |h| and |v| are present), raising questions as to how loanwords containing them are adapted.

- Literature suggests diachronic changes in how fricatives are adapted may have already taken place.
- Although English vowels do not differ drastically from Hawaiian vowels, there is much dialectal variation in English vowels, as well as a relatively wide variety of realisations which map to a relatively small variety of vowels in orthography. This means that orthographical versus perceptual borrowings may be more immediately evident than for consonants.

It is important to note that although these reasons are the main impetus for having chosen fricatives and vowels for study, they are not necessarily mutually exclusive to the categories to which they have been primarily assigned. By this, it is meant that, for example, fricative-containing loanwords may also display evidence of orthographical/perceptual borrowings and vowel-containing loanwords may also show evidence of diachronic change – indeed, this is perhaps likely.

Speaking generally about the study as a whole, it is hoped that it may assist in shedding light on how factors such as the nature of language contact may contribute to how loanwords are adapted from one language to another. In the case of Hawaiian, many of these factors have already been mentioned in passing, but there appears to have been little serious consideration given to the idea of systematically describing them. In addition to this, the study also hopes to more thoroughly investigate whether and how Hawaiian loanword adaptation has changed or in the process of changing; the vast majority of current data appears to be based on decades-old sources which do not necessarily accurately represent the present-day situation in Hawai‘i. Finally, the study contributes to the still relatively new area of orthographical optimality theory, a vital component of this thesis in order to properly model the probable effects of orthographical borrowings on loanword adaptation in Hawaiian.

2. Theoretical Framework

2.1 Optimality Theory: An Overview

Optimality Theory, or OT (Prince & Smolensky, 1993) is a linguistic model which sees language as the product of a set of constraints, all of which interact with each other in order to account for both the perception and production of speech. It is capable of modelling all aspects of the speech process, from the lowest levels to the highest. Under OT, constraints are universal, but all languages give different weight to different constraints; a candidate (e.g., a certain word) is chosen

for output when it violates the least highly-ranked constraints. There are three basic components of OT:

- Input and GEN, which receives input and generates an infinite number of possible realisations for this input
- CON, which generates all constraints and ranks them differently according to language
- EVAL, which calculates the constraint violations of all candidates and eventually selects the optimal candidate based on this

There are two main types of constraints:

- Faithfulness constraints, which are concerned with matching the phonological output to the input as closely as possible in production, e.g., *A velar stop may not be produced as an alveolar stop*, or *FAITH (velar)*
- Structural constraints, which are concerned with the structural well-formedness of the phonological output from the perspective of a given language, e.g., *No complex onsets*, or **CC*

There is also an additional type of constraint which is not a part of traditional OT, but has been used in the BiPhon model of Optimality Theory and are relevant to the current thesis: cue constraints (Escudero & Boersma, 2003). The BiPhon model of OT differs from traditional Optimality Theory in that it is the only form which seeks to integrate phonetic and phonological constraints in order to model spoken language at all levels. In this model, cue constraints determine how phonetic input is mapped from the auditory form to the phonological surface form in perception and vice versa in production, e.g., *an F1 of 360 Hz is not /i/*, or *360Hz F1 * /i/*.

A basic template of an OT tableau may be seen here:

Table 1. OT tableau template

Input	Constraint 1	Constraint 2	Constraint 3
Candidate A	*!		
Candidate B		*	
→ Candidate C			*

In these examples, Candidate C emerges as the “optimal” candidate, having violated the least highly-ranked constraint.

2.2 OT in Loanword Perception and Production

In addition to modelling the perception and production processes of native language use, OT is also suitable for modelling loanword perception and production. The constraints, rankings and general rules of candidate selection remain the same as for native language use; the only real difference is that the input into the speaker/listener’s phonological or phonetic perceptual system will generally be a non-native word or phoneme. An example of an OT tableau as used for loanword perception is seen here:

Table 2. Korean perception of the English word “tag” (Boersma & Hamann 2009: 13):

[th á:g ^g]	*[burst] /C(.)	*[^h] /-asp/	*[no noise] /+asp/	*[] /C(.)	*[] /+tense/	*[no voice] /(V)-tense(V)/	*[] /i/
/. ^h tæk./	*!			*			
/. ^h tæk ^h ./	*!		*	*	*		
☞ /. ^h tæk.i./							*
/. ^h tæk ^h .i./			*(!)		*(!)		*
/. ^h tæk.k'i./					*!		*

The notation here is somewhat different from standard OT; phonetic input is marked with square brackets rather than forward slashes, with the forward slashes instead being used to mark the potential phonological surface forms. This, however, is the only real difference; as with native-language OT modelling, one may again observe that the “optimal” loanword Surface Form selected is the one which violates the least highly-ranked constraints. That is, the candidate which is “closest” to the original English word while simultaneously not violating any native Korean structural constraints.

2.3 OT in Orthography

Finally, although it is a relatively new area, OT may also be used to model native-speaker processing of orthography, as well as orthographical borrowings. This is crucial to the current study, as orthographical borrowings must be given particular attention in order to adequately understand the different ways in which English loanwords have been adapted into the Hawaiian language. Many loanwords were originally adapted into Hawaiian through writing, as missionaries made serious efforts to increase literacy amongst the native population, with much success. This

means that words which were mainly seen by Hawaiian speakers, rather than heard, more than likely triggered different adaptation processes which must be taken into account.

OT as used for orthography is somewhat different to other forms of OT, and therefore a more in-depth explanation is necessary. This thesis follows the reading grammar set out by Hamann & Colombo (2017), which models the orthographical borrowing of intervocalic consonants in English by native speakers of Italian. Here, written words are mapped from their orthographical form to a phonological surface form. While structural constraints exist similarly as in the BiPhon model, there is also a new set of constraints to contend with: orthographical constraints (ORTH). Orthographical constraints, as the name may suggest, are concerned with ensuring that certain orthographical representations clearly and consistently map onto certain phonological forms, e.g., *Assign a violation mark to every grapheme <γ> that is not mapped onto the phonological form /p/ and vice versa, or *<γ>/p/* (note also here that orthographical representations are denoted with angle brackets, as opposed to square brackets or forward slashes – this shall also be done from now on when making specific reference to graphemes in this thesis). Below is an example of an OT tableau from Hamann & Colombo (2017: 13), for the native Italian word *fatto* (meaning “done”, or “fact”):

Table 3. Loanword OT

<fatto>	PENULT	/:'μμ./	<βiβi>/C:/	*<α>/V:/
→ /'fat.to./				
/'fa:.to./			*!	*
/'fa.to./		*!	*	
/'fa:t.to./		*!		
/.fat.'to./	*!	*!		

As may be seen from the above table, the general process of constraint ranking and candidate selection remains the same as for other aspects of language; the only difference is the introduction of new constraints and a different variety of input, i.e., orthographical input as opposed to auditory input.

2.4 Overview of Native Modern Hawaiian Phonology

This section deals briefly with some features of Hawaiian phonology which are relevant to the discussion of loanword adaptation from the English language.

Hawaiian is notable for its unusually small phoneme inventory, containing ten primary vowel phonemes (including long vowels, vowel length being contrastive in Hawaiian) and just eight primary consonant phonemes, which are shown below (sounds connected by a tilde indicate allophones in modern Hawaiian, see below for further information. Main inventory sans allophones is taken from Harb (2016), with allophones taken from Schütz (1994))

Table 4. Consonants

	Labial	Alveolar	Velar	Glottal
Nasal	m	n		
Stop	p	k ~ t		ʔ
Fricative				h
Approximant	w ~ v	l ~ r ~ d ~ ɹ		

Table 5. Vowels

	Front	Central	Back
Close	i/i:		u/u:
Close-mid	ɛ ~ e/e:		
Mid		a ~ e ~ ə/a:	o/o:
Open			

Diphthongs are |aɛ|, |aɪ|, |aɔ|, |aʊ|, |eɪ|, |eʊ|, |oɪ|, |oʊ| and |ɪu|.

2.4.1 Hawaiian Allophones and Free Variation

As is evident from the above tables, Modern Hawaiian has a relatively large number of allophonic phonemes. The allophonic vowels vary mainly according to stress (Elbert & Pukui 1979). For example, short vowels |e| and |a| often become realised as /ɛ/ and /e/ respectively when stressed, and /e/ and /ə/ when unstressed.

Regarding the consonants, the situation is slightly different in that there appears to be (to some extent) a state of free variation, i.e., a situation in which two or more different sounds may be substituted for one another without causing a change in meaning or being considered incorrect by native speakers. This means that /t/ and /k/, /w/ and /v/ and /l/, /r/, /d/ and /ɺ/ may be used more or less interchangeably by native Hawaiian-speakers, though with some exceptions. For example, /k/ is almost always realised word-initially, while /t/ is almost always realised before /i/. In the case of /w/ and /v/, /w/ is the most common realisation after /o/ and /u/, /v/ is most common after /i/ and /e/, and both realisations are equally common in all other situations (Schütz (1994) posits that historical evidence suggests that pre-contact Hawaiian originally contained neither /w/ nor /v/, but |ʋ|, and that the current state of free variation only surfaced some years after initial European contact). The allophonic state of /l/, /r/, /d/ and /ɺ/ often goes unmentioned in accounts of Hawaiian phonology, with /l/ generally being given as the only acceptable realisation. However, the interchangeability of the four sounds is mentioned both in Elbert & Pukui (1979) and Schütz (1994), the latter of which suggests that /r/ realisations may be more prevalent in the north-western islands, and /l/ realisations in the south-eastern islands (unfortunately, there does not appear to be any concrete information available on where or how /d/ and /ɺ/ are used).

It is clear even from a cursory glance at this phoneme inventory that many staple phonemes of the English language are absent in Hawaiian. In particular, a large number of English vowels are absent, and affricates and fricatives are practically non-existent. This makes heavy modification of English-origin loanwords in Hawaiian inevitable, particularly since codas and consonant clusters are also prohibited in Hawaiian. These adaptations shall be detailed in section 2.6.

2.5 Overview of Hawaiian Orthography

A number of English-origin loanwords initially entered the Hawaiian language through writing, something which has more than likely affected the realisation of these words by Hawaiian speakers. Therefore, it is also necessary in this thesis to give an account of Hawaiian orthography.

The Hawaiian language was unwritten prior to Western contact (Schütz 1994: 53), and initial efforts to commit the language to writing were scattered at best. While Latin-based script was used from the start, spelling conventions were practically non-existent and spellings often poorly reflected actual pronunciation, having been popularised by those of European descent rather than native Hawaiians (Schütz 1994: 57). For example, a popular early spelling of “Hawai’i”

was “Owyhee” (Schütz 1994: 69) (a moniker which survives in some contiguous American placenames whose exploration parties included Native Hawaiians, e.g., the Owyhee River, which flows through Nevada, Idaho and Oregon). It was not until the century after initial European contact that serious efforts to create a clear and consistent orthography for the Hawaiian language began to be made.

Missionary efforts to create standardised written Hawaiian began in 1820, with most of the modern conventions having been solidified by 1826 (Schütz 1994), with some notable exceptions which will be noted below. The main aim of these missionaries was to introduce literacy to the islanders, enabling them to read an eventual Hawaiian translation of the Bible (ibid). The first attempt at an alphabet was published in 1822 and contained 17 letters for native words: A, B, D, E, H, I, K, L, M, N, O, P, R, T, U, V and W. It also included 5 letters which were specifically intended for loanwords so that they would be immediately distinguishable from native words in orthography (Schütz 1994: 193): F, G, S, Y and Z. These letters, although not entirely obsolete, see very infrequent use in modern written Hawaiian, as the “Hawaiianisation” of most loanwords eliminates the need for them. Where they are used, they generally exist in tandem with fully nativised spellings, e.g., “Gibraltar” may be spelled as both *Kipalaleka* and *Gibaraleta* (Elbert & Pukui (1986: 450). It is unknown exactly when loanword letters began to fall out of standard use (or, indeed, if they even were in standard use by native Hawaiians as opposed to missionaries), but two definitive turning points would likely have been the 1957 publication of Samuel H. Elbert & Mary Kawena Pukui’s *Hawaiian Dictionary* and the 1979 publication of its sister guide, *Hawaiian Grammar*, the first comprehensive descriptions of Hawaiian since W.D. Alexander’s grammar in 1864 and perhaps the most influential works on the Hawaiian language even today. Both of these works tend to steer away from non-Hawaiian orthography, except in rare cases such as the example mentioned above.

While this initial effort was an important first step in the creation of a Hawaiian orthography, there were still several issues to be resolved. The 1826 version of the Hawaiian alphabet fixed one of the more pressing issues, i.e., the presence of several redundant letters, which represented allophones (such as /t/ and /k/ or /w/ and /v/) and made spelling standardisation difficult. The following letters were omitted in this updated version: B, D, R, T and V (though they were retained for use in loanwords, along with the previously-mentioned letters above (Schütz 1994: 192)). This change further improved the functionality of written Hawaiian (despite detractors’ claims that explicitly choosing one allophone over another in orthography may have negatively influenced Hawaiian speech (Schütz 1994: 127)) but it nonetheless fell somewhat

short; vowel length was still not represented in writing, nor was the glottal stop, an important and frequently-used Hawaiian phoneme. It would take some time before these features would become consistently represented in written Hawaiian in the form of diacritical markings.

A glottal stop is currently represented in written Hawaiian with a symbol known in Hawaiian as an *ʻokina* (‘). This diacritic has seen sporadic use since 1823 (Schütz 1994), but was not seen as an “official” letter of the alphabet until much later; instead, it was only used in situations where the absence of an *ʻokina* would change the meaning of a word, e.g., *kou* (“your”) versus *ko‘u* (“my”). This is largely because the predominantly Anglophone missionaries who were tasked with standardising the written language were confused by the concept of the glottal stop as a distinct consonant, instead considering it “an audible hole in the word” (Schütz 1994: 143). The *ʻokina* did not become recognised as a vital component of Hawaiian until as late as 1864, when Hawaiian-born linguist William DeWitt Alexander’s newly-published grammar of Hawaiian stated in no uncertain terms that it was “properly a consonant and forms an *essential* part of the words in which it is found” (quoted from Schütz 1994: 144), and even then did not start seeing completely consistent use until the mid-20th century (in fact, one could argue use is still not universal; according to Schütz (1994: 142), many businesses and other non-governmental institutions with Hawaiian names still neglect to use Hawaiian diacritics in their signage).

Modern written Hawaiian denotes a long vowel with the use of a macron, or *kahakō* as it is known in Hawaiian (an example of which is seen in the word itself, above the <o>). Macrons were used in Hawaiian by at least one Christian missionary, Hiram Bingham, as early as 1821 (Schütz 1994), but did not become a staple of written Hawaiian until the late 1950s, when language revival efforts began to gain traction. The relative lateness of this addition may have had an effect on how native speakers handled orthographical borrowings. More specifically, it possibly caused Hawaiians to favour short vowels in loanword realisation prior to this change, as is explained in greater detail in the section 2.8 in this thesis.

The modern Hawaiian alphabet and the main phonemes represented by them (including diphthongs, excluding rarely-used “loanword letters” listed above) may be seen in the table below (in Hawaiian alphabetical order, which lists vowels first):

Table 6. Hawaiian alphabet

Orthographical Representation	Phoneme
A/Ā	a / a:
ae	aɛ̄
ai	aᵢ
ao	aɔ̄
au	aʊ
E/Ē	e / e:
ei	eᵢ
eu	eʊ
I/Ī	i / i:
iu	ᵢu
O/Ō	o / o:
oi	ɔᵢ
ou	oʊ
U/Ū	u / u:
H	h
K	/k/~t/
L	/l ~ /r ~ /ɻ ~ /d/
M	m
N	n
P	p
W	/w/ ~ /v/
'	ʔ

2.6 Existing Findings on Hawaiian Loanword Adaptation

Although there has been relatively little systematic formalisation done with regard to the treatment of English-derived loanwords in Hawaiian, there is a fairly rich body of work documenting the types of changes that take place, likely due to the high degree of modification that words from English undergo when being adapted into Hawaiian, which often render such words almost unrecognisable for native English-speakers unacquainted with the language.

2.6.1 General Strategies Used in Hawaiian Loanword Adaptation

As mentioned, this study is primarily focused on the adaptation of fricatives and vowel sounds in loanwords in Hawaiian. Therefore, it is firstly necessary to detail the main adaptation strategies that have been observed for these sounds in their transition from English to Hawaiian, followed by a more in-depth explanation both of these strategies and other strategies which are used in Hawaiian loanword adaptation in general, and may prove themselves relevant to the topic at hand.

2.6.1.1 Adaptation of Fricatives

As seen from the phonological overview of Hawaiian in section 2.4, the Hawaiian language lacks all fricatives with the exception of /h/ and /v/. Therefore, English loanwords containing /h/ and /v/, as may be expected, are near-uniformly replicated as such in Hawaiian (though originally /v/-containing loanwords may just as often be realised as [w] due to the free variation between these sounds and the use of <w> over <v> in Hawaiian orthography). However, for other fricatives, alternative strategies present themselves, which may vary depending both on the type of fricative present in the original word and its position in said word. Elbert & Pukui (1979: 28) notes that the vast majority of fricatives are realised in Hawaiian as [k]; the only exceptions to this are /f/ which is realised as [p], and [ʃ], which in addition to being realised as [k], may also be realised as [h] in the word-initial position. Deletion is not explicitly mentioned as a strategy for fricative adaptation in this source, although Elbert & Pukui's *Hawaiian Dictionary* (1957) contains loanwords which show evidence of fricative deletion, so it can be extrapolated from this that they are aware of its existence as an adaptation strategy.

While these notes are without doubt extremely useful to keep in mind for a general overview of fricative adaptation, there is a strong possibility that they do not tell the full story of how Hawaiian speakers deal with fricative-containing loanwords today, lacking real-world speaker data. For this, we must turn to Adler (2006), a study which examined the on-the-spot English word adaptations of two native Hawaiian speakers. This study says this of fricative adaptation:

The English fricatives /f, s, z, ʃ, ʒ/ are ... not reliably mapped to a single native phoneme. For speaker 1, these sounds exhibit variation in all syllabic positions between retention as [h] and as a stop of a nearby place of articulation. That is, /f/ is realized as [p] or [h] and the coronals are realized as [k] or [h]. Speaker 2, on the other hand, deletes all non-prevocalic stridents. (Adler 2006: 1028)

From this we may see that although none of these fricatives can be linked with one single phoneme, an obvious assimilation pattern nonetheless presents itself; similarly to what was seen in Elbert & Pukui (1979), /f/ may be realised as [p] and the coronal fricatives may be realised as [k] (with /ʃ/ additionally being realised as [h]). However, we also see that [h] presents itself as a valid realisation for all of these fricatives, in contrast to what was stated in *Hawaiian Grammar*.

According to Adler (2006)'s data, the adaptation situation regarding the two interdental fricatives, /θ/ and /ð/ is similar, but with some notable differences. Both deletion and adaptation occur (though deletion appears to only occur for /θ/ in this data set), and no one Hawaiian phoneme emerges as the sole "Hawaiianised" realisation of either English phoneme; /θ/ appears to be almost identical to the other fricatives in its treatment by Hawaiian speakers, with [h] and [k] once again seen as primary realisations. On the other hand, /ð/ is adapted rather differently to the other fricatives, with deletion not occurring at all for this phoneme and the "replacement" realisations being somewhat different; [k] is once again present as a valid realisation, along with the previously unseen [ʔ] and [w].

Therefore, we see that adaptation of non-lexicalised loanwords (such as those used in Adler (2006)) may in fact vary from speaker to speaker, as well as from word to word within one speaker. Despite this rather high level of variation, one may still draw conclusions based on this data over what constitutes acceptable adaptation of a fricative in Hawaiian. For example, both deletion and assimilation are clearly valid strategies, though deletion is the somewhat rarer of the two strategies in the data presented (and, judging by the dictionary, in lexicalised loanwords also).

It is important to note that this study is certainly not a perfect account of modern loanword adaptation in Hawaiian; the fact that Adler somewhat conservatively stated that participants were to adapt loanwords in the most "Hawaiian" way possibly potentially reduced the chances of receiving authentic output. However, even in spite of this questionable methodological decision which may have unintentionally influenced participants to choose the most "orthodox" realisations, notable differences were found between dictionary loanword adaptations and these

spontaneous modern-day native speaker adaptations. These differences shall be detailed in section 2.9.

Based on this data and previous descriptions of fricative adaptation in Hawaiian as discussed at the beginning of this section, the general English fricative mappings known to be acceptable in Hawaiian today may be summarised as follows ([] signifies deletion, realisations found only in Adler (2006) are marked in bold):

Table 7. List of Hawaiian fricative adaptations

English Fricative	Hawaiian Realisation
[f]	[h] , [p]
[h]	[h]
[s]	[h] , [k], []
[z]	[h] , [k], []
[θ]	[h] , [k], []
[ð]	[k], [w] , [ʔ]
[ʃ]	[h], [k], []
[ʒ]	[h] , [k], []
[v]	[v], [w]

2.6.1.2 Adaptation of Vowels

Although it is certainly true that Hawaiian has a much smaller vowel inventory than English, the English vowel inventory is such that the majority of vowels are fairly easily and intuitively mapped to a certain Hawaiian vowel. A chart of these mappings (monophthongs only), taken from Schütz (1994: 192), may be seen below:

Table 8. List of Hawaiian vowel adaptations

English Vowels	Hawaiian Realisation
[i], [ɪ]	[i]
[e], [ɛ]	[e]
[æ], [a], [ə], [ɐ], [ʌ]	[a]
[ɔ], [o]	[o]
[u], [ʊ]	[u]

One may notice that this list is not entirely comprehensive; for one thing, it does not list unstressed forms and other allophones of the main Hawaiian vowels (for example, the unstressed realisation of [a], /ə/, which is found in loanwords with relatively high frequency). It is also perhaps important to mention the effect of vowel stress on loanword adaptation, another aspect which is neglected in this chart – Parker Jones (2009) and Schütz (1994) both observe that stressed vowels in English are often realised as a long vowel in Hawaiian, owing to the fact that long vowels are always stressed in Hawaiian. Finally, the list only mentions [a] as an acceptable realisation of the r-coloured vowel /ɚ/, though data from Parker Jones (2009) and even Schütz (1994) itself shows that the r-coloured vowel may also be realised as [lɚ], as in the given name Homer, which in Hawaiian becomes *Hōmela*, realised as /ho:melə/ (although this name, given its literary connotations, was more than likely missionary-created, and given the missionary focus on replicating English orthography rather than actual speech (Elbert & Pukui 1979: 28), this may not accurately represent actual Hawaiian adaptation patterns of the time period).

This lack of exhaustiveness aside (the latter of the omitted points, in any case, is not relevant to this particular thesis as the r-coloured vowel is being excluded from analysis and formalisation, and most of the omitted points are mentioned elsewhere in Schütz (1994) anyway), it is a relatively accurate summary of what may be expected of vowels being adapted from English to Hawaiian.

As the above chart demonstrates, there are no particular “surprises” when it comes to adapting perceptually borrowed vowels from English to Hawaiian, with the exception of the r-coloured vowel. Certainly, realisations are not nearly as inconsistent as what was seen for fricative adaptation, particularly in Adler (2006)’s data. However, this does not mean that vowel adaptation is not worth examining. On the contrary, this relative consistency in adaptation makes it particularly obvious when a loanword realisation is unexpected. For example, a non-standard realisation of a usually straightforwardly adapted vowel may be accounted for by English orthography, which often transcribes vowels in a way which could hardly be considered intuitive, particularly for non-native speakers. Alternatively, unusual vowel realisations may be down to the dialect from which a loanword was originally taken, especially considering the fact that English vowels exhibit wide dialectal variation.

2.6.1.3 Epenthesis

As mentioned in section 2.4, Hawaiian only permits open syllables, something which also holds true for any loanwords entering the language. This means that loanwords coming from English which originally contained complex onsets or codas will invariably have these features removed when brought into Hawaiian. Very often this results in epenthetic phonemes being added to the “Hawaiianised” word (though not always; Adler (2006) shows that deletion may also be a perfectly valid strategy for syllabic violations), as seen, for example, in the word *kupa* /kupa/, meaning “soup” or “to boil” (originating from the English word “soup”). Here, epenthesis occurs at the end of the word in order to avoid a coda, but it may occur in any word position when necessary, always either to avoid a complex onset or coda. Exactly what effects speakers’ choice of epenthetic vowel is unclear, but data from Adler (2006) and Elbert & Pukui (1979) shows that all Hawaiian vowels may be epenthesised; from Adler’s data, it appears that vowels adapted from the original English may have some effect on what the epenthetic vowel may be (e.g., “Colby” becomes /kolopi:/, “blessing” becomes /peleki:ne/), although such a phenomenon is not explicitly noted in the paper. This is also seen in the data presented in Harb (2016), a paper which provided a general optimality-theoretic account of Hawaiian loanword adaptation with the words /kikiki/ (“ticket”) and /palaki/ (“brush”) displaying a similar tendency, although again this is not explicitly brought to attention. Early borrowings often used by 19th century missionaries encouraged the use of [i], [e] and [a] as the primary epenthetic vowels:

When two consonants joined in a foreign word, need both to be preserved, we interpose the vowel *e*, and after a final consonant add usually the vowel *a*. (Bingham 1847: 155, quoted from Parker Jones (2009))

(Note that in the 19th century the letter *e* was still used by missionaries to describe Hawaiian [i] and [e] (Schütz 1994); this fact along with the fact that missionary-created loanwords such as *hīmeni* [hi:meni] (“hymn”, spelled here using modern Hawaiian orthography) contain both epenthetic [i] and [e] suggests that Bingham’s quote was intended to refer to both vowels).

It is not known for certain why exactly the missionaries preferred to end their loanwords with [a], but Elbert & Pukui (1979: 29) suggests that it may have been another part of their efforts to draw sharp distinctions between loanwords and native words. Regardless, the same text mentions that

this convention was not strictly followed for non-missionary loanwords, where the word-final epenthetic vowel was generally either [e] or [i] (but could indeed also be [a]).

2.6.1.4 Deletion

Deletion, as seen in section 2.6.1.1 of this thesis, is also a valid and relatively common adaptations strategy for loanwords in Hawaiian. In addition to being a well-established strategy for fricative adaptation, along with assimilation, it may also be used as a means of dealing with other illicit structures and phonemes found in loanwords. Although perhaps less common than epenthesis, Adler (2006) notes that deletion may be seen as a strategy for negating codas and consonant clusters by native Hawaiian speakers, even with orthographical effects possibly influencing the speakers to preserve sounds rather than delete them, e.g., for Speaker 2 of the study, “weird” becomes [wi:lə], with the word-final /d/ being deleted rather than adapted. From this admittedly small sample size, it appears that rates of deletion and epenthesis as strategies for repairing syllabic violations have a high degree of individual variation for non-lexicalised loanwords – Adler notes that Speaker 2 deletes syllabic violations with far greater frequency than Speaker 1, who favours epenthesis.

Deletion as a syllabic violation repair strategy almost always appears to occur word-finally and stops appear to be deleted more than other phonemes, at least in this particular study – it is also possible it is a fairly new strategy, as it does not seem to appear in other accounts of Hawaiian loanword adaptation. It may be worth noting that speakers of Hawaiian English and Hawaiian Pidgin also often delete word-final stops (Sakoda & Siegel 2003: 29); therefore, if this is an emerging strategy, it may be due to the increasing influence of Hawaiian Pidgin and Hawaiian English on the Hawaiian language in recent decades.

On the other hand, fricative deletion seems to be valid at practically any word position; Adler (2006) shows it may occur word-initially, word-medially and word-finally (e.g., “thing” becomes [i:enə], “clasp” becomes [kəlapɪ] and “crease” becomes [kali:]), as does Harb (2016); these phenomena are well-documented and are also noted by Schütz (1994) and Parker Jones (2009).

2.7 Donor Dialects

It does not suffice to simply say that the Hawaiian language was influenced heavily by the English language; given the sheer number of extant English dialects and the variety of Anglophone visitors to Hawai'i over the centuries, it may be prudent to examine these dialects in greater detail.

As mentioned previously, Captain James Cook and his crew were the first confirmed Europeans to make contact with the native Hawaiian people in 1778, and thus the first contact any of the islanders had with the English language. Cook's crew mainly consisted of men from various parts of England (although not entirely; other crew members included an American, a Welshman and a Tahitian who served as an interpreter of sorts during the voyage); although this was a landmark moment for Hawaiian in that it opened the door for other Anglophones to visit the islands and influence the language, it is thought that this particular visit had very little effect on how Hawaiian was spoken, as might be expected. It is not known if any actual loanwords entered Hawaiian at this point, although Schütz (1994: 189) deems it unlikely. What is known, though, is that loanwords began to surface quickly in the following years, as Cooks' "discovery" of the islands brought Europeans and American traders and explorers to the islands in droves – several were included in Spanish-Peruvian explorer Manuel Quimper's vocabulary of Hawaiian in 1791 (Schütz 1994). At this point in time, no one dialect of English could be said to be dominant in Hawai'i; traders came from all over the British Empire, as well as the newly-formed United States of America, and so the exact source of loanwords stemming from these period cannot be pinpointed with any great accuracy, though it may sometimes be possible to intuit this by examining the adaptations which have taken place in the word as it is realised Hawaiian.

It was not until the aforementioned arrival of Christian missionaries in the early 19th century that a single dialect of English became one of the main forms of contact that Hawaiians had with the language as a whole (though visitors and residents from other parts of the Anglosphere were of course also present). The vast majority of these missionaries had origins in America, and overwhelmingly in New England, a region known even (or perhaps especially) in the 19th century for its distinctive style of speech compared to the rest of the nation (features of special note include its non-rhoticity and the lack of a "Mary-marry-merry" merger which is common in most other dialects of American English). Schütz (1994), Parker Jones (2009) and Elbert & Pukui (1979) suggest that the non-rhoticity of this donor dialect may have affected the realisation of loanwords in Hawaiian, e.g., causing a word-final /r/ to be deleted rather than

adapted as an [l] as would be expected for adaptation from rhotic dialects, as in /ʔanəka:/ (“anchor”) versus /ʔəkele/ (“acre”).

Although English-speaking peoples from other dialect areas were not an especially rare sight in the Kingdom of Hawai‘i of the early 19th century (in particular, Scottish and Ulster Scots businessmen were a notable presence, with several having married or been advisors to members of the Hawaiian royal family), they were still relatively few in number and would have had more limited contact with native Hawaiians when compared to missionaries. These demographic patterns would begin to shift heavily in the wake of the establishment of the Republic of Hawai‘i in 1893; from this point onwards, and particularly after the 1959 admission of Hawai‘i to US statehood, English speakers of various ethnicities from all areas of America began to settle in Hawai‘i. In addition to this, the banning of the Hawaiian language in education in 1897 meant that English gradually became the home language of the vast majority of Hawaiians. Aside from these two factors, Hawai‘i also began to be marketed as a major tourist destination beginning in the 1920s, particularly for Americans. All of this meant that Hawaiian speakers were exposed to English at a greater and more sustained rate than ever before, as well as having greater exposure to non-New England dialects of American English. It is perhaps during this period, which continues to the present day, that the greatest number of loanwords from English have been added to the Hawaiian language.

Today, although many varieties of American English can be routinely heard in most any part of Hawai‘i, whether from tourists or residents, American English is not the only source of English vocabulary on the islands. In fact, Hawaiian Pidgin English, a primarily English-based creole (and not a pidgin as the popularly used name misleadingly suggests) with roughly 600000 native speakers of all ethnicities out of a permanent population of 1.43 million according to Ethnologue (2012), could be considered one of the main channels through which Hawaiian speakers are currently exposed to English vocabulary. The language first developed on sugar cane plantations in the mid-1840s, as a means of communication between predominantly Anglophone plantation owners and Native Hawaiian and non-Anglophone (especially East Asian) migrant workers (Sakoda & Siegel 2003). By the late 19th century Hawaiian Pidgin had begun to see frequent use outside the plantation setting, and even became the first language of many children growing up in Hawai‘i, with Standard American English often only being encountered for the first time at school (ibid). Because of its strong presence in Hawaiian society, and particularly in Native Hawaiian communities, it is almost unavoidable that some English loanword vocabulary would inevitably be adapted into Hawaiian from Hawaiian Pidgin. This may especially be the case for more recent

loanwords, as the social stigma of the language has decreased considerably since the latter half of the 20th century (although stigma even today is still relatively strong). Despite this ubiquity, as Parker Jones (2009) states, it is very difficult to tell which loanwords have come directly from English and which have come via Hawaiian Pidgin. Though this may be true, it may still be worthwhile to keep Hawaiian Pidgin in mind when examining the data in this thesis, as its unique phonology (including non-rhoticity, the realisation of the English interdental fricatives as stops [t] and [d], and the realisation of word-final /l/ as [o] or [ol]) may account for loanword adaptations which might otherwise be considered unexpected.

2.8 Orthographical Effects on Loanword Adaptation

Although little specific research has been done on the effects of orthography on loanword adaptation, orthographical effects have nonetheless been noted both in Hawaiian and other languages and the existing body of work on orthographical effects on loanword adaptations in general is somewhat sparse but not negligible. Even without examining the current theoretical background of this phenomenon, one can observe these effects in certain commonly used loanwords in English. For example, the word “incognito”, an Italian word which entered the English language in the middle of the 17th century (Oxford Dictionary) has the English realisation /ɪnkɔɡni:to:/. This is in contrast to the native Italian realisation, /inkɔ:ɲito/, a discrepancy which it seems overwhelmingly likely must have originated from the spelling of the word.

With regard to formal studies done in this field, an aforementioned study, Hamann & Colombo (2017), details the effects of double letter spellings of intervocalic consonants in English (e.g., words like “splatter” or “jogging”) on loanword perception and realisation in Italian. Essentially, in written Italian, double letter spellings are seen as an orthographical cue for geminate consonants, whereas in English double letter spellings tend to be an indicator of the length and quality of the preceding vowel rather than any reflection on the realisation of the consonant, as geminate consonants are not contrastive with single consonant realisations in English. When these double letter spellings are borrowed into Italian from English, geminate consonants therefore tend to be realised due to the differing cues which these spellings indicate in the two different languages. On the other hand, borrowings containing intervocalic consonants which are not spelled with a double letter, e.g., “hockey” or “hacker” are not realised in Italian with geminate consonants.

Kang (2009) also found that orthography was an important factor in how English /z/ was adapted into Korean in the 1930s. That is, /z/ was most frequently adapted as [c] when the /z/ was represented orthographically in English as <z> regardless of whether or not the /z/ was voiced, but where the /z/ was represented orthographically as <s> in English, the Korean adaptation only continued to be [c] in instances where the /z/ was voiced in the English realisation. Otherwise, the English devoiced /z/ (an example given in Kang (2009) is seen in the word “beans”) was usually realised in Korean as [s] or [s̺]. This study does not go as far as Hamann & Colombo (2017) in that it does not provide an optimality-theoretic (or any other type of) formalisation of this phenomenon, instead simply describing it as it happened. Despite the relative simplicity of this study, it is of interest in the context of this thesis in that it provides evidence of diachronic change based speakers’ increased competence in English. In the 1930s, Kang (2009) states, Korean speakers were far less familiar with English than they are now, and as a result, were more sensitive to factors such as orthography, leading to increased variability in adaptation. Now that Korean speakers have a more thorough understanding of English phonology, this variation has lessened and the situation has more or less stabilised into a “phoneme-to-phoneme adaptation” situation, as Kang (2009: 9) puts it.

Therefore, we see that orthographical effects on loanword adaptation, while not as well-documented as other factors affecting loanword adaptation, have been formally described for numerous languages; while Hawaiian is not one of these languages, there is ample evidence for orthographical effects on English loanword adaptation in the language (perhaps unsurprising, given both the often confusing and seemingly inconsistent nature of English orthography and the heavy emphasis on literacy in early post-European contact Hawai’i), as will be seen below.

Particularly from the 1820s until the late 19th century, many Hawaiian speakers would have first (and perhaps primarily) encountered many English words in writing, due to heavy missionary focus on literacy; in fact, by the mid 19th century, Hawai’i had one of the highest literacy rates in the world (91-95% according to the Kamehameha Schools website), with many capable of writing in their own language as well as English (in contrast, reports suggest that 1 in 6 adults in the state of Hawai’i are currently functionally illiterate, according to www.hawaiianliteracy.org). This bilingual literacy further compounded the proliferation of orthographically-adapted loanwords, as these orthographical borrowings became phonetically transcribed into written Hawaiian. Parker Jones (2009) details this phenomenon relatively extensively and describes how realisations may occur not only from the borrowing of English orthography, but from the failings of early Hawaiian orthography, which was initially more heavily based in English, as was seen in section 2.5 of this

thesis. An example of the latter phenomenon may be seen in the Hawaiian version of the English given name “Alex”, *Alika* /ə'likə/, a non-optimal realisation which Parker Jones claims is a result of deficient early Hawaiian orthography which has now “fossilised” a realisation which could be considered less than faithful to the original one (Parker Jones suggests a more “optimal” original adaptation buried by this lacking orthography might have been /ʔa:'likə/). The lack of an *ʻokina* preceding the initial “A” or a *kahakō* above it suggests to the Hawaiian reader that the name should be realised with a short, unstressed vowel rather than a long [a:] following a glottal stop (Parker Jones (2009) mentions that word-initial glottal stops in general are almost always a sign of an aural adaptation), and this spelling has prevailed over the years despite innovations in Hawaiian orthography as a whole, as does the realisation that accompanies it.

In addition to these types of borrowings, in which loanwords may have originally been borrowed through speech but later saw such frequent use in orthography that realisation shifted based on this, there are of course also several words which were more than likely originally adapted orthographically. Several words like this are also seen in Parker Jones (2009), e.g., *hīmeni* /hi:meni/ (from the English “hymn”). In this word, the silent <n> seen in the English spelling of this word is represented in the realisation of the Hawaiian adaptation; therefore, it seems impossible that the word could have been initially borrowed from anywhere but orthography.

2.9 Diachronic Changes in Hawaiian Loanword Adaptation

Diachronic changes in Hawaiian loanword adaptation have been briefly mentioned at earlier points in this thesis; changes in dominant English dialects and shifts from orthographical perception to aural perception over the years mean that loanword adaptations would almost certainly be expected to change over time. As Parker Jones (2009) and Schütz (1994) both mention, it is possible that newer loanwords may be more likely to adapt /r/ and /r/-coloured vowels rather than delete, due to a shift from non-rhotic to rhotic donor dialects of English.

Adler’s 2006 data also suggests a shift in what constitutes an acceptable adaptation of fricatives from English into Hawaiian is currently taking place; she mentions that although the only fricative adaptations listed by Hawaiian dictionaries are [k] and deletion, many more different adaptations were found in her own (admittedly flawed) study. In particular, the realisation of almost all fricatives as [h] was common for both speakers, despite the fact that no dictionary loanword adaptation includes [h] realisations of fricatives /f/, /s/, /z/, /ʒ/ or /θ/, with [k] and deletion being the only “legitimate” options. This may suggest diachronic change in how

loanwords are adapted by native speakers today, widening the scope of realisations which are judged appropriate. For this reason, although this study may be considered somewhat flawed in its methodology, it may still be considered an important evaluation of the loanwords perception of Hawaiian speakers in the present day, something which does not appear to be readily found elsewhere in the literature.

As is evident from this rather short list, there is very little current data on diachronic changes in loanword adaptation. Despite this relative lack of coverage, the information which does exist appears to be rather encouraging.

3. Research Questions

- How can fricative and vowel adaptation from English to Hawaiian be adequately formalised in OT in a way that accurately models (and hopefully predicts) the ways in which loanwords were and are formalised in the past and present?
- Do orthographical effects have a demonstrable effect on the adaptation of fricative and vowel-containing English loanwords in Hawaiian?
- To what extent have realisations of such loanwords changed over the years as American English has become the dominant language of all Hawaiian islands (with the exception of Ni'ihau)? Is there evidence of loanword structures which were previously considered illicit now being accepted by native Hawaiian speakers?

4. Hypotheses

In general, for both fricatives and vowels, there should be relatively consistent mapping of many English phonemes to few Hawaiian ones. In accordance with the literature, the main possible mappings should be as reported in sections 2.6.1.1 and 2.6.1.2 of this thesis. Although these mappings may be taken as a general trend, anomalies are to be expected, and these unusual realisations are the ones which shall be chosen for analysis. These anomalies should be explainable by either the effects of orthographical borrowings or dialectal perceptual borrowings. The expected results of analysis are as follows:

- Orthographical and dialectal effects will have a greater effect on vowel adaptation than that of fricative adaptation, due to the diverse nature of vowels in English dialects and the

English orthographical tendency to map many vowels to few orthographical representations.

- Diachronic changes will be seen in both fricative and vowel adaptation, but for slightly differing (though connected) reasons; newer vowel-containing loanwords shall see change due to a shift from orthographical borrowings to perceptual borrowings. On the other hand, newer fricative-containing loanwords will see a greater number of possible realisations arise due to the increasing familiarity of Hawaiian speakers with spoken English.
- Overall, newer borrowings should more closely mirror original English realisations than older ones, and while the vast majority of borrowings will still closely conform to Hawaiian phonology and phonotactics, it is expected that a slightly greater tolerance towards illicit structures will be seen in newer loanwords (more than likely with regards non-native phonemes than non-native syllable structure, which appears relatively stable). It is not, however, expected that native Hawaiian syllable structure will be compromised in newer loanwords; instead, this greater tolerance will likely only extend to the occasional realisation of non-native phonemes.

5. Methodology & Data

The main source of data for this study is Hawaiian section of the World Loanword Database (WOLD), compiled and maintained by 'Ōiwi Parker Jones. This database has mainly been collected from several dictionaries (mainly various editions of Elbert & Pukui's dictionary first published in 1957), although alternate non-dictionary realisations are also sometimes presented. The source for these is not entirely clear (most of them do not appear to be listed in the dictionary, which is perhaps not surprising considering many of these realisations contain non-native Hawaiian phonemes), although it may be assumed that they are taken from Parker Jones's own experience as a native speaker of Hawaiian and/or perhaps correspondence with other native speakers of the language. Where several valid realisations of a word exist, all of these shall be formalised in order to effectively demonstrate possible diachronic change or competing adaptation strategies for fricatives and vowels.

For the purposes of including more "spontaneous" realisations by native speakers and perhaps ascertain whether there is currently a gap between older, lexicalised loanword

adaptations and newer adaptations by native speakers, a number of words collected by Adler in her 2006 study shall also be included.

wehewehe.org, a Hawaiian online dictionary which sources words from all major Hawaiian dictionaries from the year 1865 up to the present day, shall serve as a tool to check whether alternate spellings/realisations given by WOLD and/or the realisations given by the speakers in Adler (2006) are extant in any current dictionaries.

Loanwords known to have originated in Ni‘ihau Hawaiian shall be excluded where possible as the speakers’ isolation from other Hawaiian speakers may render their adaptation processes incomparable, particularly considering the lack of mutual intelligibility between Ni‘ihau Hawaiian and other varieties of the language. This should not be a problem, as Parker Jones (2009) states that only one loanword from this particular database is known to have Ni‘ihau origins and neither of the speakers studied in Adler (2006) are Ni‘ihau natives.

Loanwords which are known to have been “created” by the *Komike Hua‘olelo*, or Lexicon Committee (a Hawaiian language committee appointed to fill lexical gaps in Hawaiian for pedagogical purposes) shall also be excluded from formalisation as there is no guarantee that these (likely conservative, given its reluctance to borrow from English at all if it may be avoided) adaptations accurately reflect loanword adaptation processes in Hawaiian speakers today. Again, these loanwords are relatively few and are clearly marked in the database in use for this thesis, so avoidance should not be a difficulty. *Komike Hua‘olelo*-created words may, however, be used in order to compare and contrast with the chosen words for formalisation or for other relevant points of discussion. The sole exception to this restriction shall be the word *peawa* (beaver). The reason for this is that this word, although labelled in his database as originating from the *Komike Hua‘olelo* in 2003, is clearly marked in Parker Jones (2009: 14) as being an older borrowing. It is possible that despite the age of the word, the *Komike Hua‘olelo*’s dictionary, *Māmaka Kaiao* (2003) was simply the first dictionary to record it in writing. This may be supported by the fact that another word for “beaver”, *piwa*, already existed in the 1986 version of Elbert & Pukui’s *Hawaiian Dictionary*, meaning there would be no need for the *Komike Hua‘olelo* to create a new word as a lexical gap did not exist.

The same restriction shall not entirely apply to words introduced by 19th century missionaries, as it is difficult to determine when this is the case (though there is an attempt to mark them in the database where possible), although words which are obviously biblical or clearly marked as originating from missionaries shall be avoided for this reason.

/h/ and /v/ are excluded from fricative analysis due to their presence in the modern native Hawaiian consonant inventory and their relative consistency in adaptation.

The following are the words which shall be formalised for this thesis (listed with Hawaiian spelling(s) and realisation(s) first, followed by English spelling and source. Realisations are approximate as “live” data on non-Adler loanwords is not readily available; in general, where phonemes with allophones occur, assume that their allophonic counterparts may also be realised in this adaptation):

- Peawa/beava/piwa/biva – /peavə/-/beavə/-/pivə/-/bivə/ (beaver) (WOLD)
- ‘Ailana – /ʔailəna/ (island) (WOLD)
- Keaka – /keakə/ (chat) (WOLD)
- Holola – /hololə/ (floor) (Adler 2006)

The above words have all been chosen for formalisation because their adaptations are in some way unusual, unexpected, or show clear evidence of a specific type of borrowing, e.g., perceptual vs orthographical. Age of lexicalised loanwords is (admittedly somewhat roughly) determined both by earliest presence in the dictionary and information given in Parker Jones (2009), which acts as a companion guide of sorts to the Hawaiian section of the World Loanword Database.

Formalisation and constraints for orthographical borrowings are based on those used in Hamann & Colombo (2017). Perceptual formalisations focus on mapping from the auditory form to the surface form, while orthographical formalisations map from the orthographical form to the surface form.

6. List of Relevant Constraints & Formalisation

6.1 Orthographical Constraints

- <ɣ> /P/ = Assign a violation mark to every grapheme <ɣ> does not map to the phoneme /P/ and vice versa
- <ɣ> / / = Assign a violation mark to every grapheme <ɣ> that is not mapped to an empty segment in the Surface Form
- *< >/P/: Assign a violation mark if the absence of a grapheme is mapped onto the phonological form /P/.

6.2 Perceptual Constraints

- $*[x]_{AUD} /P/$ = Assign a violation mark every time $[x]$ in the Auditory Form is not mapped to phoneme $/P/$ in the Surface Form
- $*X$ = Assign a violation mark every time X appears in the Surface Form

6.3 Formalisations/Discussion

6.3.1 “Beaver”

The word “beaver” in this data set is an example of an English-derived loanword which has undergone change in the Hawaiian language over time due to increased auditory input from native English-speakers. Initially, the two primary Hawaiian realisations of the word were $/pe.av.ə/$ and $/be.a.və./$, realisations which were chiefly derived from the English orthography of the word “beaver”, rather than the auditory realisation (Parker Jones 2009: 14). However, as native American English-speakers became a larger presence in Hawai‘i, this realisation began to fall out of use in favour of $/pi.və./$, a realisation more closely resembling that of English-speakers (ibid).

Table 9. Original Hawaiian realisation of “beaver”, based on English orthographical cues

<beaver>	<ea> /ea/	<r> //	 /p/	 /b/
$/bi.və./$	*!	*	*	
$/pi.və./$	*!	*		*
$/bi.və./$	*!		*	
$/pi.və./$	*!			*
$/be.a.və./$		*	*	
$/pe.a.və./$		*		*
$/be.a.və./$			*!	
→ $/pe.a.və./$				*

Table 10. Alternate tableau based on alternate orthography

<beaver>	<ea> /ea/	<r> //	 /b/	 /p/
/ .bi.və./	*!	*		*
/ .pi.və./	*!	*	*	
/ .bi.və./	*!			*
/ .pi.və./	*!		*	
/ .be.a.və./		*!		*
/ .pe.a.və./		*!	*	
/ .pe.a.və./			*!	
→/ .be.a.və./				*

Note here that the English graphemes <e> and <a> combined in the initial two realisations map to the vowels /e/ and /a/ respectively, as they would in written Hawaiian and not to /i/, as they often (though not always, e.g., “earth”, “heard”, etc) would in English.

Table 11. Modern Hawaiian realisation of “beaver” primarily based on auditory rather than orthographical input

[.bi.və.] _{AUD}	*/r/-coloured vowels	*[i] _{AUD} /e/	*[] /a/	*voiced stops	*[b] /p/
/ .bi.və./	*!			*	
/ .pi.və./	*!				
/ .bi.və./				*!	
→/ .pi.və./					*
/ .be.a.və./		*!	*	*	
/ .pe.a.və./		*!	*		*
/ .pe.a.və./		*!	*		
/ .be.a.və./		*!	*	*	*

Table 12. Alternate tableau based on alternate realisation

[.bi.və.] _{AUD}	*/r/-coloured vowels	*[i] _{AUD} /e/	*[] _{AUD} /a/	*[b] _{AUD} /p/	*voiced stops
/bi.və./	*!			*	
/pi.və./	*!				
/pi.və./				*!	
-> /bi.və./					*
/be.a.və./		*!	*	*	
/pe.a.və./		*!	*		*
/pe.a.və./		*!	*		
/be.a.və./		*!	*	*	*

Meanwhile, unlike in the earlier set, the realisations seen in the perceptual set clearly much more closely reflect actual English realisations due to cue constraints ensuring that the vowel [i] may not be perceived as /e/ and [a] cannot be perceived where it does not exist.

6.3.2 “Island”

In contrast to “beaver”, the Hawaiian realisation of “island”, /.ʔai.la.na./, has quite clearly been perceptually borrowed. This can be gleaned from the presence of a glottal stop at the start of the word, something which Parker Jones (2009) states tends to happen with vowel-initial perceptual borrowings due to Hawaiian speakers perceiving the non-phonemic glottal stop that appears at the beginning of such words in English. Aside from this, and perhaps more obviously, the non-realisation of the silent <s> and realisation of <i> as [ʔai] rather than [i] also point clearly towards a perceptual borrowing.

It also appears to be a somewhat recent borrowing (post-missionary at a minimum). It is absent from Lorrin Andrews’ 1865 dictionary, *A Dictionary of the Hawaiian Language*, which under the definition of “island” lists only several native words, with this particular loanword appearing only in the 1986 edition of Elbert & Pukui’s *Hawaiian Dictionary*. This makes sense when one considers the fact that an island nation such as Hawai’i would have had no real need of a loanword for the term during a period in which Hawaiian was still the majority language.

Table 13. Perception of “island”

[.ʻai.lənd.] _{AUD}	*CODA	*[ʻ] _{AUD} //	*[n] _{AUD} //	*[d] _{AUD} //	*[] _{AUD} /a/
/ai.lənd./	*!*	*			
/ʔai.lə.nd./	*!*				
→ /ʔai.lə.na./				*	*
/ai.lə.na./		*!		*	*
/ʔai.lən./	*!			*	
/ai.lən./	*!	*		*	
/ʔai.lə./			*!	*	
/ai.lə./		*!	*	*	

Judging by this adaptation and other vowel-initial loanwords in Hawaiian, it appears that Hawaiian speakers always perceive a glottal stop before the initial vowel in English. Thus, the optimal surface form must always contain a glottal stop. Aside from this, the vowels are more or less perfectly represented as they would be in English (although /a/ may sometimes be seen in place of a schwa due to these vowels being allophonic in Hawaiian), unlike what was seen in the orthographical borrowing in “beaver” (such features may also be seen in other perceptually borrowed vowel-initial loanwords, e.g., *ēkōna* /ʔe:.kō.nə./ (“acorn”), where again a glottal stop is present and the <a> is reproduced as /e:/ rather than /a/, as may have been expected had the word been orthographically borrowed). We also see (though it is not the under the specific focus of this thesis) that codas absolutely must not be present in Hawaiian, accounting for the presence of epenthetic /a/ despite its absence in the original English. This is also seen in the following two adaptations.

6.3.3 “Chat”

The Hawaiian adaptation of the word “chat”, /ke.a.kə./, was again chosen because it showed evidence of having been perceptually borrowed. More specifically, it shows possible evidence of having been borrowed from a specific dialect of English; the presence of two vowels, /e/ and /a/, where in English orthography and many English dialects (including 19th century New England English, the previously-dominant English dialect in Hawai’i, although this has since changed as American dialects see increasing standardisation) there is only one suggests that this particular word may have been borrowed from General American English. This dialect, once confined mainly to Western and Midwestern states but currently common (naturally, with some regional variation)

all across Anglophone North America, particularly in the media, is known for a feature known as |æ| tensing, in which the |æ| in words such as “yeah” and “cat” is instead realised as /eə/ or /ɛə/ (Labov et al 2006: 182). As was the case with “island”, “chat” appears to have been borrowed relatively recently, again only appearing in the 1986 edition of *Hawaiian Dictionary*.

Evidence of such dialectal borrowings, as well as being evident in the adaptation of /r/ as detailed in section 2.7, may also be seen in vowels in words such as *kaioke* /.kai.o.ke./ (“coyote”). In this word, the realisation of the final vowel suggests that this word was borrowed from a non-western dialect of American English (according to the Merriam Webster dictionary, western dialects frequently realise the word as /.kai.ot./ rather than the more standard /.kai.o.ti./).

Note that for this particular formalisation, <k> is used to represent both /k/ and /t/ where it is used in place of English /t/; since Hawaiian /k/ and /t/ are allophones of each other, there seems no reason why the two could not be used interchangeably where English /t/ occurs. The same interchangeability shall apply for /ə/ and /a/ for the same reason.

Table 14. Perception of “chat”

[.tʃe.ət.] _{AUD}	*CODA	*affricates	*[eə] _{AUD} /a/	*[ə] _{AUD} / /	*[tʃ] _{AUD} /k/	*[] _{AUD} /ə/
/.tʃe.ək./	*!	*				
/.ka.kə./			*!			*
/.ka.k./	*!		*		*	
→ /.ke.a.kə./					*	*
/.ke.kə./				*!	*	*

6.3.4 “Floor”

The final adaptation selected for formalisation is “floor”, adapted by Speaker 1 as /.ho.lo:..lə./ in Adler (2008: 1028) (it is not stated in the paper what Speaker 2 realised this word as – only that she deleted all non-prevocalic stridents, presumably including the one in this word). As was seen in section 2.6.1.1 of this thesis, this is interesting because /f/ is never realised as [h] in lexicalised loanwords. It is also of interest because the words in this experiment were presented to the participants orthographically rather than aurally, therefore providing a modern-day contrast to the first orthographically borrowed word formalised in this thesis, *peawa*.

Table 15. Perception of “floor”

<floor>	*< > /u/	<r> /l/	<f> /h/	<oo> /o/	*< > /o/	*< > /ə/
/.fɪb:ɹ./		*!	*			
/.pɒ.lɒ./		*!	*		*	
/.hʉ.lʉ.lə./	*!			*		*
/.pʉ.lʉ.lə./	*!	*	*	*		*
/.hɒ.lɒ./		*!			*	
→ /.hɒ.lɒ.lə./					*	*
/.pɒ.lɒ.lə./			*!		*	*
/.hɒ.lɒ.ə./		*!			*	*
/.pɒ.lɒ.ə./		*!			*	*

The constraint pertaining to fricative adaptation has been ranked quite low in this tableau, due to the fact that both this speaker and Speaker 2 seem to realise [h] and [p] relatively evenly in place of <f> (for example, Speaker 1 realises the word “find” as /.hɑi.ne.kə./ while Speaker 2 realises it as /.pɑi.nu./, “fork” is realised by both as /.pɒ.kə./ and “proof” is realised by Speaker 1 as /.pʉ.lu.hʉ./).

Unlike the orthographical borrowing of “beaver”, /.hɒ.lɒ.lə./ rather closely captures the vowel present in the English realisation of “floor”. This is undoubtedly because of the speaker’s familiarity with spoken English, which appears to override orthographical effects to some extent, (although not completely; Speaker 1 in this study mentions that she felt she may have been subconsciously compelled to epenthesise/adapt rather than delete features due to being presented with the words in writing (Adler 2006: 1029)), similar to the findings in Kang (2009). In contrast, a Hawaiian speaker far more familiar with written English than spoken may have chosen to realise [u] instead of [o], due to <oo> being an orthographical cue for /u/ the majority of the time in English. It is also notable here that the initial epenthetic vowel again matches the adapted vowel of “floor”, [o], similarly to what was seen in section 2.6.1.3 above.

7. Conclusions

Although general conclusions can be drawn from these formalisations, it is important to note that the nature of the data which they are based on means that this is not, and cannot be, a wholly comprehensive formalisation of fricative and vowel-adaptation in Hawaiian. For example, it is impossible to tell whether or not /t/ realisations are a valid option in fricative adaptation (there is

certainly no immediately obvious reason why they shouldn't be, given how widespread realisations of its allophone /k/ are). As mentioned previously, dictionary sources only adapt fricatives as [k] (or [p] for /f/-containing loanwords) or delete them – we know from the data presented in the Adler (2006) that this situation does not wholly reflect the adaptation strategies of Hawaiian speakers in the present day, as [h] realisations are also very common, alongside other realisations not mentioned in the dictionary. Additionally, in any case, <k> orthography in the dictionary does not necessarily imply that [k] is the only valid realisation in real life speech, since the allophones /t/ and /k/ share the letter <k> in orthography. Certainly, the dominance of <k> in orthography may mean that /k/ is more common than /t/ in loanwords, but it does not discount the possibility of the latter in general, since [t] realisations of native Hawaiian words spelled with <k> are widespread. Adler (2006), while in many respects (as seen above) helpful in giving a basic idea of how native Hawaiians adapt new loanwords in the present day, may not be considered a reliable indicator in this particular case due to its somewhat flawed methodology. There is a strong possibility that Adler's instructions to her participants to give the most "Hawaiian" realisations possible may have unwittingly influenced them to exclude the "lesser" partner in allophonic situations, i.e., [k] may have always been realised over [t] because of /k/'s dominance over /t/. This possibility may be corroborated by the fact that, as far as it is possible to tell, neither of the speakers ever realised [v] either. Instead, [w] was always realised, even though it is clear from Parker Jones's data in his 2009 paper and in his work on the Hawaiian section of the WOLD that [v] realisations for loanwords are not only possible but common, and arguably just as common as [w] realisations. Therefore, both current literature on Hawaiian loanword adaptation and this thesis fall short in providing a definitive list of fricative mappings, something that will have to be left for a later study.

It is also practically impossible to ascertain how widespread non-native phoneme use (both vowel and fricative) is in Hawaiian loanword realisation today without solid spontaneous speaker data, as opposed to the collection of written words and elicited adaptations which were used as data in this thesis. The same goes for investigating whether native Hawaiian phonotactics have been compromised by English influence (although admittedly, this seems somewhat unlikely). Currently this data is difficult to obtain, although funding for a publicly available digital spoken corpus was granted in April of 2017 according to the University of Hawai'i news site, which may assist in a more comprehensive study in the future.

It is also worth pointing out that the data set presented in this thesis is relatively small. As far as can be ascertained, none of the findings shown here are contradicted by any other word in

either the WOLD or Adler (2006), the two data sources used, and so it does not seem overly bold to state that they are indeed generally representative of fricative and vowel loanword adaptation in Hawaiian. However, the small size of this study is still important to note.

With these caveats in mind, the conclusions of this thesis are as follows:

- Vowel-containing loanwords, as expected, showed stronger evidence of orthographical borrowings than fricatives; the oldest words in the data set, *peawa* and *beava*, are clearly realised based on their orthography rather than their actual realisation. On the other hand, all other (newer, perceptual) vowel adaptations rather faithfully replicate the original English vowels.
- Additionally, modern native Hawaiian speakers appear to have no problem adapting vowels from orthography in a manner which resemble English realisation rather than spelling. This is perhaps unsurprising given that Hawaiian speakers are currently near-universally bilingual. Newer vowel-containing borrowings also benefit from improved orthography as detailed in sections 2.5 and 2.8, meaning faithful vowel borrowings are more likely to be preserved in writing than before. Therefore, diachronic change has occurred in vowel adaptation both due to a shift from orthographical borrowings to perceptual borrowings and increased Hawaiian familiarity with English better preserving English sounds where orthographical borrowings are seen.
- Evidence was less strong for dialectal borrowings affecting diachronic change in vowel adaptation. It is possible and maybe even likely that a shift in the dominant English donor dialects present in Hawai'i has caused change, as seen in the formalisation of "chat", but it is difficult to find concrete evidence of this since traces of early dialectal borrowings is relatively scant, meaning there is little to compare this and other similar loanwords to.
- As one might expect given the consistency of fricative representation in English orthography compared to that of vowels, orthographical effects did not appear (unless one considers the possibility that Speaker 1 of Adler (2006) may have deleted the /f/ in "floor" rather than adapting it as [h] had it not been in front of her in writing).
- Diachronic change in fricative adaptation is probable based on the data presented in Adler (2006), and may even be greater than this data suggests, as was discussed above. The emergence of /h/ as a major fricative replacement phoneme alongside the established /k/ appears very clear not only from the word formalised in this thesis, but many others present in the data set. This emergence may well be explainable by way of increasing familiarity with English, as the replacement of fricatives with another, native fricative is

arguably more faithful than replacement with a stop. Other non-dictionary fricative adaptations in the study (see /ð/ in section 2.6.1.1) have less of a strong presence (hence the decision not to formalise them in this thesis), and it therefore may be better to investigate further before declaring them a regular part of modern Hawaiian fricative adaptation, but their presence despite the circumstances of the study does suggest this may be at least partially the case.

- As mentioned at the beginning of this section, increased tolerance of non-native fricative (or indeed vowel) phonemes is difficult to prove; certainly, non-native orthography exists both in and outside the dictionary (the WOLD gives several alternate non-dictionary loanword spellings which contain non-native fricative letters, e.g., *bafulo* (“buffalo”). Presumably these were collected from his experience as a native speaker). While this suggests the possibility of non-native fricative realisation in modern Hawaiian, it is no guarantee of it; non-native orthography has been shown to have rather a long history in Hawaiian (even if in reality it is quite rare, particularly today) and clearly did not necessarily imply non-native realisation in the 19th century, and so it would be unwise to claim it does now without accompanying audio data.
- Native Hawaiian phonotactics are preserved as expected due to very highly-ranked *CODA constraint.

For future study, given the fact that [h] and [k] realisations of fricatives appear to occur in similar situations, it may be worthwhile to investigate whether /h/ is overtaking /k/ as the most common fricative adaptation or whether the two coexist in a relatively stable state.

Overall, although the results of this analysis may be considered somewhat mixed in that not all hypotheses could be definitively proven, diachronic change has been proven more or less certain, as has the role of orthographical borrowings both in this change and in Hawaiian loanword phonology in general. Particularly given the latter fact, it may be wise for future formalisations of loanword phonology both in Hawaiian and other languages to give more serious consideration to the possible effects of orthographical borrowings in the future.

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