

# QUALIA STRUCTURE AND THE ACCESSIBILITY OF ARGUMENTS: JAPANESE INTERNALLY-HEADED RELATIVE CLAUSES WITH IMPLICIT TARGET

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## ABSTRACT

The relationship between lexicon and pragmatics has been one of the most controversial issues in recent studies in linguistics. Lexicon in the conservative definition encodes only the information responsible for the regular syntactic mapping of lexical items. Any information that is not directly reflected in the syntactic structure is attributed to pragmatics. A more recent trend, in contrast, considers that lexicon should cover even apparently non-linguistic information if it leads to certain syntactic and/or semantic regularities. Generative Lexicon (GL) by Pustejovsky is a representative of such a trend.

This paper applies GL to analyze the Japanese internally-headed relative clause (henceforth, IHRC) with implicit target, which has presented a serious challenge to formal approaches. The IHRC whose target is neither a syntactic argument nor an adjunct has strongly motivated a pragmatic approach to the identification of the target. This paper argues that IHRCs with implicit target can be formally accommodated without drawing on the poorly-defined pragmatics, if the lexicon is sufficiently elaborated.

## 1. INTRODUCTION

Japanese IHRCs present several puzzling behaviors that challenge most syntactic approaches to them. One of such behaviors concerns the identification of the antecedent (henceforth, the (semantic) target) of the IHRC. Namely, the target is not limited to an argument of the head verb of an IHRC; in some cases it can be a set of arguments, while in others it can even be some entity merely implicit in the sentence. In order to accommodate such cases, most analyses posit an empty category as the relative head, whose antecedent is determined by some pragmatic considerations ([1], [2], [6]). The recourse to contextual information is shared by other approaches including the ones in Cognitive Grammar ([3], [4]). The analyses in Cognitive Grammar state that the target is selected from among salient participants of the situation, where the saliency is related to but is independent of syntactic argumenthood

One question that emerges is what the “pragmatic” considerations licensing the implicit target exactly are. Obviously, only a certain set of implicit arguments can stand as the target. Without due restrictions, the theory would become too powerful, overgenerating the IHRCs with illicit implicit targets. Besides, the complete recourse to pragmatics predicts that the availability of the implicit target is totally independent of the lexical information; it would be sensitive only to the contextual information. However, as we shall see below, the distribution of the IHRC with an implicit target is actually very limited, and the restrictions reveal regularities related to lexical information.

If a syntactic analysis assumes a lexicon which accommodates only what is structurally realized,

then the IHRC with an implicit target falls outside the scope of analysis. But if one assumes a lexicon-based framework which includes in its lexicon even the non-linguistic information of some kind, the implicit target could be dealt with in a formally restricted way. As such framework, I will employ the model of GL ([5]), and explore at the same time what kind of revision it needs to fully accommodate the data. My goal is to demonstrate that the availability of the implicit target of the IHRC is fairly constrained, and that the data can be accommodated without calling for the poorly-defined “pragmatics.”

The organization of this paper is as follows: Section 2 presents data of IHRC including the ones with implicit target, indicating the direction of approach this paper takes. The data of the IHRC with implicit target are put to detailed examination in Section 3. It shows that the availability of the implicit target is more restricted than previous analyses tacitly assume, giving the first approximate delineation of the implicit targethood. Section 4 introduces the model of GL by Pustejovsky, and explores how it can accommodate the primary data. Section 5 discusses how the model of GL should be modified to fully account for the data of IHRC. Section 6 concludes the discussion.

## 2. APPROACHES TO INTERNALLY-HEADED RELATIVE CLAUSES

Following are some typical examples of Japanese IHRCs:<sup>1</sup>

- (1) a. [[Oba -kara ringo -ga okutteki -ta] no] o tabe-ta  
 aunt from apple nom send-come-past nmlzr acc eat-past<sup>2</sup>  
 ‘My aunt sent me apples and I ate one.’
- b. [[Koppu -ga ware-ta] no ] o katazuke-ta  
 glass nom break-past nmlzr acc put-away-past  
 ‘A glass broke and I put it away.’

In (1), the bracketed part is the IHRC, and the target is the subject argument of the clause *ringo* ‘apple,’ which serves as the direct object of the matrix verb *tabeta* ‘ate.’ The fundamental problem of the IHRC is the form-meaning incongruity; that is, the semantic head (target) of the IHRC is not the syntactic head of the clause. The surface form of the IHRC is, in fact, identical with that of the sentential complement. Any analysis of the IHRC has to consider the apparent incongruity. Putting aside the details of the analyses, most of the syntactic approaches fall into either of the following two types (and their variations): (1) those which device a structure to directly access the semantic head within the IHRC and (2) those which turn to pragmatics to identify the referent of the IHRC. The latter typically posit an empty category as an argument of the matrix verb, which could be coreferential with an argument within the IHRC. Thus the semantic head of the IHRC is linked to the matrix verb only indirectly.

The recourse to pragmatics is becoming prevalent, as more challenging data are found. The IHRC whose semantic target is kept implicit constitute the most challenging data. The following are some examples of the IHRC with an implicit target (data from [3], [4]):

- (2) a. [[Nikai -no huroba -no yokusoo -ga ahureta -no] -ga] sita made moretekita  
 2<sup>nd</sup> floor gen bathroom gen bathtub nom overflow nmlzr nom downstairs to leak  
 ‘The bathtub in the bathroom upstairs overflowed and (the water) leaked to downstairs.’

<sup>1</sup> The English translation of the IHRC is not a relative clause. This is to reflect the non-restrictive character of the Japanese IHRC. The target is usually given in the pronoun *it*.

<sup>2</sup> This paper uses the following abbreviations: nom=nominative case, acc=accusative case, dat=dative case, loc=locative case, instr=instrumental, asp=aspect marker, nmlzr=nominalizer.

- b. [[Kesa kao -o sotta no] -ga] yuugata -niwa mata nobitekita  
 this morning face acc shaved nmlzr nom evening top again grow-past  
 'I shaved my face this morning, and yet (the beard) came out in the evening.'
- c. [[Tuti -o 2 meetoru hodo hotta no] -o ue -kara nozokikonda  
 ground acc 2 meters about dug nmlzr acc up from look-into-past  
 'I dug the ground about two meters deep, and looked into (the hole).'

The target of the IHRC in (2a), which is the subject argument of the main clause, is *water*; however, no such argument appears in the IHRC. Similarly, the target is *beard* in (2b), and *hole* in (2c), neither of which appears in the IHRC. The target is not a syntactically subcategorized argument which happens to be left unpronounced. The targets in (2b-c) are not allowed to occur on the surface:

- (3) a. \*Kao -o hige -de/-kara sotta  
 face acc beard -dat/from shaved  
 'I shaved beard off my face.'
- b. \*Tuti -o 2 meetoru hodo ana -o/de/ni hotta  
 ground acc 2 meters about hole acc/instr/dat dug  
 'I dug the ground about two meters deep.'

If the target does not surface, there seems no straightforward way to syntactically accommodate the structure. Thus, this kind of data lends very strong support to the empty-category analysis or the analyses which turn to pragmatics exclusively to decide the semantic.

However, is there really no way to linguistically identify the possible target? Further examination of data of various kinds shows that the availability of the IHRC with an implicit target is actually fairly restricted, and that their properties are characterizable in terms of the lexical specification of a predicate. In the next section, I will examine in more detail the cases of implicit targets presented above, to find under what conditions they occur.

### 3. CONSTRAINTS ON THE IMPLICIT TARGET

Observe the examples in (2) above again. The IHRCs and their targets share certain properties. First of all, the target NP can alternatively be an argument of the predicate. That is, though the target NP cannot occur in the IHRC as it is, it can occur alternatively as an argument of the same predicate.

- (4) a. yokusoo -ga ahureta / yu -ga ahureta  
 bathtub nom overflow hot water nom overflow  
 'The bathtub overflowed / hot water overflowed.'
- b. kao -o sotta / hige -o sotta  
 face acc shaved beard acc shaved  
 'I shaved my face / I shaved my beard.'
- c. tuti -o hotta / ana -o hotta  
 ground acc dug hole acc dug  
 'I dug the ground / I dug a hole.'

These data suggest a hypothetical constraint that an implicit argument can be the target iff it is an alternative argument. The relevance of alternative argumenthood is supported by the following data

which include the predicate *nur* ‘to paint’ and *huttoo-s* ‘to boil’:

- (5) a. [[kabe -o kiiro-ni nut-ta] no] ga sukaato -ni tuite-simat-ta  
 wall acc yellow paint-past nmlzr nom skirt loc adhere-asp-past  
 ‘I painted the wall yellow, and it (the paint) soiled my skirt.’  
 b. kabe -o nuru / penki -o nuru  
 wall acc paint paint acc paint  
 ‘to paint a wall’ / ‘to apply paint (on something)’
- (6) a. [[yakan -ga huttoosi-ta] no] o yunomi -ni sosoi-da.  
 kettle nom boil-past nmlzr acc cup loc pour-past  
 ‘The kettle boiled, and I poured it (the water) into a cup.’  
 b. yakan -ga hutoosuru / yu -ga huttoosuru  
 kettle nom boil water nom boil  
 ‘for a kettle to boil’ / ‘for water to boil’

In (6), for instance, the implicit target is boiling water, which does not appear in the IHRC. Importantly, the water is an alternative argument of the predicate; the predicate *huttoo-s* ‘to boil’ can take either *yakan* ‘the kettle’ or *yu* ‘hot water,’ as its subject argument.

However, being an alternative argument is not a sufficient condition for being an implicit target:

- (7) a. \* [[Teeburu -o huita] no ] ga te -ni tuita.  
 table acc wipe nmlzr nom hand loc adhere  
 ‘I wipe the table and it (dust) soiled my hand.’  
 b. teeburu -o huku / hokori -o huku  
 table acc wipe dust acc wipe  
 ‘to wipe a table’ / ‘to wipe off dust’
- (8) a. \* [[Heya -o katazuke-ta] no ] o sute-ta  
 room acc clean-up-past nmlzr acc throw-away-past  
 ‘I cleaned up the room and threw it (the garbage) away.’  
 b. heyaa -o katazakeru / gomi -o katazakeru  
 room acc clean-up garbage acc clean-up  
 ‘to clean up a room’ / ‘to clean up garbage’

In (7) and (8), the expected implicit targets (*hokori* ‘dust’ and *gomi* ‘garbage’) are alternative arguments of the head predicate of the IHRC. And yet, the IHRCs (7b) and (8b) are not acceptable. Why is it? What makes the contrast between the sentences in (2) and those in (7)-(8)?

It goes without saying that the implicit target ought to be recoverable from the composite meaning of the rest of the sentence. The comparison between the sentences in (2) and (7)-(8) suggests that the identification of the implicit target in (7)-(8) is not possible because the referent of the implicit argument is not lexically pre-specified. For (2a), for instance, the predicate *ahure* ‘to overflow’ and the predicate *more* ‘to leak’ specify that the subject argument is some form of liquid, and the argument *yokusoo* ‘bathtub’ specifies further that it is *water*. The same type of specification operates in (2b-c) as well. In contrast, the subject argument of the predicate *huk* ‘to wipe’ is not limited to dust; it can be anything from liquid like water to solid substance like breadcrumb, or it can be more abstractly *yogore* ‘stain.’

Interestingly, non-linguistic information given only by context is not enough to save the situation.

- (9) \*?? Nagaiaida tukatte-inakatta heya wa *hokori*-darake datta node, *hokori* o huita tokoro, [[teeburu -o hui-ta] no] ga te -ni teuite makkuro ni natta.  
 ‘(Since the room which had been left unused for a long time was covered with *dust*, I wiped the *dust*.) Then I wiped the table, and it (the dust) soiled my hand, making it black.’

The IHRC in (9) is preceded by clauses mentioning *dust*; it is contextually clear that the implicit target is dust. And yet the IHRC is marginal at best.

On the other hand, alternative argumenthood is not a necessary condition for an implicit target:

- (10) a. [[Syuuzi -o siteita no] ga te -ni tuite, makkuro-ni nat-ta  
 calligraphy acc do-asp-past nmlzr nom hand loc adhere black become-past  
 ‘I was practicing calligraphy, and it (Chinese ink) soiled my hand black.’  
 b. [[Saiten -o siteita no] ga yubi -ni tuite, makka-ni nat-ta  
 marking acc do-asp-past nmlzr nom finger loc adhere red become-past  
 ‘I was marking exams, and it (the ink) soiled my fingers red.’

In these sentences, the implicit targets *sumi* ‘Chinese ink’ and *akainku* ‘red ink’ are not alternative arguments of the predicates *syuuzi -o s* ‘to do calligraphy’ and *saiten -o s* ‘to mark (an exam).’ They could appear as instrumental adjuncts, but the sentences would sound rather redundant, and the sentences in (10) do not need such adjuncts for the implicit target reading to go through:

- (11) a. Sumi -de syuuzi -o suru  
 Chinese ink instr calligraphy acc do  
 ‘to practice calligraphy with Chinese ink’  
 b. Aka inku -de saiten -o suru  
 red ink instr marking acc do  
 ‘to mark exams in red ink’

So what is the real constraint on the possible implicit target?

As I just said, the implicit target would make a redundant adjunct. The redundancy in turn implies that the implicit argument is semantically involved in the event even when the implicit target does not appear as an argument of the predicate. In fact, the involvement of the instruments *charcoal ink* and *red ink* is an integral part of the event; they always participate in the event if they are not expressed.

This property is shared by the implicit targets in (2) above. *Water*, *beard*, and a *hole* are necessarily involved in defining the meaning of the predicates *ahure* ‘to overflow,’ *sor* ‘to shave,’ and *hor* ‘to dig.’ Given that the availability of the implicit target of IHRC is observed for sentences in (2) as well as those in (10), the necessary involvement seems to be the real key to the licensing of the implicit target. In other words, what is crucial is not whether the implicit target can appear as an alternative argument of the predicate: it is whether the target is a necessary part of the meaning of the predicate. Alternation is presumably a consequence of the crucial involvement; that is, what is crucially involved may well be coded as a syntactic argument so long as other conditions are met.

It has been suggested that (1) the implicit target must be an integral part of the event denoted by the predicate and (2) its denotation is linguistically pre-specified enough. However, these two properties still do not constitute a sufficient condition of the implicit target.

- (12) a. \*[[Syokki o aratteita] no] ga yuka -ni koboreta.  
 dishes acc wash-past nmlzr nom floor loc spill-past  
 'I was washing dishes, and it (the water) spilled over the floor.'
- b. \*[[Itsumo sakana -o 3mai-ni orositeita] no] o toida.  
 always fish acc three slice-past nmlzr acc sharpen-past  
 'I always sliced the fish into three fillets (with the knife), and I sharpened it.'

The implicit targets of IHRCs are instrumental. They are specified and are integral part of the meaning of the predicate. Just like (10), they optionally appear on the surface in the form of instrumental adjuncts, though sounding rather redundant. The syntactic similarity notwithstanding, the IHRCs are not available, in sharp contrast with (10). What brings about this contrast? Comparing the sentences that allow IHRC and those that do not, this contrast results from the event structure of the predicate and the way the implicit argument is involved. That is, the IHRCs in (2), (5), (6), (10) are all headed by an accomplishment verb and the implicit target figures in the resultant state designated by the verb. The illicit implicit targets of the IHRCs in (11), *water* and *knife*, in contrast, refer to instruments involved in the process designated by the verb, *washing* and *cutting*, and they do not figure in any resultant state (*dishes being washed* and *fish being sliced*.) It follows then that the third property constraining the implicit target of IHRC is that it must figure in the resultant state of the process denoted by the head predicate.

To summarize, this section has shown that the properties constraining the implicit target of IHRC are: (1) the implicit target must be an integral part of the event denoted by the predicate and (2) its denotation is linguistically pre-specified enough, and (3) it must figure in the resultant state of the process denoted by the head predicate of the IHRC. The next section considers how these constraints can be accommodated in a lexicon-based approach.

#### 4. APPLICATION OF GENERATIVE LEXICON

I have shown that the availability of implicit target of IHRCs is in fact linguistically restricted to a degree. Then how can the restrictions be captured? We need a mechanism which lets us access not only to subcategorized arguments of a predicate but to arguments which are not subcategorized but semantically involved in a crucial sense. We particularly need to pick up semantic participants in the resultant state of the predicate. The idea of Generative Lexicon (GL) by Pustejovsky ([5]) provides a kind of mechanism that roughly satisfies our needs.

GL consists of four levels of representations: Argument Structure, Event Structure, Qualia Structure, and Lexical Inheritance Structure. Argument Structure specifies the number and the type of logical arguments, and how they are realized syntactically. Event Structure defines the event type of a lexical item: state, process, and transition. Qualia Structure represents modes of explanation for a word, and it gives the relational force of a lexical item. It specifies four essential aspects of a word's meaning: formal, constitutive, telic, and agentive roles. Lexical Inheritance Structure relates a lexical structure to other structures in the type lattice, demonstrating how it contributes to the global organization of a lexicon. I will examine how these levels of representations can be explored to accommodate the data of IHRCs.

First of all, Argument Structure in GL is not limited for syntactically subcategorized arguments alone. [5] classifies arguments and adjuncts into four types: (1) true arguments, (2) default arguments, (3) shadow arguments, and (4) true adjuncts. True arguments are syntactically realized parameters of the lexical item. Default arguments are not necessarily expressed syntactically, but they participate in the logical definition of the predicate. Shadow arguments are semantically incorporated into the lexical item; when syntactically expressed, the sentences usually sound redundant. True adjuncts express temporal or

spatial modification and are not tied to any particular lexical item's semantic representation.

Qualia is the set of properties or events associated with a lexical item which best explain what that word means. In the case of a nominal, constitutive role expresses the internal structure of the nominal. Formal role distinguishes it within a larger domain by, for instance, identifying the category the referent of the nominal belongs to. Telic role encodes the purpose and the function of the nominal. Agentive role expresses the factors involved in its origin or how it is brought about.

One of the purposes of positing a qualia structure is to constrain the semantic extension and type shift associated with a lexical item. For instance, *starting a book* can mean *starting to write a book* or *starting to read a book*. In this case, a noun *book* means not an entity but an activity of writing or reading a book. The interpretation obtains because the complement of the predicate *to start* ought to refer to some kind of activity, and that the noun *book* is associated with such activities as writing (as the cause of there being a book) and reading (as the normal use of a book). There could be other activities involving a book, but these two are most readily available as interpretations of the phrase. In other words, the range of possible interpretations of the type shift in question is constrained by certain aspects of the noun *book*; it is usually limited to interpretations which concerns how it comes into being and how it is used. This is what the qualia structure of a nominal with agentive role and telic role captures.

In the case of the sentences examined above, all involve achievement verbs (more specifically, causative predicates), which are typically analyzed as consisting of an initial act or process followed by a resulting state. In GL, these two phases are mapped into the agentive and formal qualia roles, respectively. (13) illustrates the representation of the achievement verb *to build* in GL:<sup>3</sup>

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Now how does the GL model accommodate the data in question? The examination of the data above has shown that the possible targets of the IHRC include default arguments and shadow arguments as well as true arguments. Besides, in the case of the implicit target, I claim that the qualia structure of a predicate provides the key to accommodating the data. Since the target is a semantic argument which is

<sup>3</sup> For details of the representation, please refer to Pustejovsky (1995).

crucially involved in the resultant state of the process denoted by the head predicate of the IHRC, the target must appear in the formal qualia role of the verb.

Observe how the predicate of the IHRCs in (2a) and (2b) is represented

(14) a. *yokusoo -ga ahureru* 'for a bathtub to overflow' (cf. (2a))

ahure			
EVENTSTR =	[	E <sub>1</sub> = e <sub>1</sub> :process E <sub>2</sub> = e <sub>2</sub> :state RESTR = <α HEAD = e <sub>1</sub>	]
ARGSTR =	[	ARG 1= [1]      [container Formal = physobj	]
	[	D-ARG 1= [2]      [liquid Formal = mass	]
QUALIA =	[	state_change_lcp Formal = overflown(e <sub>2</sub> ,[2],[1]) Agentive = overflow_act(e <sub>1</sub> ,[2],[1])	]

b. *kao -o soru* 'to shave a face' (cf. (2b))

sor			
EVENTSTR =	[	E <sub>1</sub> = e <sub>1</sub> :process E <sub>2</sub> = e <sub>2</sub> :state RESTR = <α HEAD = e <sub>1</sub>	]
ARGSTR =	[	ARG 1= [1]      [animate_ind Formal = physobj	]
	[	ARG 2= [2]      [face Formal = y:physobj	]
	[	D-ARG 1= [3]      [‘hairy stuff’??? Formal = x:physobj Const = part_of(x,y)	]
QUALIA =	[	state_change_lcp Formal = not-exist-at(e <sub>2</sub> ,[3],[2]) Agentive = shave_act(e <sub>1</sub> ,[1],[3])	]

## 5. MORE CHALLENGING DATA OF THE IHRC

I have demonstrated that the implicit target can be made explicit in the model of GL. Notice, however, that not all the examples presented above find immediate solution in the current model. The

remainder of this paper examines such challenging data and consider what kind of mechanism is needed.

Some data of implicit target suggest that the formal role need to be more finely defined, or semantically decomposed. Consider again the data involving the predicate *nuru* 'to paint' given in (5).

- (5) a. [[Kabe -o kiiro-ni nut-ta] no] ga sukaato -ni tuite-simat-ta  
 wall acc yellow paint-past nmlzr nom skirt loc adhere-asp-past  
 'I painted the wall yellow, and it (the paint) soiled my skirt.'

In this sentence, the implicit target of the IHRC is *paint*, but the formal role of the predicate would be, very informally: *painted(wall)*. We need to have access to the nominal *paint* involved in the situation. This is not intuitively difficult since we can paraphrase *painting a wall* as *applying paint over a wall*. So the nominal *paint* can be accessed in the formal role if it incorporates a kind of semantic decomposition: (in a very informal representation) *be-painted(wall)* → *exist-on-the-surface-of(paint, wall)*.

This kind of semantic decomposition would accommodate the data in (10) as well, if *to practice calligraphy* is reanalyzed as *for Chinese ink to be applied on the surface of paper*:

- (10) a. [[Syuuji -o siteita no] ga te -ni tuite, makkuro -ni nat-ta  
 calligraphy acc do-asp-past nmlzr nom hand loc adhere black become-past  
 'I was practicing calligraphy, and it (Chinese ink) soiled my hand black.'

It is actually easy to find other data that call for a similar kind of semantic decomposition:

- (15) a. [[Iwasi -ga koge-ta] no] o kosoge-tot-ta  
 sardine nom burn-past nmlzr acc scrap-off-past  
 'The sardine burned black, and I scraped it off.'  
 b. [[Syatu -ga makkuro-ni yogore-ta] no] o arai-otosi-ta  
 shirt nom black soil-past nmlzr acc wash-off-past  
 'The shirt was soiled black, and I washed it off.'

In (15), the formal role of the embedded predicate is: *burnt(sardine)*. However, the implicit target, what is scraped off, is not the *sardine* itself but the burnt substance attached on its surface. In other words, the formal role needs to be sensitive to the semantic decomposition of *x being burnt* into *there being burnt substance on the surface of x*. These data share the same type of decomposition analyzing the change of the state of an object as the attachment of some substance on the object. The change appears on the surface of some object (*wall* in (5), *paper* in (11), *sardine* in (15a), and *shirt* in (15b)).

The following sentence illustrates a slightly different type of semantic decomposition.

- (16) [[Genkan -no ookina kagami -ga konagonani ware-ta] no] o itimai-itimai hirot-ta.  
 entrance gen big mirror nom into-pieces break-past nmlzr acc one-by-one pick-up-past  
 'The big mirror in the entrance hall was broken into pieces, and I picked up the pieces one by one.'

In (16), the formal role of the predicate *ware* 'to break' would be: *broken(glass)*. The implicit target of the IHRC is not exactly *a broken glass* but is *(broken) fragments of glass*. In order to accommodate this, the formal role ought to capture the decomposition of the meaning of *being broken*: *broken(glass)* → *in-pieces(glass)* → *exist(fragments of glass)*, to represent very informally. The decomposition in this sentence does not concern the attachment of some substance on the surface of an object. Nevertheless,

this sentence is similar to those involving the attachment of the substance in that the change incurred by the object is decomposed in terms of the constituents of the changed object.

Note that the semantic decomposition should not be arbitrary; otherwise, the qualia structure would give no better alternative to undefined pragmatics. In fact, the type of decomposition in the examples here is quite restricted; it typically concerns the *existence* of the constituents making up the resultant state coded in the formal role. Besides, the decomposed description is not merely an inference but it is entailed by the predicate.

There is another data of implicit target which further exploits semantic decomposition. (cf. [4]).

- (17) [[Inku-tubo o tukue -no ue -ni taosi-ta ] no ] o huki-tot-ta  
 ink pot acc desk gen top loc turn-over-past nmlzr acc wipe-off-past  
 'I turned over the ink pot on the desk, and wiped it (the ink) off.'

In this instance the semantic target is *ink*, and yet the resultant state coded in the formal role is: *turned-over(ink pot)*. The clause only states the state of a pot; however, the clause needs to imply further that the content of the pot is consequently spilled over.

Note that this type of example is not merely an instance of "container for content metonymy," which is prevalent, for instance, in English, supporting such expressions as: *to drink a bottle of wine*. A *bottle of wine* means *wine contained in a bottle*. In Japanese, the expected reading is available only in the form of the IHRC. Otherwise, the container cannot refer to its content:

- (18) a. \*Wain -no bin o non-da  
 wine gen bottle acc drink-past  
 'I drank a bottle of wine (bottle containing wine).'  
 b. [Wain -no bin o taosi-ta ] no ] o hui-ta  
 wine gen bottle acc turn-over-past nmlzr acc wipe-past  
 'I turned over a bottle of wine, and wiped it off.'

In other words, the container could refer to its content only when the semantic extension and decomposition operate, making the content accessible. More specifically, the semantically decomposed formal role should encode the implication that when a container is turned over, the content is likely to be scattered around. What is necessary is that the qualia structure encode this kind of semantic extension as well as the decomposition: *ink pot* → *bottle containing ink & turned-over(ink pot)* → *exist-out-of(ink, ink pot)*. However, this is not entailment; the ink may well not come out if the ink pot is turned over.

This type of data deserves careful examination because we do not want to allow the semantic extension and decomposition to extend arbitrarily. In fact, the availability of the data is restricted in at least three respects: (1) the semantic decomposition encodes one of the most naturally expected results directly following the event, if it is not the only possibility, (2) the semantic decomposition involved concerns the *existence* of the content out of the container, (3) the content must be lexically-specified.

The third point, that the content must be lexically-specified, is particularly important to restrict the range of semantic decomposition. In (17), it is crucial that the content of the bottle (ink pot) is specified as *ink*. Even if *tubo* 'vase' is a container which could contain some liquid, the implicit target reading of IHRC is not available without the specification of the content:

- (19) \*? [[Tubo o tukue -no ue -ni taosi-ta ] no ] o zookin -de huki-tot-ta  
 pot acc desk gen top loc turn-over-past nmlzr acc cloth instr wipe-off-past

'I turned over the pot on the desk, and wiped it (the water?) off with a cloth.'

Similarly, the implicit target of (20a-b) is given as part of the lexical meaning of an argument.

- (20) a. [[Omotya-bako -o hikkuri-kaesi-ta ] no] o hitotuzutu hiroi-atume-ta  
 toy-box acc turn-over-past nmlzr acc piece by piece pick-up-past  
 'I turned over a toy box, and picked up the toys one by one.'
- b. [[Miesi-ire -no hako -o hikkuri-kaesi-ta ] no] o itimaizutu hiroi-atume-ta  
 visiting cards gen box acc turn-over-past nmlzr acc piece by piece pick-up-past  
 'I turned over a box for visiting cards, and picked up the cards one by one.'

Interestingly, the implicit target is apparently limited to the one lexically given. A toy box and a box of visiting cards could contain something other than toys and visiting cards, respectively, and yet the IHRC reading is available only referring to toys and visiting cards

- (21) a. \*[[ Hon-no hait-ta omotya-bako -o hikkuri-kaesi-ta ] no] o issatuzutu hiroi-atume-ta  
 book gen be-past toy-box acc turn-over-past nmlzr acc one by one pick-up-past  
 'I turned over a toy box which contained books, and picked up the books one by one.'
- b. \*[[ Enpitu -no hait-ta miesi-ire -no hako -o hikkuri-kaesi-ta] no] o  
 pencils gen be-past visiting cards gen box acc turn-over-past nmlzr acc  
 itimaizutu hiroi-atume-ta  
 piece by piece pick-up-past  
 'I turned over a box of visiting cards which contained pencils, and picked up the pencils one by one.'

So it may seem that the not-entailed semantic decomposition involving an argument applies only when the decomposition makes accessible the lexically-specified part of the argument. In other words, it may seem that the implicit target must be lexically-specified in some ways. Unfortunately, there are apparent counterexamples to this constraint. Observe the following sentence:

- (22) ? [[Koppu o taosi-ta ] no] o zookin -de huki-tot-ta  
 glass acc turn-over-past nmlzr acc cloth instr wipe-off-past  
 'I turned over the glass, and wiped it (the water?) off with a cloth.'

This sentence does not contain a morpheme specifying the content in the glass; that is, the implicit target of the IHRC is not lexically given in any form, and yet the sentence is unexpectedly good. This sentence may seem to invalidate the constraint that the implicit target must be lexically-specified. However, if it does, the contrast between (19) involving *tubo* 'pot' and (22) involving *koppu* 'glass' remains a mystery.

This mystery in fact finds a solution in the model of GL. The crucial point is that the qualia structures of *tubo* 'pot' and *koppu* 'glass' are different. To be more precise, the telic role of *koppu* 'glass' should include the information that it contains liquid typically to drink. In the case of *tubo* 'pot,' on the other hand, the telic role is unspecified, for certain *tubo*'s are used to keep solid objects, others keep liquid, and still others are artistic objects used only to watch and appreciate. The type of the content of the container *koppu* 'glass' is specified in the telic role of the qualia structure. Thus, by assuming the elaborated lexicon, the constraint can be maintained, and it explains both the possible implicit targets and the impossible ones.

To summarize this section, the model of representation of Pustejovsky's GL, which is able to capture most of the cases of Japanese IHRC with implicit target, enhances its applicability if the formal quale is elaborated to integrate a kind of semantic decomposition, which reanalyzes the resultant state of the process in terms of the mode of existence of the constituent part of the state. I did not discuss how the integration can be technically achieved, or how much the semantic decomposition is allowed to go.<sup>4</sup> The solution of these problems awaits further investigation of the technical details of GL, as well as examination of more data. In particular, it is not even very clear at the moment in what level of semantic decomposition the basic representation of the quale (including the formal role) should be given. This is a fundamental issue, relevant to the question of what exactly the formal quale is meant to capture.

## 6. CONCLUSION

This paper has argued that the Japanese IHRC with implicit target can be accommodated in a lexicon-based approach if the structure of the lexicon is sufficiently elaborated. The availability of the implicit target is restricted in the following three respects: (1) the implicit target must be an integral part of the event denoted by the predicate and (2) the type of its denotation is linguistically pre-specified, and (3) it must figure in the resultant state of the process denoted by the predicate of the IHRC. The model of GL by Pustejovsky is employed to represent these restrictions. In particular, the qualia structure is shown to capture the availability of implicit target of IHRC. For the full analysis of the data, however, the qualia structure must be further elaborated to integrate the semantic decomposition of the formal role.

The qualia structure was originally proposed to account for the type shift and semantic extension and other phenomena of semantic incongruities that require a coercive measure for the interpretation to go through. If the normal structure of the IHRC has an explicit target, and the one with an implicit target obtains as a result of coercion, it is not surprising that the qualia structure constrains the availability of the implicit target. Thus this discussion of this paper lends further support to the theory of GL and the qualia structure posited in it.

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<sup>4</sup> Presumably, the possible level of semantic decomposition is not rigidly specified but allows individual variation. And this variation should account for the individual variation as regards the acceptability judgment of implicit target reflects.