A CENTERING THEORY ANALYSIS OF DISCREPANCIES ON SUBJECT ZERO ANAPHOR IN ENGLISH TO THAI TRANSLATION

Saranya Pathanasin[1]
Wirote Aroonmanakun[2]

Abstract

Centering theory (CT) has been adopted in analyzing 84 zero anaphors in 50 informative texts. It is found that most zero anaphors occur in Continuation state both in English texts (source texts (ST)) and Thai translation (target texts (TT)). Zero anaphors in the TT outnumber those in ST and are found in more environments. In terms of translation, most zero anaphors in source texts remain in the same form in the target texts although some items are translated into different anaphor forms. Results indicate that zero anaphor is used to keep discourse coherence and to refer to the backward-looking center (Cb) of current utterances in both languages. Therefore, most zero anaphors in source texts are translated into zero anaphors in target texts when the CT transition state of utterances in source texts and target texts is Continuation, and are translated into other anaphors when the CT transition state in source texts is changed to another transition state in the target texts.

Constraints in translation of zero anaphors can be explained in terms of anaphor interpretation, salience of entities, syntactic constraint, and naturalness of translation. However, this paper focuses only on one type of anaphor, namely subject zero anaphor; investigation of other types of anaphor will reveal other discrepancies in using and translating anaphors from this language pair.

1. Introduction

1.1 Background of the study

This paper focuses on the use and translation of zero form as anaphor. By zero anaphor in English, we refer to the zero pronominal with subject role to a finite verb. For example:

(1) Back behind this giant reef fish's already toothy maw looms a second set of jaws, which Ø launch from the throat, Ø grab prey from the front teeth, then Ø retreat into the dark tunnel of the eel's esophagus.

Data shows that zero anaphor (Ø) in English can be translated into both zero and overt anaphors in Thai (target language). For example:

(2) ST[3]: Key to koala survival, it [bat] laps eucalyptus nectar, then Ø disperses pollen grains up to 60 miles away.

TT[4]: ค้างคาวมีบทบาทสำคัญในการอยู่ รอดของโคอาลาเพราะพวกมันจะกินน้ำ ต้อยของ ต้นยูคาลิปตัสและ Ø ช่วยถ่ายละอองเรณู

---

[1] Ph.D. Candidate, Graduate Program in English as an International Language, Chulalongkorn University, Bangkok, Thailand
[2] Associate Professor, Department of Linguistics, Faculty of Arts, Chulalongkorn University, Bangkok, Thailand

[3] ST stands for source text which in this case is English.
[4] TT stands for target text which in this case is Thai.

ได้ไกล ถึง 97 กิโลเมตร

[khaaŋ3khaaw0 mii0 bot1baat1

sam4khan0 naj0 kaan0 juu1rɔɔt2 khɔɔŋ4

khoo0ʔaa0laa2 phrɔ3 phuuak2man0 ca1

kin0 naam3tɔj2 khɔɔŋ4

ton2juu0khaa0lip3tat3 lɛ3 ø chuuaj2

thaaj1 la3ʔɔɔŋ0 ree0nuu0 daaj2 klaj0

thɨŋ4 kaaw2sip1cet1 ki1loo0meet3]

(Bat has important role in koala survival because they will eat eucalyptus nectar and Ø help dispreses pollen gain up to 97 kilomaters far)[5]

(3) ST: Scientists knew snakes used their sides to push off twigs and rocks but **Ø** were baffled by their ability slither so well on smooth surfaces.

TT: นักวิทยาศาสตร์รู้มาก่อนหน้านี้ว่างูใช้สีข้างดัน กิ่งไม้และหินพร้อมกับดันตัวไปข้างหน้าแต่**พวกเขา** ประหลาดใจที่มันสามารถเลื้อยไปบนพื้นผิวที่เนียน เรียบได้อย่างคล่องแคล่ว

[nak3wit3tha1jaa0saat1 ruu3 maa0 kɔɔn1

naa2 nii3 waa2 ŋuu0 chaj3 sii4khaaŋ2

dan0 king1maj3 lɛ3 hin4 phrɔɔm3 kap1

dan0 tuua0 paj0 khaaŋ2naa2 tɛɛ1

phuak2khaw4 pra1laat1caj0 thii2 man0

saa4maat2 lɨɨaj3 paj0 bon0 phɨɨn3phiw4

thii2 nian0riap2 daj2 jaaŋ1

khlɔŋ2khlɛɛw2]

*(Scientists knew that snakes use sides to push off twigs and rocks when pushing themselves forward but they were baffled by the fact that **they** could slither on smooth surfaces fluidly)*

---

[5] Word-by-word translation

Examples (2) and (3) show translation of zero anaphors in English into different anaphors in Thai, which are: zero anaphor in example (2) and a personal pronoun in example (3). Since zero anaphors in English can be translated into different anaphors in Thai, an interesting question arises: what are the factors that govern translators' choices of anaphor when translating.

This study adopted centering theory (CT) to investigate the discrepancies between using zero anaphors in English and in Thai. It is a pioneer study that adopts centering theory in translation study. Our aims are: to analyze possible ways to translate English zero pronominals into Thai; to analyze discourse coherence in both source and target languages using centering theory; and to compare CT-Transition states[6] between the translation pair to reveal the principles that govern translators' decisions in translating zero anaphors from English into Thai. We hypothesize that:

1) discrepancies between the uses of zero anaphor in English and Thai can be explained according to centering theory, and

2) translation of zero anaphors from English into Thai is governed by discourse structures rather than sentence structure.

To test our hypothesis, we analyzed parallel corpora of English and Thai. Samples were collected from 50 English-Thai translations, 50 source texts (ST), and 50 target texts (TT). These are informative texts selected from National Geographic

---

[6] CT-transition state is the changes of attention in local discourse which will be described later in section 2.

magazine. This study attempts to answer the following two research questions:

1. To what extent can centering theory be used to analyze discrepancies between zero anaphor in English and Thai translation?

2. In which environments do zero anaphors remain the same and change form in translation of English to Thai?

This paper is organized as follows: Section 1, Introduction; Section 2, overviews of CT and review of particular aspects of CT adaptation in Thai; Section 3, data and research methodology; Section 4, results; and Section 5, conclusion.

2 Centering theory

2.1. CT overviews

Centering theory (CT) is formulated as a theory that relates the center of attention, choices of referring expressions, and perceived coherence of utterances, within a discourse segment (Grosz and Weinstein 1995 cited in Walker, Joshi and Prince 1998: 20). CT arose from the original work of Barbara Grosz in 1977 (Joshi and Miltsakaki 2006: 223). The centering model explains the perceived coherence of discourse by capturing the center of attention in discourse. The center of attention is a member of entities in a given discourse, and it has been seen as an interesting approach to anaphor study. Centering model can explain the different degrees of coherence in discourse as demonstrated below:

(4) 4.1) a) **John** went to his favourite music store to buy a piano.
b) **He** had frequented the store for many

years.
c) **He** was excited that he could finally buy a piano.
d) **He** arrived just as the store was closing for the day.
4.2) a) **John** went to his favourite music store to buy a piano.
b) **It** was a store John had frequented for many years.
c) **He** was excited that he could finally buy a piano.
d) **It** was closing just as John arrived.
    (Joshi and Miltsakaki 2006: 224)

CT predicts that discourse (4.1) is easier to process than (4.2) because (4.1) is more coherent than (4.2). In (4.1), *John* is the center of attention from (a) to (d), while the center of attention shifts in discourse (4.2) between *John* in (a) and (c), and *the store* in (b) and (d).

CT provides a set of definitions, constraints, and rules to formulate the transition state in local discourse which expresses how the choice of linguistic items affects hearers' processing (Kameyama 1998: 90). This transition state expresses the relationship between utterances in discourse which reflects the degree of coherence.

Centering theory definitions:

As Brennan, Friedman and Pollard (1987: 1) explained: A discourse segment consists of a sequence of utterances $U_1...,U_m$, with each utterance (U_i) associated with a list of forward-looking centers, Cf(U_i) consisting of those discourse entities that are directly realized, or realized by linguistic expressions in the utterance. The ranking of an entity on this list corresponds roughly to the likelihood that it will be the primary focus of subsequent discourse. The first entity on this list is the preferred

center, $Cp(U_i)$. U_i actual centers, or is 'about', only one entity at a time for the backward-looking center, $Cb(U_i)$. The backward center is a confirmation of an entity that has already been introduced into the discourse; more specifically, it must be realized in the immediately preceding utterance, U_{i-1}.

According to Brennan, Friedman and Pollard (1987) the set of forward-looking centers (Cf) consists of all entities that appear in the current utterance (U_i). They have different degrees of salience and therefore are ordered according to their grammatical roles as will be described later in the Cf Ranking section. The most salient member becomes the Preferred Center (Cp) which is likely to be the backward-looking center (Cb) of the next utterance.

The backward-looking center (Cb) is the entity that links the current utterance with the previous utterance (U_{i-1}) and is the center of attention in the current utterance (U_i). In each utterance, there is only one Cb.

The following example demonstrates how to determine utterance and its members:

(5) U_i Brown University sociologist John Logan has pored over the melting pot in microcosm for 40 years.
Cf: [John_Logan, Melting pot, Microcosm]
Cb: [?] (no Cb)
Cp:[John_Logan]

Note that an utterance in the present study is the updated unit which list of Cf member and Cp are updated. Utterance in our study consists of Subj + finite verb, so the sentence in example (5) is determined as one utterance. Then, we determine members of the Cf set in the above

example by including all entities existing in the utterance U_i. Those entities are ranked according to their grammatical roles which will be described later in this section. Cb is the entity in the previous utterance (U_{i-1}) that is referred to in the current utterance. Because there is no previous utterance in example (5), the utterance U_i has no Cb. The most salient entity in the Cf set of the current utterance is Cp, so Cp (U_i) is the entity realized by *John Logan*.

The definition above describes how to determine Cf, Cb, and Cp. Next, CT provides Constraints on assigning these members as follows:

Constraints

For each utterance U_i in a discourse segment D consisting of utterances $U_1,…, U_m$:

1. There is precisely one backward-looking center Cb (U_i).
2. For every element of the forward center list, Cf (U_i), must be realized in U_i.
3. The center, Cb (U_i), is the highest-ranked element of the Cf (U_{i-1}) that is realized in U_i.

(Brennan et al. 1987: 2)

These CT-constraints determine that: firstly, an utterance can have only one Cb; secondly, all members of Cf (U_i) are entities that exist in U_i. Note also that where the issue of realization has been argued by researchers in the field, the argument is not discussed in this paper. We apply the concept of realization as entities that exist or are directly referred to in the utterance. Thirdly, if there is more than one entity in U_{i-1} referred to in U_i, the highest ranked entity is the Cb (U_i).

Referring back to the definitions, Cf members are ranked according to their grammatical role. CT-Ranking says about this matter as follows:

Ranking

CT can be applied in any language. However, its universal properties are questionable. Researchers who have studied Ranking in CT agree that different languages can have different ranking which depending on the grammatical structure of the language (Walker, Iida and Cote 1994, Kameyama 1985, and Turan 1998). Cf-Ranking was originally proposed in English in which entities are ranked by their grammatical roles. The present study follows Ranking according to Grosz and Weinstein (1995: 16).

Cf ranking for English: Subject > Object (s) > others

We apply the above CT-Ranking in analyzing ST data but use a different Ranking for TT data by adopting Aroonmanakun (2000)'s Ranking for Thai which will be presented later in section 2.2.

Then, there are two CT-rules for analysis as presented here:

Rules

For each U_i in a discourse segment D consisting of utterances $U_1,\ldots U_m$:

1. If any element of $Cf(U_{i-1})$ is realized by a pronoun in U_i, then the Cb (U_i) must be realized by a pronoun also.
2. Sequences of continuation are preferred over sequences of retaining; and sequences of retaining are to be preferred over sequences of shifting.

(Grosz and Weinstein 1995: 16)

Rule 1 is generally called the 'pronoun' rule. Basically, if any entity of U_{i-1} is referred to by a pronoun in U_i, Cb (U_i) must be referred to by a pronoun as well. For example:

(6) U_{i-1} Melanee has a new skirt.
U_i She likes it very much.

In the above example, *a new skirt* is referred to by the pronoun 'it', so *Melanee,* which is the $Cb(U_i)$, is referred to by the pronoun 'she'.

Rule 2 is about the preference of the transition state, which expresses how coherent the discourse is. CT-notion prefers Continuation to Retain, which is preferred to Smooth-shift, which is preferred to Rough-shift for the coherence of a discourse. Thus, the more Continuation, the more coherent it is.

Once, all members in utterances are determined and ranked grammatically under Constraints with respect to the rule. We can formulate the transition state between utterances.

Centering transition states

The transition state is a change of attentional state from one utterance to another utterance. The attentional state determines the center of attention, which may or may not be carried across utterances. Attentional states are associated with the salience of entities. Degrees of salience correspond with degrees of processing load required for anaphoric expression interpretation. In light of this, anaphors with less information, such as zero pronouns, are expected to refer to Cb because Cb is the salient entity whereas anaphors attached with more information such as noun phrases are expected to refer to less salient entities.

Transition states are classified according to the amount of change involved. This study adopts the Centering Transition proposed by Brennan et al. (1987: 3), as follows:

Table 1 Transition States

	$Cb(U_i) = Cb(U_{i-1})$ or $Cb(U_{i-1}) = ?$	$Cb(U_i) \neq Cb(U_{i-1})$
$Cb(U_i) = Cp(U_i)$	CONTINUATION	SMOOTH-SHIFT
$Cb(U_i) \neq Cp(U_i)$	RETAIN	ROUGH-SHIFT

Transition state preferences are: Continuation > Retain > Smooth-shift > Rough-shift

As mentioned above, transition states are classified according to the amount of change involved. Each type of transition reflects the change of Cb and Cp entities between a current utterance (U_i) and its previous utterance (U_{i-1}) as follows:

Continuation: Cb (U_{i-1}) is the same as that of U_i, and Cb & Cp (U_i) are the same entity.

Retain: Cb (U_{i-1}) is the same as that of U_i, and Cb (U_i) is not Cp (U_i).

Smooth-shift: Cb (U_{i-1}) is different from that of U_i, and Cb & Cp (U_i) are the same entity.

Rough-shift: Cb(U_{i-1}) is different from that of U_i, and Cb(U_i) is not Cp(U_i).

At this stage, we can take the utterance in example 5 above to calculate the transition state as follows:

(7) U_{i-1} Brown University sociologist John Logan has pored over the melting pot in microcosm for 40 years.
Cf: [John_Logan, Melting_pot, Microcosm]
Cb: [?] (no Cb)
Cp: [John_Logan]
Transition: NON

U_i Last year he sifted through U.S. census data from 1980 to 2010
Cf: [John_Logan (he), U.S._census_data]
Cb:[John_Logan (he)]
Cp:[John_Logan (he)]
Transition: Continuation

In example (7), the transition state is calculated from the Cb, the Cp of the current utterance and that of the previous utterance. There is no previous utterance for U_{i-1}; therefore, U_{i-1} has no transition. Then an entity realized by John Logan is not the Cb(U_{i-1}) but is the most salient element in the Cf (U_{i-1}). Therefore, John Logan is expected to be the Cb of the next utterance (U_i). John Logan is the most salient entity from the previous utterance (U_{i-1}). Therefore, it is the Cb (U_i) and it is referred to by the pronoun 'he' in Ui since John Logan is also the Cp(U_i), Cb(U_{i-1}) = [?], Cb ((U_i) = Cp (U_i)). The transition state at this point is then Continuation.

2.2 Centering theory in the analysis of Thai

This section turns attention to previous studies of CT in the Thai language where zero anaphor is the center of attention. The Zero pronoun in Thai is an empty category, which can function in both subject and object slots in Thai sentences (Hoonchamlong 1991: 71). According to Aroonmanakun (2000) the zero pronoun is used commonly when its referent has the most focus in discourse. Normally, the antecedent of the zero pronoun is the Cb. Aroonmanakun (2000) investigated zero pronoun resolution in Thai discourse by using CT. In his study, the centering

algorithm was modified to resolve zero pronoun which antecedent is in further than immediate processing utterance (U_{i-1}). From the results of this study, Aroonmanakun proposed CT rule 1 for Thai as modified from Grosz and Weinstein (1995) as follows:

Rules:

For each U_i in a discourse segment U_1…..U_m:

1. If some element of $Cf(U_{i-1})$ is realized as a zero pronoun in U_i, then so is $Cb(U_i)$.

2. Transition states are ordered. CONTINUATION is preferred to RETAINING and RETAINING is preferred to SHIFTING. Aroonmanakun (2000: 135)

Aroonmanakun's reforming algorithm has been proven suitable with Thai discourse segments containing a zero pronoun, and the present study adopts this algorithm in analysis.

As mentioned above, Cf ranking was found to be varied across languages. Since ranking in Thai discourse has never been proposed, this study will follow the ranking adapted by Aroonmanakun (2000) in his analysis of Thai zero pronouns. The ranking was originally proposed by Kameyama (1985) (cited in Aroonmanakun 2000) in a CT analysis of Japanese. Although Japanese and Thai are different, this ranking has been proven useful in Thai discourse analysis by Aroonmanakun as follows: [Topic > Subject > Object> Others]. The present study follows this ranking in its analysis of Thai (target texts).

3. Research methodology

3.1 Data collection

Data in our study are parallel corpora of English (source texts) and Thai translation (target texts). Source text (ST) data was collected from 50 articles in the National Geographic magazine. All articles are informative. Each article contains 125-225 words. Target text (TT) data is the translation of ST published in National Geographic Thailand in the same issues with their ST.

The study focuses only on zero anaphor in English informative texts as rendered in Thai translation. By means of zero anaphor in the English source text, we refer to the zero pronominal with subject role to a finite verb and point to the antecedent in the previous utterance. Deictic zero pronouns are disregarded. Those in quotations are also excluded because they can be considered as unbound anaphors with links to an entity that was introduced and developed in conversation, not in the narrative of the text.

3.2 Data analysis

The data was analyzed quantitatively and qualitatively. There are three steps in the analysis.

The first step is compiling the corpora. All English texts (ST) and Thai translation texts (TT) are separated into utterances. An utterance in our study consists of a Subj+finite Verb. Therefore, compound and complex sentences will be broken down into clauses. For example:[7]

---

[7] a) $U_{j/com}$ stands for compound clause of U_j
b) $U_{j/sub}$ stands for subordinate clause of U_j

(8) ST: U$_i$ Melanee wants a pet.

TT: U$_i$ เมลานีอยากมีสัตว์เลี้ยง (*Melanee wants pet*)

[mee0laa0nii0 jaak1 mii0 sat1liaŋ3]

ST: U$_j$ She goes to a pet shop

TT: U$_j$ เธอไปที่ร้านขายสัตว์เลี้ยง (*She goes to shop sell pet*)

[thɤɤ0 paj0 thii2 raan3khaaj4 sat1liaŋ3]

ST: U$_{j/com}$ and Ø buys a puppy.

TT: U$_{j/com}$ และØซื้อลูกหมาหนึ่งตัว

(*and Ø buys puppy one CLSS.*)

[lɛ3 ø sɨɨ3 luuk2maa4 nɨng1 tua0]

The second step is the centering theory analysis. A Centering model is adopted. In all utterances in ST and TT, members of the Cf set, Cb, and Cp are determined. Then, CT-transition states between utterances are computed.

The last step is comparing CT-transition states. The transition flows in ST and TT are compared. This will reveal differences in discourse structure that govern translation of zero anaphors. The discrepancies in the translation of zero anaphors will be explained from a Centering point of view.

4. Results and discussion

This section presents the results of CT analysis which can reveal discrepancies between the uses of zero anaphor in English and Thai.

4.1 Comparison of zero anaphors in English-Thai corpora

Results show very similar trends of CT-transition states between English (ST) and Thai (TT). It could be said that ST and TT are equally coherent as presented in Table 2.

Then, we surveyed the distribution of zero anaphors in all 50 texts, both in ST and TT. We found in both languages that zero anaphors occur mostly in the Continuation-state, as shown in Table 3.

As can be seen from Table 3 below, zero anaphors occur mostly in Continuation-states in both languages: 75% (63 items) in ST; and 72.7% (107 items) in TT. The high number of zero anaphors in the Continuation state shows that zero anaphor is used in discourse segments in which coherence is kept. The use of zero anaphors corresponds to degrees of salience of the entity that it refers to, as will be discussed later in section 4.2.3. Following this up further, the number of zero anaphors in ST is fewer than in TT as seen in Table 3. This reveals that zero anaphors occur in TT in greater environments than in the ST. Then, the translation of zero anaphors was surveyed. The result is presented in Table 4.

Table 2 Comparison of CT-Transition State

	Continuation	Retain	Smooth-Shift	Rough-shift	No-transition
ST	40.09%	18.85%	11.69%	4.29%	25.05%
TT	44.47%	20.29%	10.14%	5.07%	20.00%

Table 3 Zero Anaphor Distribution

	Continuation	Retain	Smooth- shift	Rough-shift	no transition	Total
Source Texts	63	4	15	0	2	84
Target Texts	107	10	27	0	3	147

Table 4 Zero Anaphor Translation

Zero Anaphors	Translation in TT		
in ST	Zero anaphors	Personal pronoun	Definite Np
48	37	7	4

Of all 84 zero anaphors in ST from Table 3, only 48 have equivalent anaphoric forms in TT. It can be seen in Table 4 that most zero anaphors are translated into zero anaphors in TT. The result indicates that translators employ a direct translation method by default when translating zero anaphors. However, some items have been translated into overt anaphors. In the next section, discrepancies in uses and translation of zero anaphors are discussed.

4.2 Discrepancies of zero anaphor in ST and TT

4.2.1 General usage

Zero anaphors occur mostly in the subject position of compound sentences where the subject of the main clause and the compound clause share the same referent, and in subject position of subordinate clauses where zero anaphors in both languages refer to the nearest entity. We found that most zero anaphors in our data

are in the Continuation-state and point to the Cb both in the ST and TT. For example:

(9) ST: Brown University sociologist John Logan has pored over the melting pot in microcosm for 40 years.
Cf: [John_Logan, Melting_pot, Microcosm]
Cb: [?]
Cp: [John_Logan]
Transition: NON

U_i Last year he sifted through U.S. census data from 1980 to 2010
Cf: [John_Logan (**he**), U.S._census_data]
Cb: [John_Logan (**he**)]
Cp: [John_Logan (**he**)] Transition: Continuation

$U_{i/com}$ and **Ø** identified 20 traditionally multiethnic metropolitan centers, including Los Angeles, Newark, and Houston.
Cf: [John_Logan (**Ø**),20_Multiethnic_ Metropolitan_Center, Los_Angeles, Newark, Houston.]
Cb: [John_Logan (**Ø**)]
Cp: [John_Logan (**Ø**)]
Transition: Continuation

TT: จอห์น โลแกน นักสังคมวิทยาจาก มหาวิทยาลัยบราวน์ ศึกษาเบ้าหลอมทาง วัฒนธรรม (melting pot) ในสังคมขนาดเล็กมา นานร่วม 40 ปี
Cf: [John_Logan, Melting_pot, Microcosm]
Cb: [?]
Cp: [John_Logan]
Transition: NON
[cɔɔn0 loo0kɛɛn0 nak3saŋ4khom0- wit3tha1jaa0 caak1 ma3haa4- wit3tha1jaa0laj0braaw0 sɨk1saa4

baw2lɔɔm4 thaaŋ0 wat3tha3na3tham0 (melting pot) naj0 saŋ4khom0 kha1naat1 lek3 maa0 naan0 ruuam2 sii1sip1 pii0]
(John Logan: sociologist from University of Brown; studies the melting pot in a small society for 40 years)

U_i เมื่อปีที่ผ่านมา เขาสืบค้นข้อมูลสำมะโน ประชากรสหรัฐ ตั้งแต่ปี 1980-2010
Cf: [John_Logan (เขา), U.S._census_ data]
Cb: [John Logan (เขา)]
Cp: [John Logan (เขา)]
Transition: Continuation

[mɨɨa2 pii0 thii2 phaan1maa0 khaw4 sɨɨp1khon3 sam4ma3 noo0- pra1chaa0kɔɔn0 sa1ha1rat3 taŋ2tɛɛ1 pii0 1980-2010]
(Last year, he investigated a census of the U.S. data from 1980 to 2010)

$U_{i/com}$ และ **Ø** ระบุศูนย์กลางแหล่งพหุชาติพันธุ์ ดั้งเดิม 20 แห่งซึ่งรวมถึงลอสแอนเจลิส นิวอร์ก และฮิวสตัน
Cf: [John_Logan (**Ø**),20_Multiethnic_ Metropolitan_Center, Los_Angeles, Newark, Houston.]
Cb: [John Logan (**Ø**)]
Cp: [John Logan (**Ø**)]
Transition: Continuation

[lɛ3 ø ra3bu1 suun4klaaŋ0 lɛŋ1 pha3hu1chaat2ti1phan0 daŋ2dɣɣm0 20 hɛŋ1 sɨŋ 2 ruuam0thɨŋ4 lɔɔt3 ʔɛɛŋ 0cee0lit3 niwɔɔk1 lɛ3 hiw0 sa1tan2]
(and Ø identified centers of 20 traditionally multiethnic metropolitan, which included Los Angeles, Newark, and Houston)

4.2.2 Discrepancies in syntax

Discrepancies are found in the use of zero anaphors between English and Thai in our data. Analysis reveals that zero anaphors are used in TT in more environments than in ST due to the fact that Thai is a pro-drop language which allows subject and object omission (Hoonchamlong 1991). In Thai the subject of the main clause can be omitted. It is found only in TT that the zero anaphors occur in the initial position of sentences when sentences are in the Continuation-state; this aspect is not found in ST data. For example:

(10) ST: If it success,....
          TT: หาก Ø สำเร็จ...

          haak1 ø sam4ret1…

          (If   Ø success….)

          ST : Or do they?
          TT: แต่ Ø เป็นเช่นนั้นจริงหรือ

          [tɛɛ1 ø pen0 chen2nan3

          ciŋ0rɨɨ4]
          (but Ø be that true Y/N)

Interestingly, zero anaphors in the initial position of sentences in the TT can occur only in the Continuation-state in our data. It is not found in other CT-transition states. We assume that this finding is a phenomenon of informative texts.

4.2.3 Zero anaphors and salient entities

It has been found that zero anaphors commonly point to the Cb which is the most salient entity in the utterance. With regard to this matter, Givon (1983: 359) demonstrated a scale of correlation between the degree of continuity/predictability of topic NP's and the average size of the marking devices used to express them,

which start from zero pronoun for the most continuous/predictable topic to modified DEF-NP when the degree is decreased. Although Givon's scale of Topic Continuity/Predictability and Marking Size was the result of a spoken English analysis, it corresponds well with the result of our CT-analysis both in ST and TT where zero anaphors are used to refer to the most salient entity which is continually predicted to be the topic.

As the result recorded in Table 4 above shows, zero anaphors in the ST are translated into zero anaphors in the TT when utterances of the ST and TT are in the Continuation state and when they refer to the Cb as shown in example (9) above. On the other hand, when there are changes of salient entity and transition state in the ST and TT, we found that zero anaphors in the ST are translated into other anaphors in the TT. For example:

(11) ST: (U_i)   The breeders will cross those cattle to retain the pertinent DNA, jettison the rest, and make bovines that,

Cf: [breeder, cattle, DNA, bovines]
Cb: [breeders]
Cp: [breeders]
Transition: **Continuation**

($U_{i/sub}$) in about a decade, Ø are expected to look and act just like their extinct ancestors.

Cf: [bovines (Ø), Aurochs (their
    extinct ancestors)]
Cb: [bovines (Ø)]
Cp: [bovines(Ø)]Transition: **Smooth-shift**

    TT: U_i จากนั้นพวกเขาจะทำการผสมข้ามพันธุ์
    ระหว่างวัวเหล่านี้อย่างต่อเนื่องราว 10 ปี

55

Cf: [breeder, cattle, DNA, bovines]

Cb: [breeders (พวกเขา)]

Cp: [breeders (พวกเขา)]

Transition: Continuation

[caak1nan3　　phuuak2khaw4　　ca1
tham0kaan0　pha1som4　khaam2　phan0
ra3waaŋ1　wua0　laaw1nii3　jaaŋ1　tɔɔ1
nɨɨaŋ2　raaw0　10　pii0]
*(The breeders will cross those cattle
continually for about 10 years,)*

$U_{i/sub}$ จนกว่า Ø จะได้<u>วัว</u> **(bovines)** ที่โตขึ้นมามี
รูปร่างหน้าตาและพฤติกรรมเหมือนบรรพบุรุษที่
สูญพันธุ์ไปแล้วของพวกมัน
Cf: [breeders(Ø), Aurochs (their
extinct ancestors)]
Cb: [breeders(Ø)]
Cp: [breeders(Ø)]
Transition: **Continuation**

[con0kwaa1　ø　ca1　daj2　<u>wua0</u>　thii2　too0
khɨn2maa0　mii0　ruup2raaŋ2　naa2taa0
lɛ3　　　phrɨt3ti1kam0　　　mɨɨan4
ban0pha3bu1rut1　thii2　suun4phan0　paj0
lɛɛw3　khɔɔŋ4　phuak2man0]
*(until Ø make bovines that look and act
just like their extinct ancestors)*

In example (11), the Cb $(U_{i/sub})$ was
changed from *bovines* in the ST to
breeders in the TT caused by the change
of passive voice to active voice. The
translator converted voices to be suitable
to Thai discourse, resulting in not only the
change of salient entity, but also transition
state in the $U_{i/sub}$. This result suggests that
the zero anaphor in the above example is
translated into an NP because of the
change in the Cb.

4.2.4 Double zero anaphors

Findings confirm the modification of CT
rules for Thai discourse as proposed by
Aroonmanakun (2000) which state that: <u>If
some element of Cf(U_{i-1}) is realized as a
zero pronoun in U_i, then so is Cb(U_i).</u> It
was found in the TT that if an entity of Cf
(U_{i-1}) is referred to by a zero anaphor in
the current utterance, Cb(U_i) is referred to
by a zero pronoun as well. For example:

(12) ST:U_i Popular in Alpine villages
centuries ago, Krampus scared kids
straight-his long red tongue upped the
fear factor-
Cf: [demon (Krampus), kids,
long_red_tongue, Alpine_villages]
Cb: [demon]
Cp: [demon]
Transition: **Continuation**

$U_{i/com}$ and Ø taught them that evil bows
before good.
Cf: [demon (Ø), kids(them)]
Cb: [demon (Ø)]
Cp: [demon(Ø)]
Transition: **Continuation**

TT:U_i ปีศาจซึ่งเป็นที่ชื่นชอบตามหมู่บ้านแถบ
เทือกเขาแอลป์จะคอยขู่เด็กๆ ให้อยู่ในลู่ทาง
Cf: [demon (Krampus), Alpine_villages,
kids]
Cb: [demon]
Cp: [demon]
Transition: **Continuation**

[pii0saat1　siŋ2　pen0　thii2　chɨn2chɔɔp2
taam0　muu1baan2　thɛɛp1　thɨɨak2khaw4
ʔɛɛw3　ca1　khɔɔj0　khuu1　dek1dek1　haj2
juu1　naj0　luu2thaaŋ0]
*(Demon which popular in Alpine villages
will scare kids)*
$U_{i/sub}$แล้ว Ø สอน Ø ให้รู้ว่าธรรมะย่อมชนะอธรรมเสมอ

Cf: [Demon (Ø), Kids(Ø)]
Cb: [Demon (Ø)]
Cp: [Demon (Ø)]
Transition: **Continuation**

[lɛɛw3 ø sɔɔn4 ø haj2 ruu3 waa2

tham0ma3 jɔm2 cha3na3 ʔa1tham0

sa1mɣɣ4]
(and Ø taught Ø that good always defeat bad.)

In the above TT example, the entity realized by *kids* is referred to by a zero anaphor in the ($U_{i/sub}$). Therefore, *demon* must be referred to by a zero anaphor for it is the Cb ($U_{i/sub}$). It is found that this phenomenon is not always true for the ST as we found no two zero anaphors occur in the same utterance due to the restriction of the English language. However, we found in the ST that zero anaphors can occur along with other forms of anaphors such as personal pronoun, or definite NPs. In such cases, the zero anaphor always points to the Cb, while the other anaphor forms point out to less salient entities. For example:

(13)   Today her naturally mummified body resides in San Diego's Museum of Man.

U_i U.S. Navy medical personnel performed the scan
Cf: [U.S. Navy_medical_personnel]
Cb:[?]
Cp:[U.S. Navy medical personal]
Transition: **NON**

$U_{i/com}$ and Ø produced **this image** (bones and white, soft tissue is red).
Cf:[U.S. Navy_medical_personnel(Ø), image]
Cb:[U.S. Navy medical personnel (Ø)]
Cp:[U.S. Navy medical personnel (Ø)]
Transition: **Continuation**

4.2.5. Zero anaphor on discourse level

Following this further, we found in the TT that when an entity is continued as the most salient in a discourse segment, the zero anaphor is expected to be its anaphoric reference. On the other hand, when the status of the salient entity is not carried over in the discourse segment, other anaphors are expected. For example:

(14) ST: U_i Together they report
Cf: [Researcher_groups (**they**)]
Cb: [Researcher_groups (**they**)]
Cp: [Researcher_groups (**they**)]
Transition: **Smooth-shift**

$U_{i/sub}$ that the female of this solitary bee-which eschews hive life-digs a shallow tunnel in loose ground with room for one or two chambers, or brood cells, each up to two inches deep.

Cf: [Bee, Tunnel, Chamber, Cells]
Cb: [?]
Cp: [Bee]
Transition: **NON**

U_j She then papers the cell walls with overlapping petals flown in one by one from nearby fields,

Cf: [Bee (**she**), Cell_Walls, Petals, Fields]
Cb: [Bee (**she**)]
Cp: [Bee (**she**)]
Transition: **Continuation**
$U_{j/sub}$ Ø gluing two layers together with a thin coat of mud.

Cf: [Bee (Ø), Layers, Mud]
Cb: [Bee (Ø)]
Cp: [Bee (Ø)]
Transition: **Continuation**

TT: U*i* **พวกเขา**รายงานตรงกันว่า

Cf: [Researcher_group (พวกเขา)]

Cb: [Researcher_group (พวกเขา)]

Cp: [Researcher_group (พวกเขา)]

Transition: **Continuation**

[phuak2khaw4 raaj0ŋaan0 troŋ0kan0 waa2]
(They reported similarly that)

U*i/sub1*ผึ้งสันโดษเพศเมียชนิดนี้ไม่นิยมทำรังแบบผึ้งทั่วไป

Cf: [Bee, Hive, Bees]
Cb: [?] Cp: [Bee]
Transition: **NON**

[phɨŋ2 san4doot1 pheet2mia0 cha3nit3 nii3 maj2 ni3jom0 tham0raŋ0 bɛɛp1 phɨŋ2 thua2paj0]
(These female bees do not like making hives like other bees)

U*i/sub2*แต่ ø จะขุดอุโมงค์ตื้นๆ ในดินร่วนซุยให้มีพื้นที่เพียงพอสำหรับหนึ่งหรือสองห้อง

Cf: [Bee (Ø), Tunnel, Chamber, Cells]
Cb: [Bee (Ø)]
Cp: [Bee (Ø)]
Transition: **Continuation**

[tɛɛ1 ø ca1 khut1 ʔu1moŋ0 tɨɨn2tɨɨn2 naj0 din0ruuan2suj0 haj2 mii0 phɨɨn3thii2 phiaŋ0phɔɔ0 sam4rap1 nɨŋ1 rɨɨ4 sɔɔŋ4 hɔɔŋ2]
(but Ø will dig small tunnel in ground to be enough for one or two rooms)

U*j* แต่ละห้องลึกประมาณหนึ่งถึงสองนิ้ว
Cf: [Chamber]

Cb: [Chamber]
Cp: [Chamber]
Transition: **Smooth-Shift**

[tɛɛ1 la3 hɔɔŋ2 lɨk3 pra1maan0 nɨŋ1 thɨŋ4 sɔɔŋ4 niw3]
(Each room deep about one to two inches)

U*k* จากนั้น**มัน** (it) จะนำกลีบดอกไม้มาติดซ้อนทับกันไว้ตามผนังห้อง
Cf: [Bee (มัน), Petals, Cell_Walls]
Cb: [?]
Cp: [Bee (มัน)]
Transition: **NON**

[caak1nan3 **man0** ca1 nam0 kliip1dɔɔk1maaj3 maa0 tit1 sɔɔn3thap3 kan0 waj3 taam0 pha1naŋ4 hɔŋ2]
(After that it will bring flower petals to glue together on wall rooms)

U*k/sub* โดย Ø บินไปเก็บมาจากทุ่งหญ้าใกล้เคียงทีละกลีบ

Cf : [Bee (Ø), Fields, Petals]
Cb: [Bee (Ø)]
Cp: [Bee (Ø)]
Transition: **Continuation**

[dooj0 ø bin0 paj0 kep1 maa0 caak1 thuŋ2jaa2 klaj2 khiaŋ0 thii0la3kliip1]
(by Ø fly to collect from field nearby one by one)

U*k/com* และ Ø ใช้โคลนบางๆยึดกลีบแต่ละชั้นไว้ด้วยกัน
Cf : [Bee (Ø), Mud, Petals]
Cb: [Bee (Ø)]
Cp: [Bee (Ø)]
Transition: **Continuation**

[lɛ3 ø chaj3 kloon0 baaŋ0baaŋ0 jɨt3 kliip1 tɛɛ1la3 chan3 waj3 duaj2kan0]
(and Ø use thin mud glue each layer together)

In the above example, an entity realized by *bee* in the ST is the most salient member (Cp) from $U_{i/sub}$ to $U_{j/sub}$. In the ST, the U_j must have a subject due to grammatical constraints of English, governing the use of a pronoun (she) in this slot to refer to the Cb. On the other hand, in the TT, the entity is the most salient from $U_{i/sub1}$ to $U_{k/com}$ except in the U_j. When the Cb was changed between $U_{i/sub2}$ and U_j, it has a Smooth-shift transition. Then when *bee* is referred to again in the U_k the use of a zero anaphor here in the U_k would violate the notion of CT because the referent entity is not the Cb. Hence, when the status of salience is not carried through the discourse segment, to Cb is referred to by overt an anaphor. Thus, the translator referred to *bee* by the pronoun มัน (it) in U_k.

It is clear at this point that the use of zero anaphors in the TT is mainly to keep utterances in a Continuation state for the coherence of the discourse segment. A zero anaphor is expected to refer to the highest salient entity of an utterance. In the next section, we will discuss discourse factors that govern the use of zero anaphors in translation.

4.3 Factors that govern the translation and use of zero anaphors

Analysis shows that zero anaphors in both ST and the TT are used to refer to the Cb and to keep discourse coherence. However, differences in the use of zero anaphors between English and Thai are identified in our results.

We found that zero anaphors can occur in the initial position of Thai sentences in the Continuation state because Thai is a pro-drop language. On the other hand, zero anaphors in English cannot occur in this environment. In addition, our results contribute to the previous study by Aroonmanakun (2000) regarding zero anaphors in Thai. It is only in the TT that an utterance can contain two zero anaphors whereas an utterance in the ST can have only one zero anaphor. In terms of translation, we found that zero anaphors in the ST are translated into zero anaphors in the TT when an utterance is in the Continuation state and into overt anaphors when the transition state in the ST is changed in the TT.

Not only differences in the use of zero anaphors between English and Thai, but also differences in discourse between the two languages affect discrepancies in the translation of zero anaphors. Here, we have analyzed and identified discourse factors that govern translators in using and translating zero anaphors. These factors, i.e., meaning and anaphor interpretation; syntactic constraints; and the naturalness of the target language, are included in the following discussion.

4.3.1 Meaning and interpretation

We found that zero anaphors in the ST tend to be translated into zero anaphors in the TT by default as shown in Table 4. This direct translation method is employed to keep discourse coherence. However, it was found that some items are translated into overt anaphor forms which are: personal pronoun and definite NP as shown in Table 4. At this point, zero anaphors in English can be translated into different anaphor forms in Thai. Analysis shows that when working on zero

anaphors, translators take into account anaphoric interpretation and ambiguity. Which form of anaphor is chosen relies on the basic principle that readers must be able to interpret its antecedent conveniently and unambiguously without increasing the processing load.

We found that change in the CT transition state and salience entity is directly relevant to the change in zero anaphors between the ST and TT. Thus, overt anaphors are employed in the TT to help Thai readers interpret referents conveniently when the center of attention is shifted between U_{i-1} and U_i. Some good examples on discrepancies in the translation of zero anaphors are presented in Examples 11 and 14 above.

4.3.2 Syntactic constraint

The uses of zero anaphors in English and Thai follow the syntactic constraints of each language. Automatically, the translation of anaphors from English to Thai is governed by syntactic constraints in the Thai language. An important aspect to discuss here is that Thai is a pro-drop language which allows subjects to be omitted while English is not. Consequently, our data showed that the zero form in the TT occurs in higher numbers than in the ST, and is found in more environments of use. An example of these discrepancies is presented in Example 10 above. It can be assumed that the discrepancy in the translation of zero anaphors is under syntactic constraints.

Another syntactic constraint that governs the uses and translation of zero anaphors in our data concerns to possessive pronouns. While authors of ST, have to link inalienable possession with possessor by a possessive pronoun, such anaphors cannot be omitted. For example:

(15a) ST: To go faster, they (*snakes*) shift **their** weight by slightly raising parts of **their** body, as we do.

In the above example, the possessive pronoun 'their' in the ST links the possessor *snakes* with the body part which is considered an inalienable possession. In English, the possessive pronoun is needed as a linkage between *weigh* and *body* with *snakes*. On the other hand, a possessive pronoun is not necessary in Thai when the possession is inalienable (i.e. body part). Therefore, the translator translates the possessive pronoun in this environment into a zero anaphor. Moreover, if possessive pronouns were kept, it would create redundancy. The above sentence is translated as:

(15b) TT: หากต้องการเลื้อยให้เร็วขึ้น พวก มัน (*snake*) จะถ่ายน้ำหนัก∅โดยยกตัวขึ้น∅ เล็กน้อย

[haak1 tɔŋ2kaan0 lɯ̂aj3 haj2 rew0khɯn2 phuak2man0 ca1 thaaj1 naam3nak1 ø dooj0 jok3tua0 khɯn2 ø lek3nɔɔj3]
(To go faster, they shift weight by slightly raising parts of body)

4.3.3 Naturalness of language in the target texts

In attempting to keep discourse coherence, translators must be aware of the naturalness of language. For example, we found that translators convert passive voice in the ST into active voice in the TT as it is generally accepted that passive voice can sound unnatural in Thai as seen in Example 11 in section 4.2. Moreover, we found that translators often combine/rearrange a discourse segment of

several utterances in the ST into a coordinate sentence in the TT and employ a zero anaphor in the subject position of a subordinate clause to make the TT sound natural in Thai. For example:

(16) ST: Today cranberries are marketed year-round in both juice and dried form. They're also touted as a health food, because they can keep bacteria from clinging to the urinary tract and Ø may even play a role in cancer prevention.

TT: ปัจจุบันเรารับประทานแครนเบอร์รี่ได้ ตลอดทั้งปี ทั้งในแบบเชื่อมและแบบแห้งและ Ø ยังถือเป็นอาหารสุขภาพ เนื่องจาก Ø มีสรรพคุณ ป้องกันไม่ให้แบคทีเรียเกาะทางเดินปัสสาวะ และ Ø อาจช่วยป้องกันโรคมะเร็งอีกด้วย

[pat1cu1ban0   raw0   rap3pra1thaan0 khrɛɛn0byɣɣ0rii2   daaj2   ta1lɔɔt1 thaŋ3pii0 thaŋ3 naj0 bɛɛp1chɨɨam2 lɛ3 bɛɛp1hɛɛŋ2   lɛ3   ø   jaŋ0thɨɨ4pen0 ʔaa0haan4   suk1kha1phaap2 nɨɨaŋ2caak1 ø mii0 sap1pha0khun0 pɔɔŋ2kan0   maj2haj2   bɛk1thii0ria0 kɔ1 thaaŋ0dɣɣn0pat1sa0wa3 lɛ3 ø ʔaat1chuaj2 pɔŋ2kan0 rook2 ma3reŋ0 ʔiik1duaj2]

(at present, we can eat cranberry all year both in juice and dried and Ø is accepted as health food because Ø can prevent bacteria from clinging to the urinary tract and Ø may help prevent cancer as well.)

In the above example, the ST sentence is rearranged in the TT. The translator combines two sentences in the ST into one coordinate sentence in the TT. Then she

employs three zero anaphors in subject position to keep the entity realized by *the dart berries* (cranberries) in focus. This change is to make the TT sound natural in Thai.

5. Conclusion

In adopting centering theory in the analysis of discrepancies in the uses and translation of zero anaphors between English and Thai, the study found that zero anaphors point to Cb(U$_i$),when U$_i$ is in the Continuation-state in both languages. Zero anaphors are used in the TT in more environments than in the ST due to syntactic constraints-especially the status of Thai as a pro-drop language. In addition, zero anaphors in English can be translated into different anaphor forms in Thai. Our findings reflect that different language structures influence translators to rearrange discourse segments for the sake of naturalness in the target language. Consequently, the rearrangement affects the salience of entities in utterances and CT-transition states. These cause discrepancies in the translation of zero anaphors from English into Thai.

The results can answer our two research questions stated in the introduction. That is to say: we can adapt centering theory in the analysis of discrepancies in uses of the zero anaphors between English and Thai; and the discourse structure of the TT governs the rearrangement of the target language, and consequently, affects the translation of zero anaphors.

Hopefully, the results of the study can benefit researchers in translation and discourse study. For further studies, CT analysis of other anaphor types such as

demonstrative pronouns, personal pronouns, and definite NPs should be conducted. Studies on discrepancies of anaphors in other translation genres, and in larger sample sizes, should confirm the results of the present study, and reveal other discrepancies in English to Thai translation. It is also interesting to see if zero anaphors can occur in the initial position of a sentence in other CT-transition states besides Continuation, as reported in our study. Lastly, research on Cf-ranking in Thai should be conducted for further application of centering theory in Thai.

Acknowledgements

References

Aroonmanakun, Wirote. 2000. Zero Pronoun Resolution in Thai: A Centering Approach. Paper presented at *The International Conference on Human and Machine Processing of Language and Speech*. National Electronic and computer Technology Center. Bangkok.

Brennan, Susan, Marilyn W. Friedman and Carl J. Pollard. 1987. A Centering Approach to Pronouns. Paper presented at *The 25th Annual Meeting of the Association of Computational Linguistics,* 6-9 July, 1987, Stanford.

Givon, Talmy. 1983. *Topic Continuity in discourse: A Quantitative Cross Language Study*, Amsterdam/Philadelphia: J.Benjamins.

Grosz, Barbara J. 1977. *The representation and use of focus in dialogue understanding* (technical report no. 151). Menio Park CA: SRI International.

Grosz, Joshi and Scott Weinstein. 1995. Centering: A Framework for Modelling the Local Coherence of Discourse. *Computational Linguistics* 21:203-255.

Hoohchamlong, Yuphaphan. 1991. Some Issues in Thai Anaphora: A Government and Binding Approach. Doctoral dissertation, University of Wisconsin, Madison.

Joshi, Aravind and Eleni Miltsakaki. 2006. Anaphora Resolution: Centering Theory Approach. In *Encyclopedia of Language&Linguistics* (Second Edition), edited by Keith Brown, pp. 223-230. Elsevier Science.

Kameyama, Megumi. 1985. *Zero Anaphora: The Case of Japanese*. Doctoral dissertation, Stanford University.

---, 1998. Ranking Forward Looking Centers. In *Centering Theory in Discourse*, edited by Waler et al., pp. 90-112. Oxford: Clarendon Press.

Turan, Umit D. 1998. Ranking Forward Looking Centers in Turkish: Universal and Language-Specific Properties. In *Centering Theory in Discourse*, edited by Waler et al., pp. 139-160. Oxford: Clarendon Press.

Walker, Marilyn, Sharon Cote and Masayo Iida. 1994. Japanese discourse and the process of centering. *Computational Linguistics* 20.2: 193-232.

Walker, Marilyn, Aravind Joshi and Ellen Prince. 1998. *Centering Theory in Discourse*. New York: Oxford University Press.