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Dr. Brian Nolan

Editor

ITB Journal

Institute of Technology Blanchardstown

Blanchardstown Road North

Blanchardstown

Dublin 15

IRELAND

Editorial

I am delighted to introduce the **22th edition of the ITB Journal**, the academic journal of the Institute of Technology Blanchardstown.

The first paper, by Evangelia K. Asproudi of the School of English at Aristotle University of Thessaloniki, Greece, examines the comprehension and production of wh-interrogatives in early L1 Greek. Children's language performance is explored at in regard to argument/adjunct extraction and presence/absence of negation. In order to test the predicted lead of comprehension over production, a group of ninety four-to-seven-year old Greek children participated in elicitation tasks. It was found that the Greek children performed better in question comprehension compared to question production, with individual findings suggesting that children's economy-based processing may not be constrained exclusively by syntactic factors.

The second paper, an article by Avelino Corral Esteban of Universidad Autónoma De Madrid, investigates interrogative sentences in Lakhota within the framework of Role and Reference Grammar (RRG henceforth) with the aim of explaining their structure as well as finding out the restrictions on 'wh'-question formation that this language exhibits. A goal of this study is to verify the close relationship that exists between interrogative words and indefinite pronouns in this language, see the constraints on linking in simple 'wh'-questions and provide an account of the subjacency effects that block the formation of 'wh'-questions involving complex constructions. The paper shows the quite significant interplay between several syntactic, semantic, and pragmatic features plays in the formation of interrogative sentences. It proves that the RRG analysis provides an adequate explanatory account of the structure of interrogative sentences and also of the restrictions on extraction phenomena and, in so doing, it demonstrates that these restrictions can be accounted for through the interaction of syntax, semantics and pragmatics, rather than simply through syntactic movement rules.

The aim of our third paper, by Jone Bruno of Trinity College Dublin, was to analyse the gender assignment patterns and processes to English loan nouns that were inserted into Lithuanian language during the process of natural speech. Construction Morphology and the Morpheme-based Model were fused for the purpose of the analysis thereby allowing the detailed analysis of phonological, morphological, syntactic and semantic procedures. The focus of this research is the change that occurs in the word level while inserting an L2 item into L1 discourse. The findings revealed that masculine gender was assigned as a default gender regardless of stem vowel classification for inanimate nouns. Biological sex determined the gender of English nouns that are animate. Furthermore, a complex process of suffix merging from English and Lithuanian languages was observed, regarding the combined suffixes as one item. This research contributes to greater understanding of the morphological processes that occur when words are borrowed into the Lithuanian language and how assignment of grammatical and inherent gender to English loan words occurs in Lithuanian discourse.

The next and fourth paper by Farhad Moezzi pour of Trinity College Dublin undertakes a study of Persian cleft constructions. This is also within the framework of Role and Reference Grammar. RRG intends to investigate the interaction of syntax, semantics and pragmatics via the constituent, logical and focus structure as independent but interrelated domains of the paradigm. To start, the author demonstrates the specification role of the cleft construction, which is a universally semantic property of the construction, in the syntactic, semantic and information structures. In Persian clefts, despite that the clefted constituent is the semantic argument of the predicator of the cleft clause, it bears the role of pragmatic predicate assigned by the matrix predicator and the optional presence of the cleft pronoun as well, originating from the non-isomorphic nature of the cleft construction which expresses a single semantic proposition through a bipartition syntax. Given that the copula does not agree with the clause-

initial cleft pronoun, albeit with the clefted constituent, and also that the matrix grammatical elements are considered to be merely focalizers, the so-called demonstrative, i.e. "in" is regarded as emphatic pronoun. The syntax-information structure interface in the cleft-like constructions in Persian, such as extraposition and preposed adverbials forms one of the central analyses of this paper where it will be displayed that RRG achieves higher levels of descriptive and explanatory adequacy than the other theories to reflect the linguistic interfaces within various grammatical constructions. Of the most important findings is the necessity to distinguish the anaphoric "in", 'this' in the extraposition construction and the emphatic "in" 'it' in the cleft construction.

This fifth and final paper, by Judith Gottschalk of BBDO Services GmbH, Germany, examines three-place predicates in English as a means of teasing out elements of the computability of RRG within a computational linguistics approach. The concept of computational adequacy is introduced as an important external principle from a philosophy of science perspective to sharpen the scientific principles of the area of functional computational linguistics. In addition, a pseudo-code-based meta-language is developed in order to semi-formalize the linking algorithm from semantics to syntax. This paper will show that RRG in its current fashion is not executable on an abstract machine model - called Random Access Machine - and is therefore not computationally adequate. It is highlighted that the semantics to syntax linking algorithm as presently proposed in RRG is too coarsely grained to account for the variable undergoer linking in English three-place predicates. The concept of intelligent software agents is introduced in order to account for the functional linguistic approach used in RRG. The author shows that it is possible to account for variable undergoer linking in three-place predicates using constructional schemas as considered as grammatical objects. Based on the development of typed feature structures of thematic relations, a claim of the author is that it is possible to show that semantic macroroles are epiphenomenal. And can be considered an unnecessary concept set on top of thematic relations, and thereby in conflict with the principle of economy. In this paper it is shown that thematic relations stored in inheritance networks in the mental lexicon interact with constructional schemas for transfer verbs. The concept of discourse representation structures is also of crucial importance and, as such, it is shown that variable undergoer linking in English is based on information structure considerations. In order to work towards a computationally adequate version of RRG, a revised version of the semantics to syntax linking algorithm is developed.

We hope that you enjoy the papers in this issue of the ITB Journal.

Dr. Brian Nolan

Editor

ITB Journal

Institute of Technology Blanchardstown

Blanchardstown Road North

Blanchardstown

Dublin 15

Email: brian.nolan@itb.ie

Wh-Interrogatives in Early L1 Greek: Comprehension vs. Production

Evangelia K. Asproudi

School of English

Aristotle University of Thessaloniki, Greece

Abstract

This paper examines the comprehension and production of wh-interrogatives in early L1 Greek. Specifically, children's performance is explored at both levels with regard to argument/adjunct extraction and presence/absence of negation. In order to test the predicted lead of comprehension over production, a group of ninety four-to-seven-year old Greek children participated in elicitation tasks that were designed mainly along the methodological principles of Crain and Thornton (1998). On the whole, the results were in line with the initial expectation. That is, the Greek children performed better in question comprehension compared to question production, with individual findings suggesting that children's economy-based processing may not be constrained exclusively by syntactic factors.

Keywords: *wh-interrogatives, comprehension, production, L1 Greek, extraction site, negation*

1. Introduction

The aim of this paper is to investigate children's behaviour with regard to the acquisition of wh-questions in L1 Greek. More concretely, question comprehension and production will be examined in an attempt to provide a thorough picture of what happens with the acquisition of wh-movement in the language.

The core hypothesis underlying this paper is that in languages clause-typing wh-questions by overt wh-movement (Cheng 1991, 1997), children acquire wh-movement from a very young age. Short-distance (henceforth SD) movement is present in child grammar from very early on (e.g. Guasti 2000 etc.), while access to long-distance (henceforth LD) movement occurs from around the age of three onwards (e.g. Thornton 1990, Thornton & Crain 1994, de Villiers et al. 1990 etc.). At this point, a distinction should be made with regard to children's performance on comprehension and production of wh-movement. Specifically, it is hypothesized that children perform better at the comprehension than at the production level, given that the latter involves more processing demands than the former.

In view of the above hypotheses, the prediction with regard to the acquisition of wh-questions in early L1 Greek is that Greek children will perform better at the comprehension than the production level, with accurate performance rates increasing with age.

2. Method

In order to test the above prediction concerning early L1 Greek, a study was designed in which the methodology of research adopted was one of elicited comprehension and of elicited production. What follows is a description of the participating subjects, of the

experimental tasks set and of the procedure followed, as well as of the measurement steps employed for the analysis of the collected data.

2.1 Participants

The study group consisted of ninety typically developing children aged 4;0 to 7;0. These children were divided into three equivalent subgroups A, B and C. Group A included thirty children between four and five (mean age range: 4;6), group B thirty children between five and six (mean age range: 5;5) and group C thirty children between six and seven years old (mean age range: 6;7). Group A and B children were in their first and second year in kindergarten respectively, while group C children attended the first grade in primary school.

2.2 Procedure and Materials

As stated earlier, the present study aims to investigate areas of L1 question comprehension and production. For this purpose, three experimental tasks were prepared for data collection. These tasks were designed to investigate the research areas as follows:

- Task 1: *comprehension of questions without wh-islands (wh-COMP¹ questions) and of questions with wh-islands (wh-wh questions)*
- Task 2: *production of LD questions*
- Task 3: *production of SD questions*

These experimental tasks will be described in more detail in the following sections through the presentation of the rationale, the materials and the procedure pertaining to each one of them.

Before turning to the presentation of each experimental task in isolation, some general procedural remarks applying to all tasks set should be mentioned. As regards the setting, each child was tested separately in a room next to their classroom during their daily school program. The testing of each child involved two sessions that took place on different days; each session lasted about forty-five minutes, and it was tape recorded and transcribed at a later stage. Tasks 1 and 2 were conducted during the first session, while task 3 during the second one.

What follows is a detailed presentation of the three experimental tasks mentioned above.

Task 1: Comprehension of wh-COMP and wh-wh Questions

Rationale. The rationale behind task 1 was twofold. On the one hand, the aim was to see whether children would prefer SD over LD movement at the comprehension level, and for this reason ARG-COMP and ADJ-COMP² questions were included where both a SD and a LD interpretation was grammatical and plausible. On the other hand, there was also an interest in whether children would show sensitivity to wh-islands. In order to test this, a set of argument- and adjunct- medial questions was also included that permitted the children a choice between a grammatical SD and an ungrammatical LD

¹ COMP refers throughout to an overt non-wh-complementiser.

² ARG = argument, ADJ = adjunct

interpretation. On the whole, the expectations were that children would show increasing preference for SD interpretations and sensitivity to island constraints.

Materials. For the purpose of this task, short stories were created which replicated scenarios used in similar studies in other languages (e.g. Abdulkarim et al. 1997, Philip & de Villiers 1992, Roeper & de Villiers 1992, Thornton & Crain 1994, de Villiers et al. 1990), or which were adapted from stories included in school text books in an attempt to create materials that would not be remote from children's school experience. All stories were followed by comprehension questions; each story provided a context that made all interpretations (grammatical and ungrammatical ones) salient and that excluded any possibility of coreferentiality of SD and LD interpretations. To preclude a bias for one interpretation over the other, care was taken to deliver all test questions in as neutral intonation as possible. A sample test story is presented below.

(English translation)

The dog has a ball. The cat and the rabbit have to climb up a wall to see who has the ball. The cat tries first: she takes a ladder and tries to climb up the wall but eventually falls down. Then the rabbit tries: she uses the same ladder, climbs up the wall and sees the dog. Then she says: "I can see who has the ball! The dog has it and he is holding it with his legs!"

Experimenter's question: *Pjos_{ij} t_i emathe oti t_j exi ti bala?*

'Who_i t_i found out that she has the ball?' – SD reading

'Who_i did she find out t_j to have the ball?' – LD reading

Target answer: *to kuneli* 'the rabbit' – SD reading

o skilos 'the dog' – LD reading

Experimenter's question: *Pws_i emathe t_i pjos exi *t_i ti bala?*

'How_i did she find out t_i who has *t_i the ball?'

Target answer: *skarfalonondas ton tiho* 'by climbing up the wall'

Procedure. The duration of this task was about twenty-five minutes. After an explanation of the procedure to follow, each of the stories was acted out with props in front of the child or presented through pictures to her. Then, the accompanying comprehension questions were posited. In case the child did not respond to a certain test question, this question was repeated once; if no answer was elicited, the procedure proceeded with the presentation of the next question or of the next story and its accompanying questions.

Task 2: Production of LD questions.

Rationale. In task 2 the aim was the production of LD questions by children. The rationale of this task evolved around the hypothesis that LD extraction is more processing costly for children than SD extraction, and hence difficult to produce.

Materials. For the elicitation of LD questions two games were designed along the lines of similar crosslinguistic tasks (Thornton 1996). For the purposes of this task, a puppet called 'Astrulis' that had come from another planet was introduced to the child. The first game included prompts of the type *Rotise ton Astruli X mandevi aftos* ('Ask

Astrulis [i.e. the puppet] X he guesses'), where X stood for the respective wh-element. As for the second game, it consisted of prompts which were of the form *Rotise ton Astruli X protimai aftos* ('Ask Astrulis [i.e. the puppet] X he prefers'), where X stood again for the respective wh-element.

What is presented below is a sample of the first and second game protocol as well as of the stimulus sentences used.

1st game:

The experimenter presents five toys: one car, one pink and one blue comb, and one red and one yellow ball. She asks both the child and the puppet to cover their eyes while she is hiding each of these toys in different numbered boxes. Then she asks the child and the puppet to uncover their eyes, and the game proceeds. After the experimenter has elicited the child's guess, she prompts the child to elicit the puppet's guess. One of the stimulus sentences she uses is the following:

Stimulus sentences:

Experimenter: *Sto kuti 3 ekripsa mia xtena. Ja mandepse pja.*

'In box 3 I hid one of the combs. Guess which one.'

(the child says his/her guess...)

Experimenter: *Esi mandevis oti sto kuti 3 ekripsa tin ... xtena. Rotise ton Astruli pja mandevi aftos.*

'You are guessing that in box 3 I hid the ... comb. Ask Astrulis which one he is guessing.'

Target question: *Pja xtena mandevis oti ekripse sto kuti 3?*

'Which comb are you guessing that she (i.e. the experimenter) hid in box 3?'

2nd game:

The experimenter presents four toy characters: one rabbit, one dog and two horses. She explains to the child that three of these toy characters have to be matched with certain actions.

Stimulus sentences:

Experimenter: *Kapjo alogaki tha pai volta. Rotise ton Astruli pjo protimai aftos.*

'One of the two horses is going for a walk. Ask Astrulis which one he prefers.'

Target question: *Pjo alogaki protimas na pai volta?*

'Which horse do you prefer that it go for a walk?'

Procedure. The duration of task 2 was about twenty minutes, fifteen minutes for the first and five minutes for the second game. As regards the procedure, both games were based on ideas from Thornton (1996). The first game proceeded as follows: both the child and the puppet covered their eyes while the experimenter hid objects in small numbered boxes. The child guessed what was hidden in each box, and then the experimenter prompted her to ask the puppet about his guess. In the second game, the

child and the puppet saw some toy characters and some possible actions they could do. The experimenter prompted the child to ask the puppet decide which action each toy character would do. Thus, through these two games, the child was prompted to produce the target LD questions. In case the child did not react to the experimenter's prompt, the prompt (and the relevant part of the game) was repeated twice; if still no question was elicited, the procedure continued with the presentation of the next part of the game and the corresponding prompt.

Task 3: Production of SD questions.

Rationale. Task 3 aimed at the production of SD questions. The main rationale underlying this task was that SD question production is in line with local preference processing accounts (e.g. Fanselow et al. 1999, Frazier & Flores d' Arcais 1989 etc.), and hence it would not posit any serious problems to children.

Materials. The puppet called 'Astrulis' was again employed for the purposes of the present task. The prompts were designed on the basis of scenarios and short stories close to children's everyday life. All prompts ended either on the phrase *Rotise ton Astruli X* ('Ask Astrulis [i.e. the puppet] X'), where X stood each time for the respective wh-element, or on the phrase *Rotise ton Y X* ('Ask Y X'), where X stood each time for the respective wh-element and Y for a person from the acted-out story. Here is a sample set of the test stories and of the relevant stimulus sentences:

1st situation:

(English translation)

Three smurfs are roller-skating in the forest when they meet two horses. While playing with the two horses, a bear suddenly appears and treads down the brown horse.

Stimulus sentences:

Experimenter: *I arkuda patise ena alogaki. Rotise ton Astruli pjo.*

'The bear trod down one of the horses. Ask Astrulis which one.'

Target question: *Pjo alogaki patise i arkuda?*

'Which horse did the bear tread down?'

2nd situation:

(English translation)

Jim goes shopping. He wants to buy a ball. He goes in a shop and sees two balls, a red one and a yellow one.

Stimulus sentences:

Experimenter: *O politis lei ston Dimitri na min pari kapja bala. Rotise ton pja.*

'The salesman tells Jim not to take one specific ball. Ask him which one.'

Target question: *Pja bala na min pari o Dimitris?;*

'Which ball should Jim not take?'

Procedure. The duration of the present task was about forty-five minutes. In the first part of this task, the experimenter prompted the child to pose questions to the puppet about himself and his friends and about life on his planet (e.g. Thornton 1996). Then, both the child and the puppet saw stories acted out with props in front of them or

accompanied by pictures. At the end of each story, using lead-in statements the experimenter prompted the child to ask the puppet the target questions so as to see whether the puppet understood what had happened in the story. In the second part of the task, a big story was acted out in front of the child and the puppet, with the latter playing this time the role of a passive observer. At frequent intervals, the child had to pose questions to the toy characters of the story, so as to find out how the story continued. In cases that the child did not react to the experimenter's prompt, the prompt (and the story where necessary) was repeated twice; if still no question was elicited, the procedure continued with the presentation of the next story and its accompanying prompt.

2.3 Analyses and measurements

The data collected from all three experiments were inserted into a database using the statistical software SPSS 17.0 for Windows. Mean ratings were then calculated for each participant; these ratings were tested statistically with mixed ANOVA analyses which provided within- and between- subject comparisons. These in turn enabled the checking for significance of the effect of category and group on the ratings. On the whole, the analyses of the data carried out were the following: a. correct responses with regard to the prediction tested, and b. type of errors.

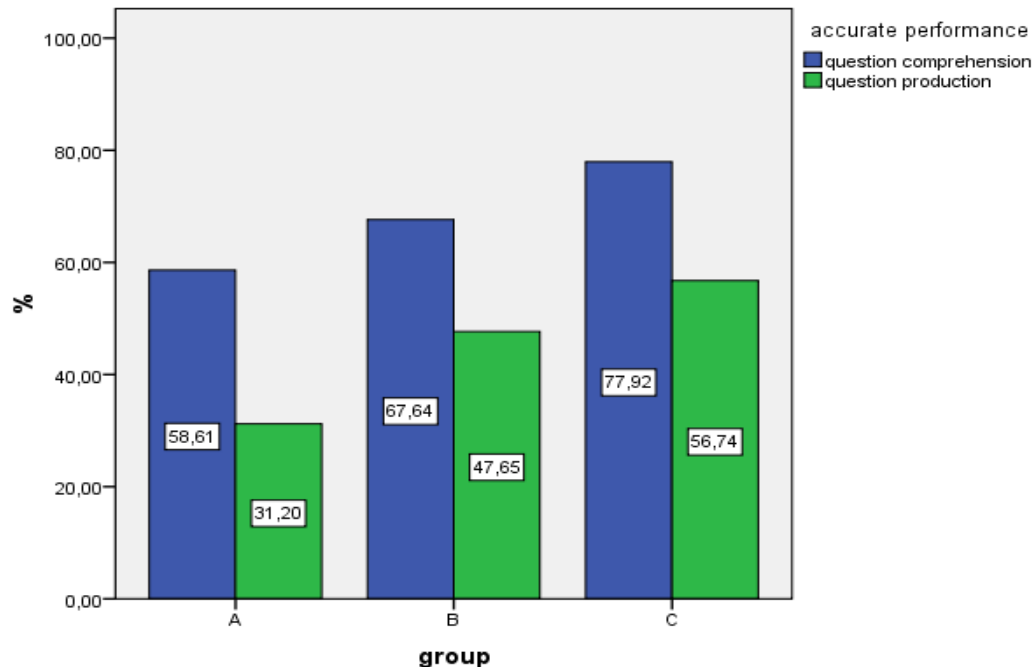
3. Results

Overall, the results obtained from tasks 1, 2 and 3 were in line with the prediction formulated in the introductory section³. As a reminder, the prediction was that children's performance will become more and more accurate as age increases and that children will show higher accurate performance on question comprehension than on question production overall. The following figure provides the average accurate performance rates of all groups. It should be noted that the phrase 'accurate performance' is used in a very general sense here and subsumes under it various responses on the part of the children. In terms of comprehension, 'accurate performance' includes grammatical SD/LD readings of ambiguous and unambiguous questions, namely of questions that allow either both readings or only one reading respectively. In terms of production, accurate performance implies production of target questions with respect to SD/LD movement and wh production. Separate results for all types of questions tested in comprehension and production will be provided in figures 2-5. To begin with, here is a presentation of the overall accurate performance rates attested in question comprehension and production.

As shown in Figure 1, for both conditions accuracy rates increased with age. In addition, within-group differences are also apparent, with accurate comprehension rates being higher than accurate production ones within all groups.

³ It should be noted that performance and every elicitation on the part of the children, either at the comprehension or the production level, will be characterised throughout in terms of 'accuracy'. The term 'target' will refer to the responses/structures aimed at by the experimenter.

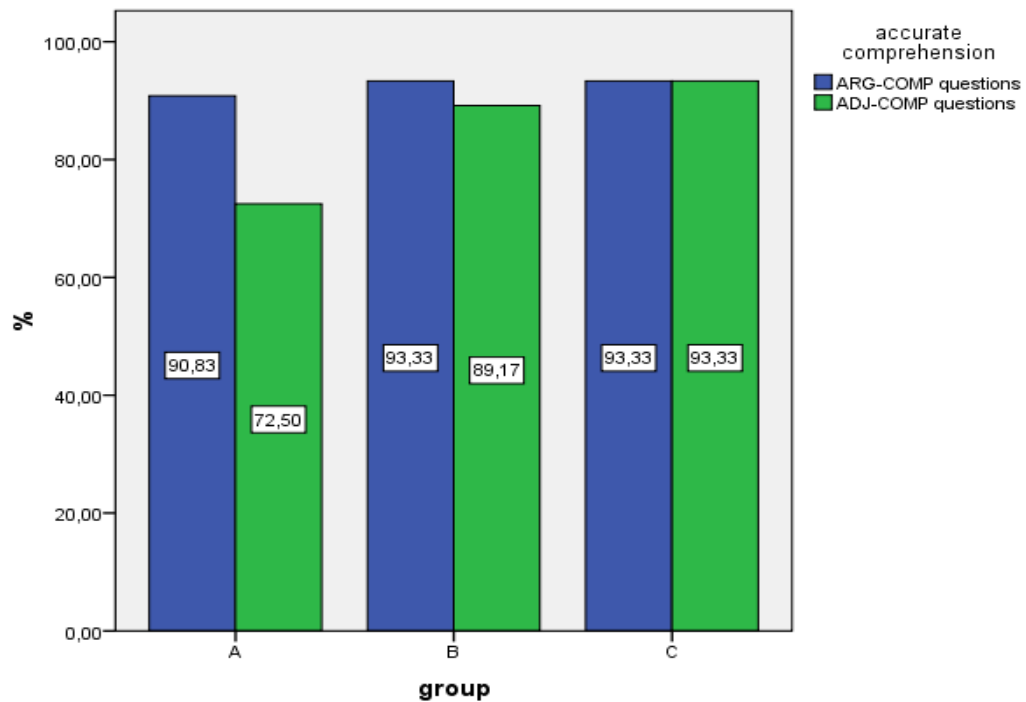
**Figure 1. Overall Accurate Performance
in Question Comprehension vs. Question Production**



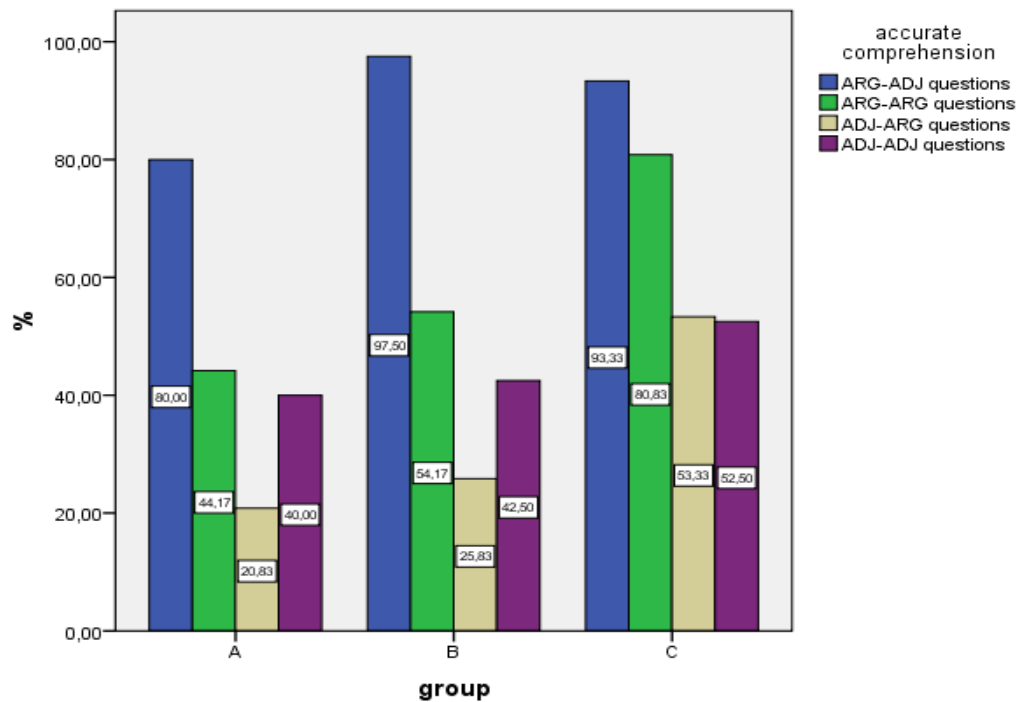
A two-way mixed ANOVA was performed on the results; it revealed significant within-group effects of accurate performance [$F(1,87)=105.641$, $p=.000$]. No significant interaction was found between accurate performance and group [$F(2,87)=1.127$, $p=.329$] but only a significant between-group effect [$F(2,87)=16.949$, $p=.000$], which suggests that there is large heterogeneity in performance between groups. Pairwise comparisons showed significant within-group differences in all groups ($p=.000$), which indicate that the Greek children performed significantly better at the comprehension than the production level from the youngest age. As for between-group comparisons, they were all found to be significantly different in question comprehension (A-B: $p=.053$, A-C: $p=.000$, B-C: $p=.01$), which suggests a clear pattern of development in children's comprehension ability. In question production, on the other hand, a burst in accurate performance was attested by group B, with A-B ($p=.002$) and A-C ($p=.000$) comparisons being the significantly different ones.

Analyzing the above data in more detail, it is interesting to see how children performed with respect to the comprehension and production of specific types of questions. On the comprehension side, two types of questions were tested: argument and adjunct questions with no wh-island (wh-COMP), and argument and adjunct questions involving a wh-island (wh-wh). The accurate performance rates on these two types of questions are shown in figures 2 and 3 respectively.

**Figure 2. Accurate Performance
in the Comprehension of Wh-COMP Questions**



**Figure 3. Accurate Performance
in the Comprehension of Wh-Wh Questions**



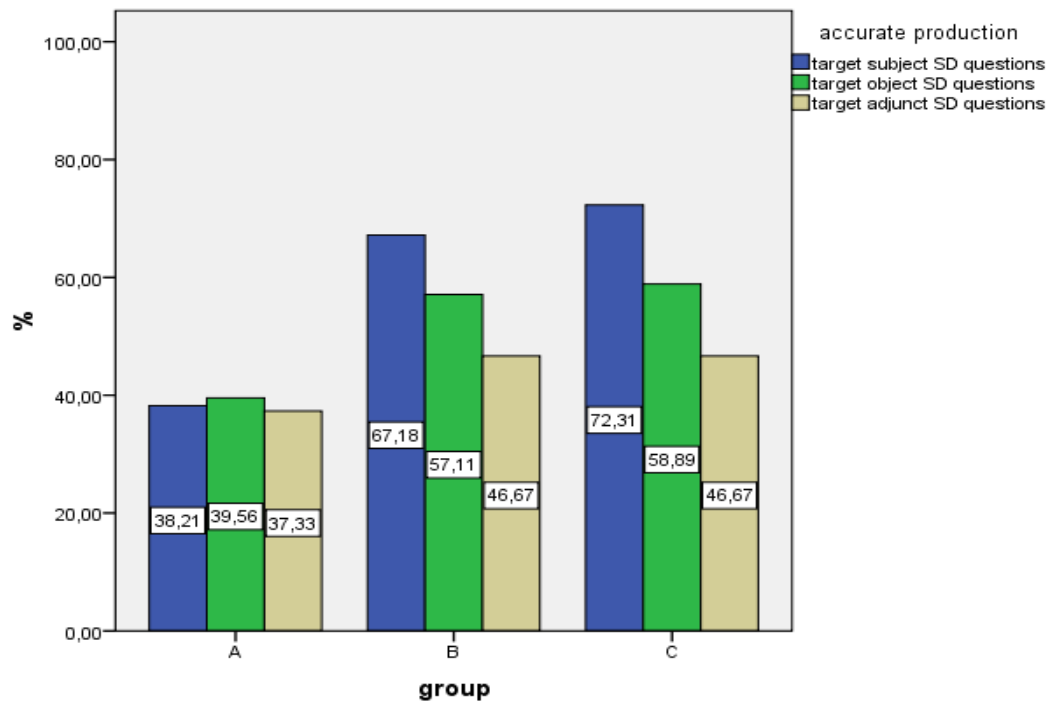
In both types of questions accurate performance increased with age. In wh-COMP questions children were very consistent, with ADJ-COMP questions being more difficult than ARG-COMP ones in the two younger groups, especially in A. As for wh-wh questions, ARG-ADJ ones proved to be the easiest for all groups, with ARG-ARG, ADJ-ADJ and ADJ-ARG questions following in decreasing order of difficulty.

Overall, the main within-group effects of accurate performance per question type [$F(5,435)=110.991$, $p=.000$] and of its interaction with group [$F(10,435)=4.958$, $p=.000$] were significant; in addition, the main between-group effect was also significant [$F(2,87)=11.303$, $p=.000$]. Pairwise, accurate comprehension of ARG-COMP questions at a within-group level was significantly higher than that of ADJ-COMP ones only in group A ($p=.001$). Between groups, no significant comparisons were found for ARG-COMP but only for ADJ-COMP, where a significant increase in accurate comprehension was found between groups A and B (A-B: $p=.005$, A-C: $p=.000$). Turning to wh-wh questions, in groups A and B all within-group comparisons were significant except for the comparison between ARG-ARG and ADJ-ADJ questions. In group C all comparisons were again significant, except for the comparisons between argument-extraction questions (ARG-ADJ vs. ARG-ARG) and between adjunct-extraction questions (ADJ-ARG vs. ADJ-ADJ). Between groups, the significant burst in accurate comprehension of argument-medial questions was attested between B and C (ARG-ARG: A-C: $p=.000$, B-C: $p=.000$; ADJ-ARG: A-C: $p=.000$, B-C: $p=.002$), whereas in ARG-ADJ questions between A and B (A-B: $p=.003$, A-C: $p=.028$). As for ADJ-ADJ ones, no significant comparisons were attested as their accurate comprehension rates remained at similar levels across groups.

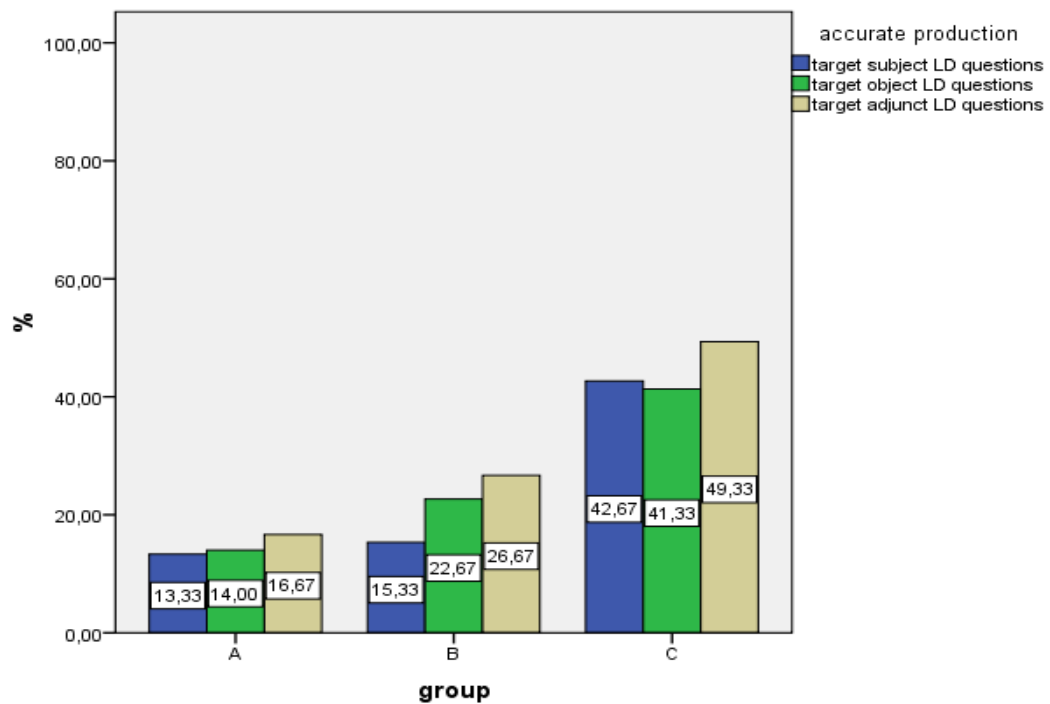
On the production side, two types of questions were targeted: SD argument and adjunct questions, and LD argument and adjunct ones. The following two figures illustrate the three groups' performance in target SD and target LD question production.

As shown in figures 4 and 5, accuracy rates became increasingly higher in both argument and adjunct question production, but they were higher in SD compared to LD questions. In addition, in target SD extraction, subject questions had the higher accurate production rates for the two older groups, whereas in target LD extraction this was the case for adjunct questions across groups.

**Figure 4. Accurate Performance
in the Production of Target Short-Distance Questions**



**Figure 5. Accurate Performance
in the Production of Target Long-Distance Questions**



Within-subjects, the main effect of extraction site was significant in both target SD [$F(2,174)=16.406$, $p=.000$] and target LD [$F(2,174)=7.240$, $p=.001$] production, while the effect of extraction site by group interaction was significant only in target SD

[$F(4,174)=3.838$, $p=.005$], not in target LD [$F(4,174)=1.295$, $p=.274$]. Between subjects, however, the main effect of group was significant in both types of questions [SD: $F(2,87)=8.338$, $p=.000$, LD: $F(2,87)=9.696$, $p=.000$]. As for pairwise comparisons, within-group analyses revealed no significant differences between the various extraction sites in the youngest children's accurate SD and LD questions. For group B and C children, accurate subject, object and adjunct SD extraction rates all differed significantly from one another (B: subject-object: $p=.001$, subject-adjunct: $p=.001$, object-adjunct: $p=.030$; C: subject-object: $p=.000$, subject-adjunct: $p=.000$, object-adjunct: $p=.015$), whereas accurate LD production rates were significantly lower for subject compared to object and adjunct extraction (subject-object: $p=.029$; subject-adjunct: $p=.004$) in group B, and significantly higher for adjunct compared to subject and object extraction in group C (adjunct-subject: $p=.075$, subject-adjunct: $p=.007$). At a between-group level, accurate production with regard to all extraction sites increased significantly between A and B in target SD (subject: A-B: $p=.001$, A-C: $p=.000$; object: A-B: $p=.009$, A-C: $p=.005$; adjunct: A-B: $p=.064$, A-C: $p=.064$), and between B and C in target LD questions (subject: A-C: $p=.000$, B-C: $p=.000$; object: A-C: $p=.001$, B-C: $p=.017$; adjunct: A-C: $p=.000$, B-C: $p=.005$), which indicates clearly the greater ease of children with target SD compared to target LD question production.

As for inaccurate performance, the error types attested are broadly defined and illustrated below.

**Table 1. Inaccurate Performance
in Question Comprehension vs. Question Production: Error Analysis**

<i>Condition</i>	<i>Error Type</i>	GROUP A		GROUP B		GROUP C	
		<i>No</i>	<i>Mean</i>	<i>No</i>	<i>Mean</i>	<i>No</i>	<i>Mean</i>
Question comprehension	Island violation	33/298	11.07%	18/233	7.73%	22/159	13.84%
	Medial-wh interpretation	185/298	62.08%	153/233	65.66%	73/159	45.91%
	Irrelevant interpretation	80/298	26.85%	62/233	26.61%	64/159	40.25%
Question production	Non-target landing site (SD → LD, LD → SD)	518/991	52.27%	530/754	70.29%	487/623	78.17%
	Non-target wh	35/991	3.53%	60/754	7.96%	50/623	8.02%
	Isolated wh	408/991	41.17%	147/754	19.49%	73/623	11.72%
	Irrelevant question	18/991	1.82%	10/754	1.33%	10/623	1.61%
	No response	12/991	1.21%	7/754	0.93%	3/623	0.48%

With regard to question comprehension, it is evident that medial-wh interpretations constituted the main type of error, with irrelevant interpretations and island violations following. As for question production, non-target landing site was the dominant error, followed by isolated wh production especially in group A. The error types presented here are very general categories that can be further specified into more concrete ones. In question comprehension, 'island violation' refers both to questions with a wh- and a negative island, while 'irrelevant interpretation' to questions with a wh-island and to questions without one in sum. Moreover, all error types in question production concern target SD and target LD questions together. In a more fine-grained analysis, the

distribution across particular types of questions of the errors presented in table 1, is provided in the following tables 2-5⁴.

Question Comprehension

**Table 2. Inaccurate Performance
in the Comprehension of Wh-COMP Questions: Error Analysis**

<i>Condition</i>	<i>Error Type</i>	GROUP A		GROUP B		GROUP C	
		<i>No</i>	<i>Mean</i>	<i>No</i>	<i>Mean</i>	<i>No</i>	<i>Mean</i>
ARG-COMP questions	Irrelevant interpretation	7/7	100%	4/4	100%	8/8	100%
ADJ-COMP questions	Island violation	13/33	39.39%	6/13	46.15%	4/8	50%
	Irrelevant interpretation	20/33	60.61%	7/13	53.85%	4/8	50%

**Table 3. Inaccurate Performance
in the Comprehension of Wh-Wh Questions: Error Analysis**

<i>Condition</i>	<i>Error Type</i>	GROUP A		GROUP B		GROUP C	
		<i>No</i>	<i>Mean</i>	<i>No</i>	<i>Mean</i>	<i>No</i>	<i>Mean</i>
ARG-ADJ questions	Island violation	6/24	25%	1/3	33.33%	3/8	37.50%
	Medial-wh interpretation	11/24	45.83%	1/3	33.33%	2/8	25%
	Irrelevant interpretation	7/24	29.17%	1/3	33.33%	3/8	37.50%
ARG-ARG questions	Island violation	0/68	0%	0/57	0%	3/23	13.04%
	Medial-wh interpretation	64/67	95.52%	54/55	98.18%	19/23	82.61%
	Irrelevant interpretation	3/67	4.48%	1/55	1.82%	1/23	4.35%
ADJ-ARG questions	Island violation	2/95	2.10%	1/89	1.12%	1/56	1.79%
	Medial-wh interpretation	68/95	71.59%	56/89	62.92%	18/56	32.14%
	Irrelevant interpretation	25/95	26.31%	32/89	35.96%	37/56	66.07%
ADJ-ADJ questions	Island violation	12/72	16.67%	10/69	14.49%	11/57	19.30%
	Medial-wh interpretation	42/72	58.33%	42/69	60.87%	34/57	59.65%
	Irrelevant interpretation	18/72	25%	17/69	24.64%	12/57	21.05%

⁴ The error types in tables 2-5 are presented per condition. Therefore, in order to gather, for example, the youngest children's 33 instances of island violation during question comprehension (see table 1), what needs to be done is add together all the instances of island violation that are presented per question type in tables 2 and 3.

Question Production

**Table 4. Inaccurate Performance
in the Production of Target Short-Distance Questions: Error Analysis**

<i>Condition</i>	<i>Error Type</i>	GROUP A		GROUP B		GROUP C	
		<i>No</i>	<i>Mean</i>	<i>No</i>	<i>Mean</i>	<i>No</i>	<i>Mean</i>
Target: subject questions	LD	25/241	10.37%	44/128	34.38%	59/108	54.63%
	Non-target wh	18/241	7.47%	15/128	11.72%	16/108	14.81%
	Isolated wh	191/241	79.25%	65/128	50.78%	27/108	25%
	Irrelevant question	5/241	2.07%	2/128	1.56%	6/108	5.56%
	No response	2/241	0.83%	2/128	1.56%	0/108	0%
Target: object questions	LD	92/272	33.82%	116/193	60.10%	151/185	81.62%
	Non-target wh	7/272	2.57%	12/193	6.22%	9/185	4.87%
	Isolated wh	157/272	57.72%	57/193	29.53%	21/185	11.35%
	Irrelevant question	11/272	4.04%	5/193	2.59%	4/185	2.16%
	No response	5/272	1.84%	3/193	1.55%	0/185	0%
Target: adjunct questions	LD	31/94	32.98%	48/80	60%	50/80	62.50%
	Non-target wh	2/94	2.13%	4/80	5%	5/80	6.25%
	Isolated wh	59/94	62.76%	25/80	31.25%	25/80	31.25%
	Irrelevant question	2/94	2.13%	3/80	3.75%	0/80	0%

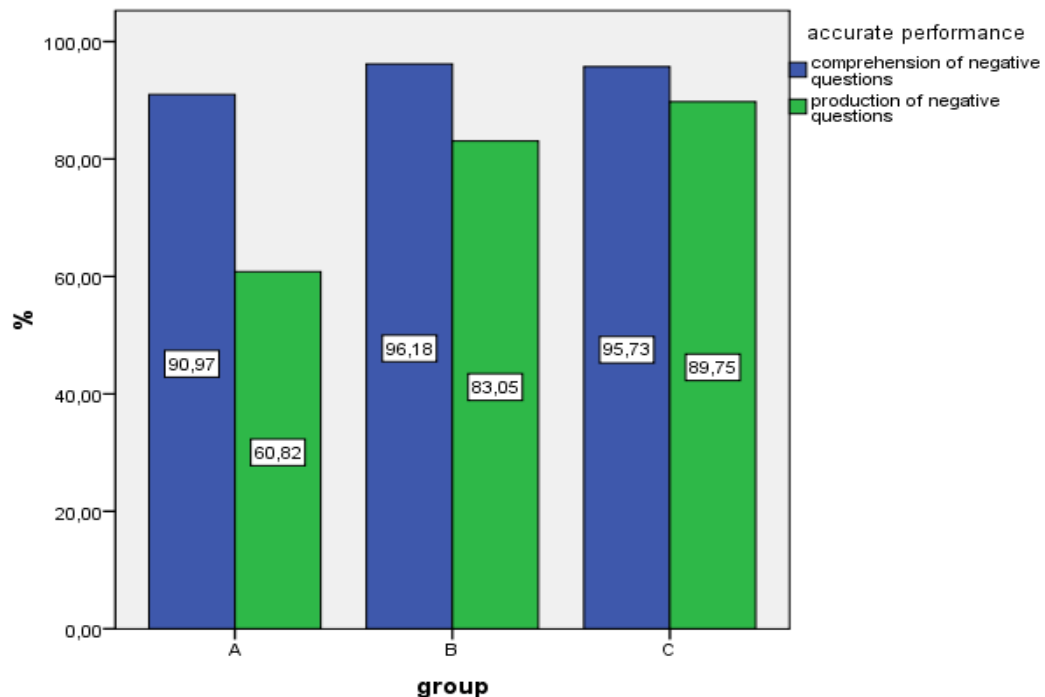
**Table 5. Inaccurate Performance
in the Production of Target Long-Distance Questions: Error Analysis**

<i>Condition</i>	<i>Error Type</i>	GROUP A		GROUP B		GROUP C	
		<i>No</i>	<i>Mean</i>	<i>No</i>	<i>Mean</i>	<i>No</i>	<i>Mean</i>
Target: subject questions	SD	121/130	93.08%	112/127	88.19%	80/86	93.02%
	Non-target wh	7/130	5.38%	14/127	11.02%	5/86	5.81%
	Isolated wh	0/130	0%	0/127	0%	0/86	0%
	No response	2/130	1.54%	1/127	0.79%	1/86	1.16%
Target: object questions	SD	126/129	97.67%	110/116	94.83%	82/88	93.18%
	Non-target wh	0/129	0%	6/116	5.17%	5/88	5.68%
	Isolated wh	1/129	0.78%	0/116	0%	0/88	0%
	No response	2/129	1.55%	0/116	0%	1/88	1.14%
Target: adjunct questions	SD	123/125	98.40%	100/110	90.91%	65/76	85.52%
	Non-target wh	1/125	0.80%	9/110	8.18%	10/76	13.16%
	Isolated wh	0/125	0%	0/110	0%	0/76	0%
	No response	1/125	0.80%	1/110	0.91%	1/76	1.32%

On the whole, question comprehension was found to develop earlier than question production, with significant differences attested in all groups. Therefore, the main prediction is, in general terms, borne out. Before ending this section, however, it is interesting to see whether this pattern remained the same when dealing with negative questions exclusively.

Figure 6 below presents the average accurate performance rates of all groups with respect to the comprehension of negative questions and the production of negation in target negative contexts, irrespective of accurate SD/overuse of LD extraction counts⁵.

Figure 6. Accurate Performance in Negative Questions



As depicted, accurate performance in negative questions was the dominant pattern from the youngest age, with accurate performance rates increasing with age. Within groups it is evident that children, especially in the two younger groups, performed much better in the comprehension rather than in the production of negative questions.

The main effect of negation within subjects was significant [$F(1,87)=29.992$, $p=.000$], and so was the effect of negation by group interaction [$F(2,87)=4.729$, $p=.011$]. As for the main between-subjects effect of group, it was also found to be significant [$F(2,87)=7.760$, $p=.001$]. Pairwise, within-group comparisons revealed that accurate performance in the presence of negation was significantly better at the comprehension than the production level in groups A ($p=.000$) and B ($p<.01$), but not in C ($p=.249$). As for the between-group analysis, in comprehension no significant comparisons were attested as accurate performance rates were very high from the youngest test age. Turning to production, the presence of negation was not avoided in target negative questions; on the contrary, accuracy rates were above 50% from the youngest age, with significant differences attested between groups A and B ($p=.002$), and between groups A and C ($p=.000$). This suggests that a significant burst in the production of negation occurred between A and B, and the accuracy rates increased gradually thereafter.

⁵ On the comprehension side, what were of interest in the present measurement were children's responses with regard to the fronted wh-element. On this ground, medial-wh and irrelevant interpretations were excluded from the measurement. On the production side, instances of isolated wh and irrelevant questions were excluded.

As a final note, it is interesting to mention that the negative questions produced by the Greek children in the present study were grammatical in their overwhelming majority. Instances of negation doubling were not attested, while instances of verb doubling were scarce and amounted to only six across groups: five in group A and one in group C. As a matter of fact, all these six instances involved doubling not only of the verb but also of the *wh*-element, and are listed just below.

- (1) 'Pu tha pai pu dhe tha pai kanis?'
where will go-3SG where not will go-3SG no one
target: Pjos na min pai puthena simera?
(= 'Who should not go anywhere today?')
- (2) 'Ti na pari ti mi pari mesa sto spiti?'
what to take-3SG what not take-3SG inside the house
target: Ti na min pari mesa sto spiti?
(= 'What should he not take in the house?')
- (3) 'Pjo na pai pjo na min pai makria?'
which to go-3SG which to not go-3SG away
target: Pjo pedhi na mi fiji makria? (= 'Which child should not go away?')
- (4) 'Ti na min fai o Kostas ti na fai?'
what to not eat-3SG the Kostas what to eat-3SG
target: Ti na min fai o Kostas? (= 'What should Kostas not eat?')
- (5) 'Pjo na bi pjo na mi bi mesa?'
which to enter-3SG which to not enter-3SG inside
target: Pjo pedhi na mi bi mes sto spiti?
(= 'Which child should not go in the house?')
- (6) 'Astruli pjo dhokimazi pjo dhe dokimazi o filos su?'
Astruli which try-3SG which not try-3SG the friend your
target: Pjo fajito dhen troi o Jack? (= 'Which food doesn't Jack eat?')

The rest of the negative questions produced across groups were grammatical, with two of them actually instantiating the use of a cleft construction⁶.

- (7) 'Pjos ine aftos pu dhe bori na pai?'
who be-3SG he that not can-3SG to go-3SG
'Who is the one that cannot go?'
target: Pjos dhe tha voithisi ti mama? (= 'Who will not help mum?')

⁶ As a matter of fact, instances of cleft questions were only three throughout the production data. The two of them are the ones listed in (7) and (8), while the third instance of *wh*-cleft was produced by one of the oldest children in a target affirmative context and is presented below.

'Pjos itan pu xoreve orea sti jiortula?'
who was-3SG that danced-3SG well at the party
'Who was the one who danced well at the party?'
target: Pjos xorepse orea sti jiorti? (= 'Who danced well at the party?')

- (8) 'Pjo itan to zoaki pu de xorepse para poli kala?'
 which was-3SG the animal that not danced-3SG very very well
 'Which was the animal that did not dance very well?'
target: Pjo zoo dhen xorepse katholu kala?
 (= 'Which animal did not dance well?')

On the whole concerning negative questions, the above results indicate that negation effects were present in child grammar from the youngest test age, with comprehension being better compared to production. In other words, the more general pattern of higher accuracy rates in comprehension than production seems to be confirmed even when looking to negative questions in isolation.

4. Discussion and Conclusions

To sum up with regard to children's performance on the acquisition of wh-questions, the main result was that the comprehension of wh-questions showed overall significantly higher accurate performance rates than the production of wh-questions from the youngest test age. Besides, it is important to note that children's better performance in comprehension over production is also reflected at a more fine-grained level. That is, accurate performance in comprehension of all wh-COMP and wh-wh questions, with the exception of ADJ-wh ones, either was high/top⁷ by the youngest test age or became high/top at a certain age. On the production side, accurate performance displayed some degree of development as well: it increased significantly by group B in target SD and by group C in target LD questions. However, it never reached a level of high/top performance, thus being in contrast with accurate performance in comprehension.

Regarding accurate performance per extraction site, the following tendencies were observed. As far as comprehension is concerned, accurate performance in wh-COMP questions was high/top in the two older groups but significantly lower in adjunct (average performance) compared to argument extraction (top performance) for the youngest children. In the presence of a wh-island (i.e. wh-wh questions), however, accurate comprehension rates were generally lower. In the two younger groups, ARG-ADJ were the significantly easiest (high/top performance) and ADJ-ARG the significantly most difficult questions to comprehend (low performance), with ARG-ARG and ADJ-ADJ falling in-between with decreasingly low-level rates of accurate performance. As for the oldest group, all argument questions (ARG-ADJ, ARG-ARG) were significantly easier (high/top performance) than all adjunct ones (ADJ-ARG, ADJ-ADJ) (low performance). On the whole, then, it seems to be the case that the comprehension of argument-extraction questions caused less problems than the comprehension of adjunct-extraction ones to the 4-to-7 year old Greek children that participated in this study. At the production level, where target LD questions were generally more difficult to produce than target SD questions across all test ages, the argument/adjunct extraction site did not affect the youngest children's accurate performance, which remained at low levels in all conditions. Yet, in groups B and C a

⁷ Such characterizations of performance throughout this section refer to the following specifications:

top performance: 90% <

high performance: 80% - 89.99%

average performance: 60% - 79.99%

low performance: < 59.99%

different pattern was observed: in target SD questions adjunct extraction was found to be significantly more difficult than argument extraction, whereas in target LD questions adjunct extraction was easier to produce than argument extraction.

On the basis of all these observations regarding accurate performance per extraction site, one important similarity seems to emerge between comprehension and production. Specifically, the comprehension of *wh-wh* questions, where grammatical interpretation of the raised *wh* essentially involves SD movement (cf. Thornton & Crain 1994: 228), patterns together with the production of target SD questions. That is, at both the comprehension and the production level, SD extraction of adjuncts was more problematic than SD extraction of arguments, especially in the older groups. At first sight, the increased problems with adjunct extraction may be considered to be the result of conceptual difficulties associated with the more abstract concepts expressed by adjuncts compared to arguments (e.g. Bloom et al. 1982: 1084, Thornton & Crain 1994: 248-249). Interestingly, however, a reverse pattern applied to LD extraction at the production level, where adjunct questions were less problematic than argument questions. From a closer look at a deeper level, this discrepancy pattern between arguments and adjuncts may be argued to reflect an attempt on the part of the children to save on processing resources. Given that arguments are projected by the lexicon and need to be attached into the parse tree under the dictation of grammatical principles while adjuncts are only optionally attached to the verb by a more global principle (e.g. Full Interpretation) (Pritchett 1991: 327), it follows that the formation of *wh*-argument chains is more demanding in terms of processing than the formation of *wh*-adjunct chains. Modality of performance (comprehension/production) and distance of extraction (short/long) are then considered to play a counterbalancing role, with accurate argument chains being more prominent in target SD production and question comprehension, and accurate adjunct chains more prominent in target LD question production⁸.

To summarize so far, these findings suggest that children's performance follows consistently resource-saving strategies. The significantly higher accurate performance in question comprehension than in question production as well as the attainment of high/top performance in the former as opposed to the latter, are well explained under the assumption that comprehension necessitates the employment of fewer processing resources than production. Furthermore, even at an extraction-specific level, the significantly higher accurate performance on argument and adjunct extraction in comprehension/SD production and in LD production respectively, may also be treated as evidence in support of children's employment of resource-saving strategies.

In addition, it is interesting to note, in passing, that in target SD and target LD production, accurate performance rates in argument extraction did not differ significantly between subject and object questions in the youngest group. Yet, significant differences were attested in the two older groups: subject extraction was significantly easier in target SD questions for groups B and C, whereas object extraction was significantly easier in target LD questions, but only for group B⁹. Our findings from the youngest children contradict relevant crosslinguistic ones (e.g. Fahn

⁸ Remember that comprehension is less costly in terms of processing than production, and so is SD over LD production.

⁹ For group C children, no significant differences were observed between subject and object extraction.

2003, Guasti et al. 2011), which have been explained in terms of length-of-wh-chain effects on children's parser: subject chains can be formed earlier than object chains, since the latter always include an intervener (typically the subject) between the filler and the gap (Friedmann et al. 2009: 81). On this ground, subject chains require less memory load in order to get processed, and hence they are preferred over object chains (e.g. Gibson et al. 1994). According to Guasti et al. (2011), this subject/object asymmetry disappears in Greek because the morphological case marking on the wh-expressions nullifies the presence of any intervention effect. This seems to hold for the youngest children in the present study, but not for the older ones. For the older children, length-of-wh-chain effects similar to those attested crosslinguistically seem to be in operation in target SD questions and thus to override case-marking effects; as for the greater ease with object extraction in target LD questions, this might be explained on pragmatic grounds: object questions are less marked than subject ones in terms of focus, and this reduced pragmatic markedness may counterbalance the greater processing cost associated with LD dependencies, thus leading to higher accuracy in the production of target object compared to target subject LD questions (cf. Stromswold 1995).

Turning to negative questions as a final point, the early Greek data showed that the presence of negation was generally not avoided in target negative questions, since accurate performance rates had become high by group B. It is worth underlining that almost all negative questions produced by the Greek children were grammatical. At a crosslinguistic level, early English data has shown that children's negative questions often involve some type of doubling, like doubling of the auxiliary or doubling of the auxiliary along with negation (Guasti et al. 1995, Hiramatsu 2003, Thornton 1995). On the contrary, early Italian negative interrogatives are adult in form, with doubling occurrences never being attested (Guasti 1996). Given these two trends in the production of negative questions, early Greek seems to pattern together with Italian, since the only observed instances of doubling included wh and verb doubling and amounted to only six across groups. Drawing on the claim that children initially assume that negation must stay in a V-related projection (cf. Guasti 1996, Guasti et al. 1995), it is argued here that Greek children, on a par with their Italian but unlike their English peers, seem to hypothesize correctly from start that the Neg-Criterion must be satisfied inside CP and not IP. Unlike English, all verbs can raise to C in Greek and Italian, and hence CP is the V-related projection where the negation feature is checked. For this reason, Greek children locate negation inside CP from start and produce adult-like negative interrogatives¹⁰. The highly grammatical negative questions provide validation of the claim on children's initial assumption to place negation in a V-related projection, which attests, in turn, to that children adopt the most restrictive hypotheses possible at each stage of processing (cf. Guasti et al. 1995).

On the whole, all these findings converge to a common point: in child grammar, the most economical options prevail, as dictated by the natural economy principle that

¹⁰ Contrary to Greek children, Italian children have to *raise* negation to CP in order to produce grammatical negative questions. This difference between Greek and Italian stems from the fact that negation occupies a higher structural position in the former compared to the latter language. That is, in Greek NegP is located between the two lower C heads C_{OP} and C_M within a split-CP domain (see Roussou 2000: 79 for more details), while in Italian negation is located within IP (Guasti et al. 1995, Guasti 1996). As a result of this difference, adult-like negative interrogatives in Greek, unlike Italian, do not involve raising to but merely retaining of negation inside CP.

permeates the operations of the language acquisition device. In other words, an economy-based hierarchy of choices is in play, with the least marked strategies being preferred over the most marked ones. What is essential to underline here is that this economy-based hierarchy of choices is not triggered exclusively on syntactic grounds. As suggested in the above discussion, semantic and pragmatic factors also seem to affect the formation of this hierarchy. Thus Jakubowicz's (2005) Derivational Complexity Hypothesis, according to which less complex derivations are correctly spelled out at the PF interface before more complex ones during language development, can be seriously challenged. Children's processing ability may lag behind not at the level of form but at the level of meaning integration. In other words, maturation in terms of processing, which constitutes an extra-linguistic domain, is involved, and this maturation concerns semantics rather than syntax. On the whole, then, maturation of a non-linguistic ability is hypothesized, which is in line with a continuity account of language acquisition (e.g. Hyams 1986, 1994, Pinker 1984).

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A Role And Reference account of interrogative sentences In Lakhota

Avelino Corral Esteban

Universidad Autónoma De Madrid

avelino.corral@uam.es

ABSTRACT. *This article has investigated interrogative sentences in Lakhota within the framework of Role and Reference Grammar (hereafter RRG) (Van Valin, 1995; Van Valin and LaPolla, 1997), with the aim of explaining their structure as well as finding out the restrictions on 'wh'-question formation that this language exhibits. By means of this study, we will be able to verify the close relationship that also exists between the interrogative words and the indefinite pronouns in this language, see the constraints on linking in simple 'wh'-questions and give an account of the subacency effects that block the formation of 'wh'-questions involving complex constructions. All in all, this paper will show the remarkable role that the interplay between several syntactic, semantic, and pragmatic features plays in the formation of interrogative sentences, hence it will prove that the RRG analysis provides an adequate explanatory account of the structure of interrogative sentences and also of the restrictions on extraction phenomena. This is very relevant because it demonstrates that these restrictions can be accounted for through the interaction of syntax, semantics and pragmatics, rather than simply through syntactic movement rules.*

KEYWORDS. *Interrogative sentences, 'wh'-questions, interrogative word in situ, focus structure, subacency, linking algorithm.*

RESUMEN. *Este artículo ha tratado las oraciones interrogativas en Lakhota desde el punto de vista de la Gramática del Papel y la Referencia (Van Valin, 1995; Van Valin & LaPolla, 1997), con el objetivo de explicar su estructura además de dar cuenta de las restricciones que esta lengua muestra en la formación de preguntas de información. Por medio de este estudio, podremos comprobar la estrecha relación que existe entre las palabras interrogativas y los pronombres indefinidos en esta lengua, ver los problemas que presenta el algoritmo de enlace en oraciones interrogativas simples, y encontrar una explicación para los efectos de subyacencia que impiden la formación de preguntas de información las cuales contienen construcciones complejas. Por consiguiente, este artículo mostrará el importante papel que desempeña la relación entre varios aspectos sintácticos, semánticos y pragmáticos en la formación de oraciones interrogativas, de aquí que también demostrará que el análisis de la Gramática del Papel y la Referencia ofrece una explicación adecuada de la estructura de las oraciones interrogativas así como de las restricciones en fenómenos de extracción. Esto es muy relevante ya que demuestra que estas restricciones pueden ser explicadas a través de la interacción de la sintaxis, la semántica y la pragmática, y no simplemente por medio de reglas de movimiento sintáctico.*

PALABRAS CLAVE. *Oraciones interrogativas, preguntas de información, palabra interrogativa in situ, estructura focal, algoritmo de enlace.*

1. INTRODUCTION

It is widely acknowledged that RRG provides us with an excellent method of analysis to study the structure of a wide range of languages, since it relies on the relationship among syntax, semantics and pragmatics in order to unveil the common core all languages seem to share. The RRG conception of the clause, the 'layered structure of the clause' (LSC) is universal since it applies equally to all types of languages, regardless of whether they are fixed word-order or free word-order languages, head-marking or dependent-marking languages, and languages with and without grammatical

relations. Accordingly, all these hierarchically arranged syntactic units clauses are composed of are all universal aspects too. As for the non universal elements, it is possible to find clauses that have a 'precore slot' (PrCS), which is the position of 'wh'-elements in languages like English, and sentences with a 'left-detached position' (LDP), which is the position of a pre-clausal element in a left-dislocated construction. Analogously, we can also find clauses with a 'postcore slot' (PoCS), for example in verb-final languages, and sentences with a 'right-detached position' (RDP), which is the position of a post-clausal element in a right-dislocated construction. Likewise, each of the major layers (nucleus, core, clause) is modified by one or more operators, which include grammatical categories such as tense, aspect, modality and evidentiality.

2. THE POSITION OF THE QUESTION WORDS IN LAKHOTA

Interrogative sentences involve the clausal operator 'Illocutionary Force' (henceforth IF). This operator specifies the type of speech act, that is, whether the utterance is an assertion, a question, a command or an expression of a wish, modifying the proposition as a whole. Therefore, there are different types of IF: declarative, interrogative, imperative, and optative IF.

In order to indicate the type of speech act, Lakhota makes full use of 'gender deixis', especially in formal speech. This difference in male and female language usage is represented most commonly by the presence of enclitics which differ according to the type of sentence, and occupy the last position in the clause. In order to indicate declarative IF, this language uses a wide range of enclitics, whose choice depends on the sex of the speaker: men will employ *yeló*, *weló* (after *o*, *u*, *uŋ*), *-ló* (after e-ablaut) or *-pe ló* (following the plural suffix *-pi*) and women will use *ye*, *we* (after *o*, *u*, *uŋ*), *-le* (after e-ablaut), *-pe* (following the plural suffix *-pi*) or *kstó* (stronger assertion).

- (1) Bébela kiŋ asáŋpi kiŋ Ø- yatké lo
 baby the milk the 3SG:SUB-drink DECL
 'The baby is drinking the milk.'

The enclitics that mark questions are among the most frequent ones. These interrogative enclitics also present a distinction as to the sex of the person that is speaking, which is, men use *hwo* and women use *he*, although nowadays men also use *he* in informal situations.

- (2) Tuktél ya- thí he?
 Where 2SG:SUB-live Q?
 'Where do you live?'

The commands in Lakhota are also marked by the presence of an enclitic at the end of the clause. The imperative particles also vary according to the sex of the speaker: for men, *yo* (singular, after *a*, *aŋ*, *e*, *i*, *iŋ*), *wo* (singular, after *o*, *u*, *uŋ*), *šni yo* (singular in negative), *po* (plural), *-pi šni yo* (plural in negative); and for women, *ye* (singular, after *a*, *aŋ*, *e*, *i*, *iŋ*), *we* (singular, after *o*, *u*, *uŋ*), *šni ye* (singular in negative), *pe* (plural), *-pi šni ye* (plural in negative).

- (3) La- tké¹¹ yo!
 2SG:SUB-drink IMP
 'Drink it!'

Finally, this language normally expresses wish or desire by adding the enclitic *ní* at the end of the sentence.

- (4) Léčhel okhí- Ø- kahniga- pi ní
 this way STEM-3:SUB-understand sth- PL OPT
 'I wish they understand this.'

When it comes to studying universal aspects such as nucleus, core, periphery and clause, practically we find no cross-linguistic differences since they are all semantically motivated. Yet, when we attempt to analyze non-universal aspects, which are not semantically motivated but rather pragmatically motivated, more divergence is expected to be found. Thus, the use of operators is not identical cross-linguistically. Besides, the position that 'wh'-words, certain postposed elements, and detached phrases occupy will not be the same across languages. Nevertheless, these differences between non-universal aspects will have no bearing on the basic issue of determining core and peripheral elements.

In many languages, there are two major options for the positioning of the interrogative words in simple 'wh'-questions. Thus, these interrogative elements can occupy two different positions: they can either be placed at the beginning of the clause, which involves some type of movement, or be left in situ, that is, in the position that is associated with a non 'wh'-word that is bearing the same grammatical function as the interrogative element. Consequently, there will also be two different positions in the syntactic representation: question words that appear at the beginning of the clause will be considered as occurring in the PrCS and question words in situ will be treated as core arguments. In Lakshota, the interrogative words or 't'-words do not appear in initial position or PrCS like in English, but they occur in situ, regardless of whether they stand for core arguments (e.g. *tuwá* "who", *táku* "what", *tukté* "which" or *tóna* "how much/many") or adjuncts (*tuktél* "where", *tókheške* "how", *tóhan* "when" or *tákuwe* "why"). Furthermore, in this language the form of the interrogative words and the indefinite pronouns is identical. The fact that interrogative words appear in situ occupying the same position as a core argument and the coincidence that both interrogative words and indefinite pronouns share the same form brings as a consequence the possibility to find cases of ambiguity:

- (5) Thaṅké hokšíla kiṅ hé wašté- Ø- Ø- lake ló
 my-sister boy the that STEM-3SG:SUB-3SG:OBJ-like DECL
 'My sister likes that boy.'
- (6) Thaṅké hokšíla kiṅ hé wašté- Ø- Ø- lake he?
 my-sister boy the that STEM-3SG:SUB-3SG:OBJ-like Q
 'Does my sister likes that boy?'
- (7) Thaṅké tuwá wašté- Ø- Ø- lake ló
 my-sister who/someone STEM-3SG:SUB-3SG:OBJ-like DECL
 'My sister likes someone.'
- (8) Thaṅké tuwá wašté- Ø- Ø- lake he?

¹¹ The verb *yatkán* "drink" triggers e-ablaut before the particle *yo*.

- my-sister who/someone STEM-3SG:SUB-3SG:OBJ-like Q
 'Who does my sister like?' or 'Does my sister like someone?'
- (9) *Tuwá* *than ké wašté-* Ø- Ø- lake he?
 Who/someone my-sister STEM-3SG:SUB-3SG:OBJ-like Q
 'Who likes my sister?' or 'Does someone like my sister?'
- * 'Who does my sister like?' and * 'Does my sister like someone?'

The canonical word order in Lakhota is SOV, as illustrated in the example (5). The only difference between a declarative sentence and a question lies in the presence of different IF operators, as can be seen in (7) and (8) and no other change is made in the structure of the sentence. In this language, a same word, in this case *tuwá*, can be interpreted as either a question word (e.g. "who") or an indefinite-specific pronoun (e.g. "someone"): the choice depends on whether they appear in an interrogative (example (8)) or in a non-interrogative sentence (example (7)). Furthermore, when a question word and an interrogative IF operator co-occur, as in (9), the sentence is ambiguous since it can admit two different interpretations: one of them as a question word leading to a 'wh'-question and another as an indefinite pronoun resulting in a yes/no question. The choice of one type or another of interrogative sentence depends on the position of the focus: if the question word is the focus of the question, then the sentence is interpreted as a 'wh'-question, whereas if the focus falls upon another different element in the sentence, then this is interpreted as a yes/no question containing an indefinite pronoun. The striking fact about this coincidence is that it is not a language-specific feature of Lakhota, since indefinite and interrogative pronouns are not only closely related in Lakhota but also in many other languages, for example in German.

Consequently, focus is the concept that establishes a connection between 'wh'-questions in languages with 'wh'-words *ex situ* and 'wh'-questions in languages with 'wh'-words *in situ*. What both types of 'wh'-questions have in common is that their 'wh'-element must receive the focus of the question. The best evidence to illustrate this universal trait of language comes from the languages in which focus is obligatorily displaced to a specific syntactic position (e.g. the PrCS), that is, when the 'wh'-phrase appears in the initial position of a clause. This is undoubtedly one of the most common types of focus position and can be observed in many of the languages documented in Kiss (1995a, 1998a). This fact suggests that 'wh'-questions and focus constructions are structurally related.

Likewise, according to my native consultant Gene Thin Elk, it is also very common to distinguish between a 'wh'-question and a yes/no question containing an indefinite pronoun by means of the addition of the enclitic *čá/hč́i(ŋ)* right after the 't'-word, when the interpretation of the 't'-word as indefinite pronoun is intended, since the meaning of this particle denotes a participant in particular. In comparison with the former method, the example in (10b) is more emphatic than the same sentence where the question word does not receive the focus and is not accompanied by the enclitic *hč́iŋ*.

- (10) a. *Tuwé* ó- Ø- ma- *kiya* o- Ø- *kíhi* *huwó*?
 who STEM-3SG:SUB-1SG:OBJ-help STEM-3SG:SUB-be able to Q
 'Who can help me?'
- b. *Tuwé* *hč́iŋ* ó- Ø- ma- *kiya* o- Ø- *kíhi* *huwó*?
 someone STEM-3SG:SUB-1SG:OBJ-help STEM-3SG:SUB-be able to Q
 'Can anyone help me?'

If we analyze this language-specific feature, that is, the positioning of the 'wh'-word in English and Lakhota, two languages that illustrate the two types of languages concerning the position of question words aforementioned, some similarities can be observed. English is a lexical-argument language whose 'wh'-words appear in PrCS and therefore they undergo 'wh'-movement. By contrast, Lakhota is a head-marking language, which represents all the core arguments of the verb as bound morphemes within the verb complex and therefore the referents of these pronominal arguments are outside the core. Accordingly, in this language, the 'wh'-words appear in situ, that is, they occupy the same position as that of an NP that corefers with a pronominal marker, hence this position does not involve any type of movement.

Although this position, which is often labelled Extra-Core Slot (ECS), appears to be identical to the PrCS, they are only structurally identical (e.g. they are both direct daughters of a clause node), since there are some underlying differences between them. On the one hand, the PrCS is the clause-initial position where there is usually no pause separating it from the rest of the clause and where both core arguments and adjuncts functioning as question words appear in this position in both dependent-marking languages and head-marking languages, such as English and Cheyenne respectively. On the other hand, the ECS is a position that only hosts question words which function as question words in lexical-argument languages like Lakhota. In contrast, in this language, when a question word functions as an adjunct, it is placed in the periphery of the core, in clause-initial position, that is, in the position where adjuncts typically occur in Lakhota. This contrast is illustrated in examples (11) and (12) respectively:

- (11) Táku čhaŋksáyuha kiŋ Ø - Ø - čhiŋ hwo?
 What policeman the 3SG:SUB-3SG:OBJ-want Q
 'What did the policeman want?'

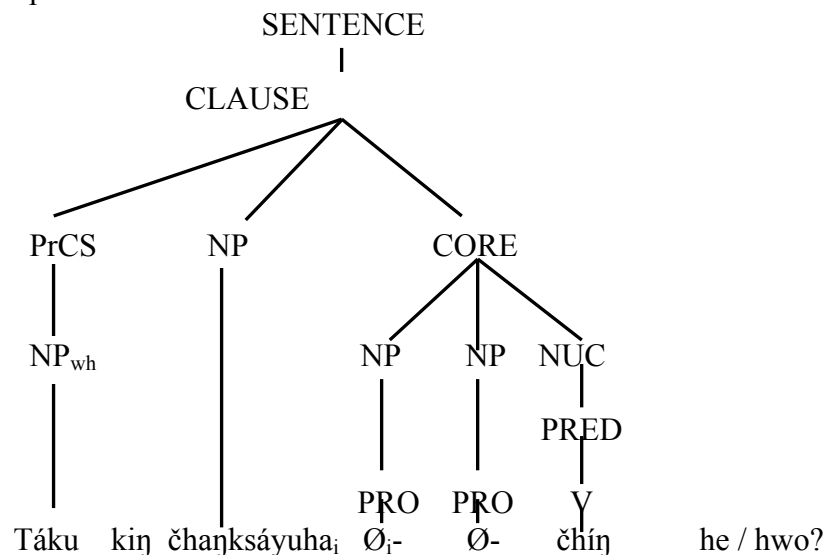


Figure 1: Question word in Lakhota represented in the ECS

- (12) Tuktél čhaŋksáyuha kiŋ Ø - thí hwo?
 Where policeman the 3SG:SUB-live Q
 'Where does the policeman live?'

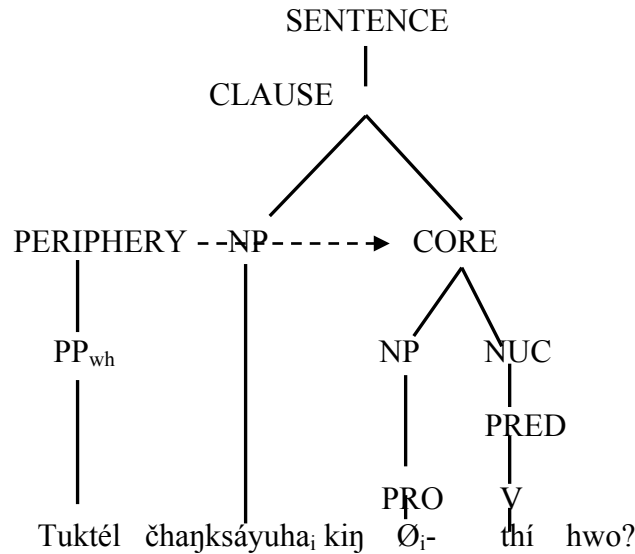


Figure 2: Question word in Lakshota represented in the periphery_{CORE}

Consequently, in languages like English, PrCS is the location of topicalized elements in sentences like “Football I don’t like” and also of question words, which undergo a ‘wh’-movement and subsequently appear in a focus position. If this highlighted element appears in final position in the clause, then it will be represented in the Post-Core Slot (PoCS), which is the same position as the PrCS, with the only difference that this topicalized element appears after the core. Conversely, in a language like Lakshota, whose question words remain in situ and where the obligatory arguments appear as affixes in the verbal complex, all the question words that stand for core arguments will be situated in the structurally identical ECS, that is, their position branches from clause and is core-external. The following chart shows the main differences between the PrCS and ECS:

	PrCS	ECS
Number of elements	one	As many as arguments in the core
Position in the clause	fixed	Unrestricted
Type of clauses they can occur in	Main clauses	Main and embedded clauses
Type of element	Argument or adjunct (Question words or topicalized elements)	Argument (RPs)
Type of language	Both head-marking and dependent-marking languages	Only head-marking languages

Table 1: Differences between elements in PrCS and ECS

Consequently, although there is a coincidence between the PrCS and ECS in terms of structure, the concept behind each is different, since these positions depend on the morphosyntactic features of each language.

Likewise, just like in English, question words in Lakshota can also appear within a subordinate clause. Thus, some verbs can be complemented by a dependent clause headed by a question word, such as: *táku*, *tuktél*, *tóna*, *tókheške* or *tuwá*. As explained above, these 't'-words can only be interpreted as question words in interrogative sentences, since they would function as indefinite pronouns in declarative sentences. Nevertheless, in these complement clauses, although they are indeed declarative sentences, they include an embedded 'wh'-clause, whose interrogative element behaves similarly as in a 'wh'-question since it receives a focus position, thereby satisfying the aforementioned rule.

These complement clauses, like their English counterparts, also behave like an NP and have the same function as an obligatory argument of the matrix predicate. As for the formation of these complement clauses in Lakshota, their question word occupies the first position and there is usually an article like *kiŋ* or *héci* at the end of the subordinate clause functioning as a CLM:

- (13) Táku tókhe- Ø- uŋ kiŋ slol- Ø- wá- ye šni
 what do something-3SG:SUB-STEM CLM STEM-3SG:OBJ-1SG:SUB-know NEG
 'I don't know what he did.'
- (14) Tákuwe héch- Ø - uŋ kiŋ o- Ø- wá- kahnige šni
 why do that-3SG:SUB-STEM CLM STEM-3SG:OBJ-1SG:SUB-understand NEG
 'I don't understand why he did that.'
- (15) Tókheskhe hécha- m- uŋ héci¹² i- Ø- ma- yunŋe
 how do that-1SG:SUB-STEM CLM STEM-3SG:SUB-1SG:OBJ-ask
 'He asked me how I did it.'
- (16) Tuwé kiŋ waŋ- Ø- blá- ke šni
 who CLM STEM- 3SG:OBJ-1SG: SUB- see NEG
 'I didn't see who it was.'

This language can also make use of another method in order to overcome the aforementioned case of ambiguity. Thus, sometimes it is possible to distinguish overtly between the interpretation of a question word as an interrogative word or as an indefinite pronoun through the use of the word *waŋži*¹³, which is added to the right of the question word:

- (17)
 Hé tuwé waŋ- Ø- Ø- yáŋke kiŋ slol- Ø- wa- ye šni
 he who STEM- 3SG:OBJ-3SG:SUB- see CLM STEM-3SG:OBJ-1SG:SUB-know NEG
 'I don't know who he saw.'
- (18)
 Hé tuwé waŋži waŋ- Ø- Ø- yáŋke héci slol- Ø- wa- ye šni
 he someone STEM- 3SG:OBJ-3SG:SUB-see CLM STEM-3SG:OBJ-1SG:SUB-know NEG
 'I don't know whether he saw someone.'

(19)

¹² The article *héci* marks topics unknown to the speaker.

¹³ This word is used in reference to a hypothetical topic and therefore it usually appears in questions, commands, wishes, or sentences in future.

Tuwé waŋʒi hé waŋ- Ø- Ø- yáŋke héči slol- Ø- wa- ye šni
 someone he STEM-3SG:OBJ-3SG:SUB-see CLM STEM-3SG:OBJ-1SG:SUB-know NEG
 'I don't know whether someone saw him.'

In the example (17) the 't'-word *tuwá* is interpreted as a question word and therefore it is not accompanied by the enclitic *hči(ŋ)*. Nevertheless, in (18) and (19) the presence of this enclitic guarantees that the 't'-word be understood as "someone" rather than as "who". It is also very interesting to notice the presence of the word *hé*, not only because this demonstrative pronoun appears in these three examples functioning as the third person singular personal pronoun, equivalent to the English personal pronoun "he", but also because this fact appears to contradict the view of Lakhota as a head-marking language. Nevertheless, the presence of a third person singular participant continues being coded by a bound morpheme (although in the case of a third person core argument, this pronominal marker is always realized covertly) and this situation is only exceptional, since the use of the demonstrative as a lexical personal pronoun only occurs to avoid ambiguity in the assignment of semantic roles. Thus, as the predicate *waŋyaŋka* has two third person singular participants as obligatory arguments and this language represents this kind of participants with null pronominal markers, it is necessary to include *hé* to mark overtly the position of the participant represented in English by "he" and consequently to know the semantic role of this participant as well as that of the question word in (17) or the indefinite pronoun in (18) and (19).

3. AN ACCOUNT OF THE FORMATION OF LAKHOTA 'WH'-QUESTIONS

Questions, especially 'wh'-questions, have always been an important topic in syntactic theory for many different reasons, for example: the position and the case of the 'wh'-element, the participant that the interrogative element makes reference to, the filling of the slot in the LS, etc. In Lakhota there is no nominal case marking¹⁴ but, owing to its head-marking character, it shows verb coding instead, since all the obligatory arguments are represented by verbal affixes. The study of questions in this language presents very striking facts about their formation, especially regarding the positioning of its interrogative elements. Accordingly, the interrogative pronouns *táku* "what" and *tuwá* "who" can have two different positions, depending on whether they function as actor or or undergoer of the predicate:

(20)

Wičhítanaškaŋškaŋ othí kiŋ ektá ni-ikhiyela thí tuwá waŋ- Ø- Ø- yaŋka hwo?
 cinema the in your neighbour who STEM-3SG:SUB-3SG:OBJ-see Q
 'Who did your neighbour see in the cinema?'

¹⁴ Some Lakhota nouns are very exceptionally marked by a nominal suffix: for instance, *othúŋwahe-ta* 'in town'.

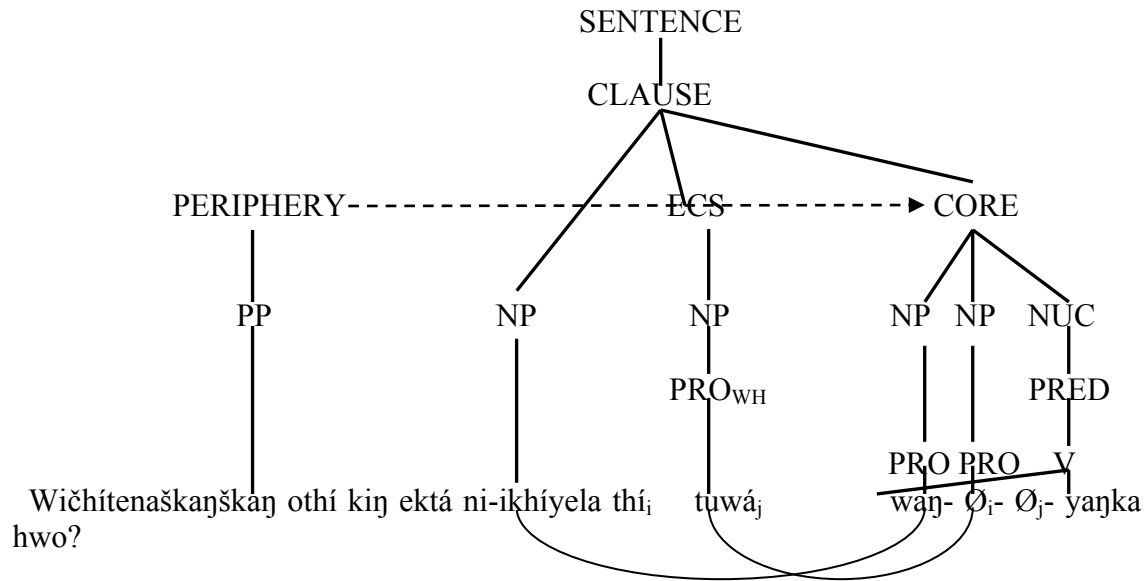


Figure 3: 'Wh'-word in Lakota functioning as Undergoer

In the example (20) we can observe how the first NP *ni-ikhíyela thí* functions as the actor of the sentence and the question word *tuwá* acts as the undergoer of the sentence. Accordingly, the word representing the object follows the subject, thereby respecting the canonical word order for Lakota SOV. This contrasts with the position of the English question words, which always appear in clause-initial position when they are in an interrogative sentence.

(21)

Tuwá wičhítenaškaŋškaŋ othí kiŋ ektá ni-ikhíyela thí waj- Ø - Ø- yaŋka hwo?
 Who cinema the in your neighbour STEM-3SG:SUB-3SG:OBJ-see Q
 'Who saw your neighbour in the cinema?'

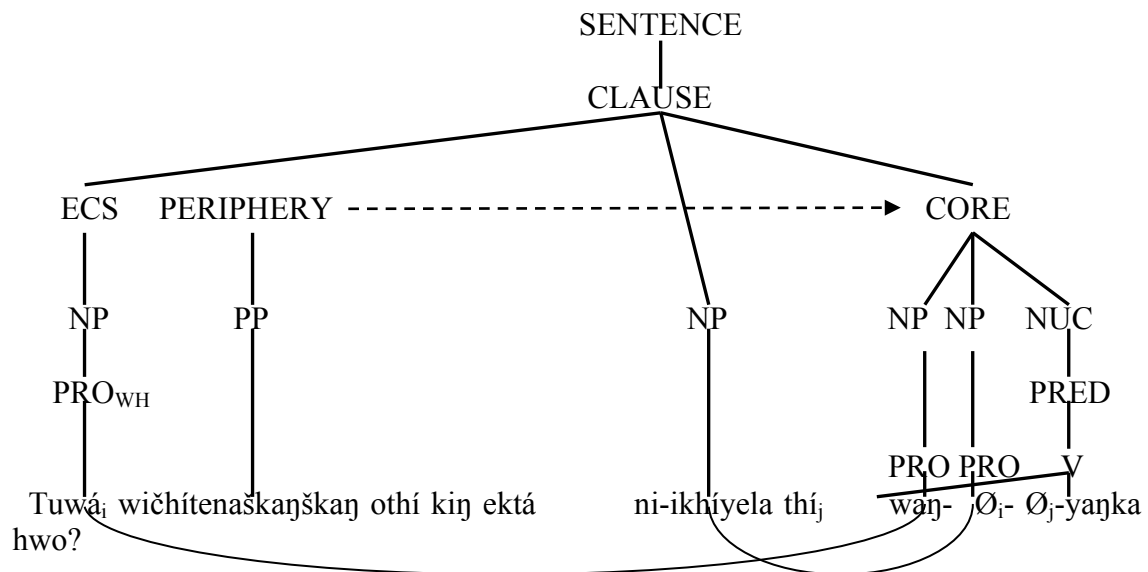


Figure 4: 'Wh'-word in Lakota functioning as Actor

As we can see in (21), taking the canonical word order SOV in Lakhota into consideration, if the question word *tuwá* is placed before the other NP *ni-ikhíyela thí* (regardless of whether there is an adjunct preceding or following it), it functions as the subject of the sentence, since the general rule implies that the first potential actor in a clause is interpreted as the actor or agent of the action. In this example, the NP *ni-ikhíyela thí* functions as the object, rather than the subject like in (20) and therefore follows the subject (as well as the optional adjunct). Therefore, when there may be ambiguity, it is very important to bear in mind the word order not to confound the meaning of the sentences. In case no possible ambiguity could exist, as in the case of the sentence (22b), the word order can be altered without affecting the meaning of the sentence:

- (22) a. John táku Ø- Ø- chíŋ he?
 John what 3SG: SUB-3SG:OBJ-want Q
 'What does John want?'
 b. Táku John Ø- Ø- chíŋ he?
 What John 3SG: SUB-3SG: OBJ-want Q
 * 'What wants John?' / 'What does John want?'

For obvious reasons, it is not possible to interpret the expected translation “*what wants John?”, which would be the correct interpretation in accordance with the canonical order SOV that rules in Lakhota.

Once a description of the grammatical structure of interrogative sentences has been presented, an example of the linking algorithm in a Lakhota ‘wh’-question will be offered in order to give an account of some typical problems that normally appear concerning the linking of the syntactic and semantic representations in this type of interrogative sentences:

- (23)
 Táku aŋpétuwakhaŋ čhaŋksáyuha kiŋ hé hokšíla kiŋ lé Ø- Ø- Ø- k’u he?
 what Sunday policeman the that boy the this 3SG:SUB-3SG:OBJ-3SG:OBJ give Q
 'What did that policeman give this boy on Sunday?'

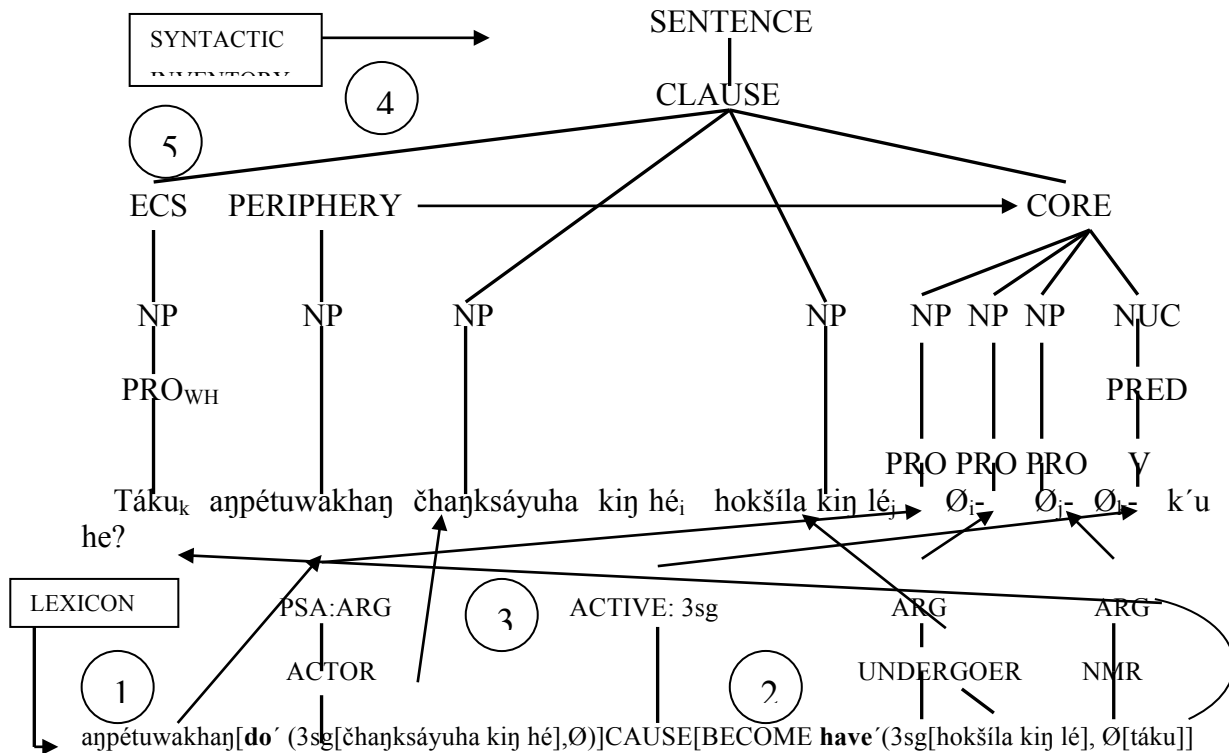


Figure 5: Semantics to syntax linking algorithm in a 'wh'-question with a three-place predicate in Lakhota

As Lakhota is a head-marking language, its obligatory arguments are realized by pronominal markers within the core attached to the verbal stem and they corefer with independent NPs outside the core. In this language, just like in the rest of Native American languages, the concept of animacy plays a crucial role in grammar, which can be noticed, for instance, in the order of the affixes, hence with three-place predicates like *k'u* the three affixes in the verb follow the fixed order: Actor + Recipient + Patient. Accordingly, the interrogative pronoun corefers with the rightmost core argument within the core. Taking into account that the RPs are optional as arguments of the verb and are only used when context demands them because all the core arguments are marked by agreement affixes on the verb, the verbal affix standing for this inanimate core argument will be then linked to the slot of the LS. Furthermore, owing to the preference shown by this language for animate participants over inanimate participants, when it comes to assigning the semantic macroroles, it exhibits the marked undergoer choice and therefore here the ditransitive verb *k'u* has the agent and the recipient as actor and undergoer semantic macroroles respectively, the patient realized by the question word being the non-macrorole argument.

Likewise, an important distinction between Lakhota and English can be seen in the structure of the core in 'wh'-questions including a question word functioning as an obligatory argument. In English, as the obligatory arguments are always realized by NPs, rather than by pronominal affixes, the presence of the 'wh'-word in the PrCS involves the reduction of one NP argument in the core. In Lakhota, by contrast, such an NP reduction does not take place, as can be observed in this ditransitive structure, where the three obligatory pronominal markers are present, despite the fact that the interrogative element, which makes reference to an obligatory argument of the predicate, is also placed outside the core.

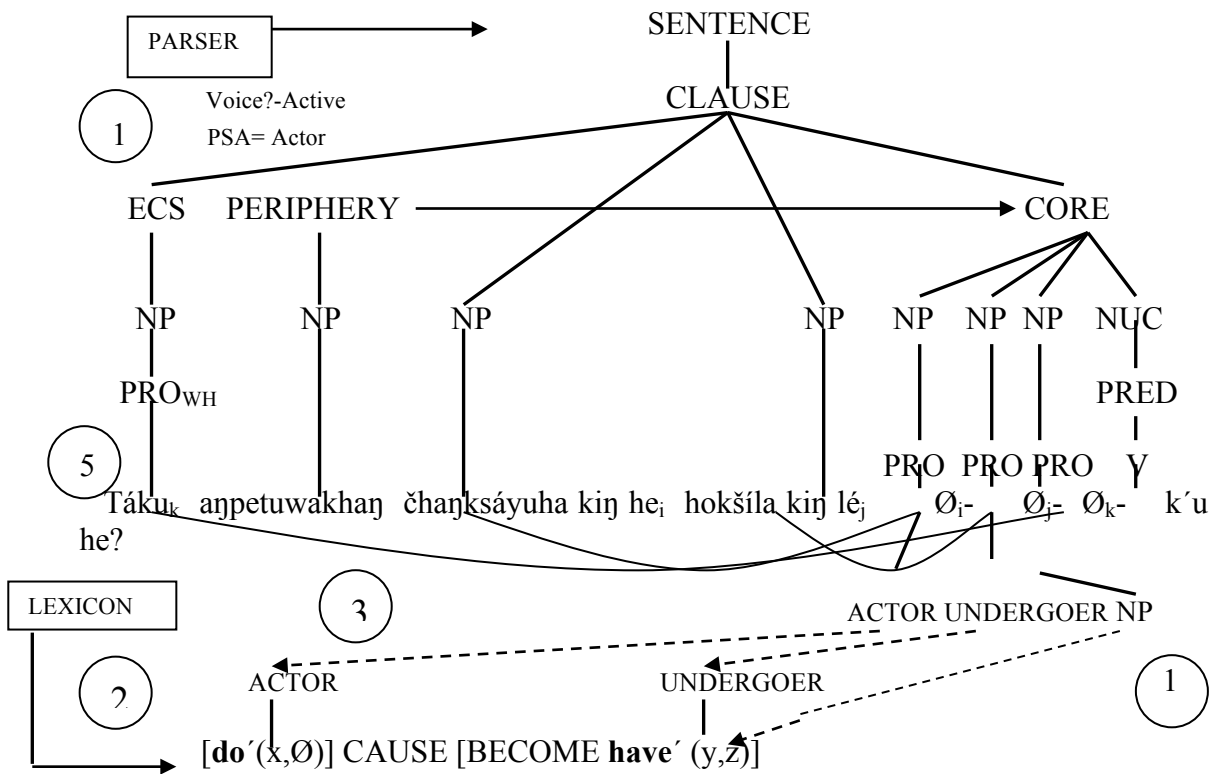


Figure 6: Syntax to semantics linking algorithm in a ‘wh’-question with a three-place predicate in Lakhota

As noted above, this language varies the canonical word order for pragmatic reasons. For instance, in Figure 6 as the position of the 't'-word depends on the function it performs in the clause, here *táku* should be interpreted as the subject of the clause because of its clause-initial position. Nevertheless, analogously to the example (22b), this sentence is unambiguous because, according to the meaning denoted by the predicate *k'u*, it is not possible to regard *táku* as its subject, the only possible function being the direct object, and therefore its position does not have to respect the canonical word order for this language, where the direct object in a ditransitive construction like this should occupy the right-most position with respect to the subject and indirect object, that is, S+IO+DO+V. Instead of the default position, here *táku* appears in clause-initial position for pragmatic reasons, since it is in this position that an element receives more focus.

As a summary, in a language like Lakhota where the question words appear in situ and occupy the ECS branching from the clausal node (or the periphery_{CORE} in case they function as adjuncts). Thus, the linking principle for 'wh'-questions will consist in assigning the [+wh] XP to the normal position of a [-wh] XP with the same function, except in some situations where the context helps us distinguish the semantic roles of the participants with so much clarity that it makes unnecessary to respect the canonical word order. In English, in contrast, the [+wh] XP is always mapped into the PrCS through 'wh'-movement.

4. EXTRACTION PHENOMENA IN LAKHOTA 'WH'-QUESTIONS INVOLVING COMPLEX CONSTRUCTIONS

Unlike simple sentences, where there are hardly any restrictions concerning the formation of 'wh'-questions, the extraction of an element out of certain syntactic configurations in complex constructions in order to form questions lead to the existence of some restrictions. Chomsky in 1973 attempted to provide a theoretical basis to explain these extraction restrictions and included all of these under the term of 'subjacency', whose basic idea is that movement transformations ('wh'-movement and NP-movement) cannot move an element across more than one bounding node in a single move. This principle works perfectly in English, since in this language the interrogative elements represent obligatory participants move out of the core into the PrCS, and NP and S (IP) represent the bounding nodes. Therefore, if we attempt to apply this reasoning to a language like Lakhotá, which presents no 'wh'-movement because its question words appear in the same position as that of an obligatory argument, we could think that, presumably, there should not be any subjacency effects. Nevertheless, these subjacency effects do exist, as can be observed in another example including a relative clause:

(24) a.

Wičhaša waŋ šuŋkawakháŋ kiŋ hená ophé- Ø-wičha- thuŋ kiŋ slol- Ø- yá- ye ye
 man a horse the those STEM-3SG:SUB-3PL:OBJ-buy the STEM-3SG:OBJ-2SG:SUB-know DECL
 'You know the man that bought those horses.'

a'. Wičhaša waŋ táku ophé- Ø- wičha- thuŋ kiŋ slol- Ø- yá- ye ye
 man a something STEM-3SG:SUB-3SG:OBJ-buy the STEM-3SG:OBJ-2SG:SUB-know DECL
 'You know the man that bought something.'

a''.

Wičhaša waŋ táku ophé- Ø- wičha- thuŋ kiŋ slol- Ø- yá- ye
 hwo?

man a what/something STEM-3SG:SUB-3SG:OBJ-buy the STEM-3SG:OBJ-2SG:SUB-know Q
 * 'What do you know the man that bought?' / 'Do you know the man that bought something?'

In the example (24a') the undergoer of the relative clause has been replaced by *táku* "what/something", and, owing to the presence of the IF marker *ye*, which denotes a declarative sentence, we have to interpret this sentence as one having an indefinite inanimate undergoer. In the example (24a''), the sentence has the question particle *hwo* and therefore must be interpreted as a question. Yet, the only possible interpretation is a yes/no question where the 'wh'-word *táku* is interpreted as an indefinite-specific pronoun. Thus, we can see that it is not possible to form a 'wh'-question if the question word functions as a semantic argument in the relative clause, although the element does not cross more than one bounding node, since its question words do not occur in the PrCS but rather in the same position as a normal NP argument. Consequently, this language shows subjacency effects despite not fulfilling the subjacency principles. This means that there must be something else in addition to 'movement' in order to explain these restrictions.

A feature shared by these two languages is that it is not possible to form 'wh'-questions when the interrogative pronoun is linked to an argument position within a construction

involving a relative clause. This occurs despite the fact that Lakota relative clauses are, unlike in English, embedded within a complex NP with a lexical head noun.

Van Valin (1991; 1993; 1995; 2003) explains these restrictions on the formation of 'wh'-questions in terms of the potential focus domain. There is then a general principle governing the scope of the potential focus domain in complex sentences: "The potential focus domain extends into a subordinate clause if and only if the subordinate clause is a direct daughter of (a direct daughter of) the clause node which is modified by the illocutionary force operator" (Van Valin 1993b: 121). Consequently, this rule establishes a general restriction on questions in Lakota because it posits that a subordinate clause will be within the potential focus domain only if it is a direct daughter of the clause node, which is affected by the IF operator, and therefore the element questioned must always occur in a clause which is within the potential focus domain of the sentence. This holds for languages where the question words remain in situ but, however, a remark should be made on this rule when applied to languages like English whose 'wh'-words undergo movement and therefore appear displaced: it is not the position in the PrCS but the core-internal position that the core argument, which the 'wh'-word is linked to, occupies that must occur in the potential focus domain.

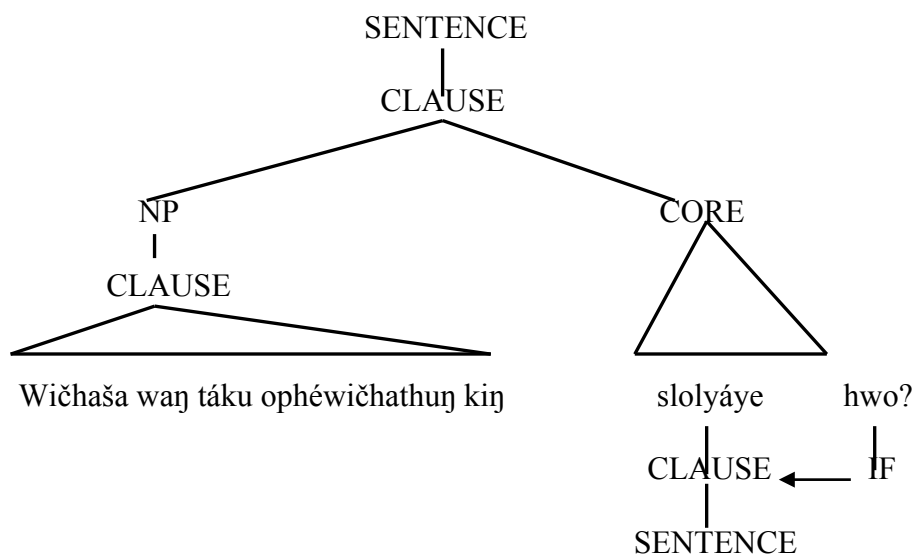
Consequently, despite the differences that exist in the formation of relative clauses in English and Lakota, which present head-external and head-internal relative clauses respectively, this principle can be applied to both languages, since in both of them relative clauses are not a direct daughter of the clause node modified by the IF. The following figure shows the representation of the example (24a''), which illustrates why it is impossible to extract an element out of a relative clause:

(24a'')

Wičhaša waŋ táku ophé- Ø- wičha- thun kiŋ slol- Ø- yá- ye
hwo?

man a what/something STEM-3SG:SUB-3SG:OBJ-buy the STEM-3SG:OBJ-2SG:SUB-know Q
'Do you know the man that bought something?'

* 'What do you know the man that bought _?'



**Figure 7: Representation of a relative clause in Lakota
(NP subordination)**

As is clear from the example above the embedded clause is not a direct daughter of the clause which is modified by the IF operator and therefore it bears no direct relationship to the matrix clause. Rather, it is embedded into an NP position, which means that it is out of the PDF of the matrix clause.

We now turn to restrictions in predicate-based complex constructions. Out of the eleven possible juncture-nexus types, Lakshota exhibits all of them except for nuclear coordination, nuclear subordination and sentential subordination. Nuclear junctures entail a single clause since they comprise a complex core containing two nuclei junctures that function as a complex predicate, and consequently, in terms of question formation, nuclear cosubordination and ad-nuclear subordination linkage types would behave just like simple sentences, which show no restriction on question formation:

- (25) a. Kim wáglutapi kiŋ šá - Ø- Ø- yé
 table the become red-3SG:SUB-3SG:OBJ-CAUS
 ‘Kim painted the table red.’
 a’. Kim táku šá - Ø- Ø- yé he?
 what become red-3SG:SUB-3SG:OBJ-CAUS Q
 ‘What did Kim paint _ red?’
- (26) a. Wičhínčala kiŋ thab(‘óihpeyapi)škáta- Ø- Ø_i- haŋ- pi
 girls the play basketball- 3:SUB-3SG:OBJ-ASP-PL
 ‘The girls are playing basketball.’
 a’. Wičhínčala kiŋ táku škáta- Ø- Ø_i- haŋ- pi he?
 girls the play - 3:SUB-3SG:OBJ-ASP-PL Q
 ‘What are the girls playing _?’

Core junctures involve a single clause containing more than one core, each with its own nucleus and its own set of core arguments, and therefore they also behave like simple sentences as far as question formation is concerned, hence core cosubordination, and core coordination do not present any restriction on the formation of ‘wh’-questions:

- (27) a. Kim thiyópa kiŋ Ø- yugáŋ i- Ø- yúthe kta héčha
 door the 3SG:OBJ-open STEM-3SG:SUB-try must
 ‘Kim must try to open the door.’
 a’. Kim táku Ø- yugáŋ i- Ø- yúthe kta héčha he?
 what 3SG:OBJ-open STEM-3SG:SUB-try must Q
 ‘What must Kim try to open _?’
- (28) a. Thúnkašila hugmíyaŋ nahómniŋi waŋ ophé-Ø- thuŋ Ø- ma- ší he?
 my-grandfather bike a STEM-3SG:OBJ-buy 3SG:SUB-1SG:OBJ-tell Q
 ‘Did my grandfather tell me to ride his horse?’
 a’. Thúnkašila táku ophé- Ø- thuŋ Ø- ma- ší he?
 my-grandfather what STEM-3SG:OBJ-buy 3SG:SUB-1SG:OBJ-tell Q
 ‘What did my grandfather tell me to buy _?’

Finally, with constructions exhibiting the clausal subordination, clausal coordination and sentential coordination linkage combinations, which involve the joining of units that are structurally independent, obviously it is only possible to form individual ‘wh’-questions from each unit taken separately, but not from the whole sentence:

- (29) a. Othúnwahe ektá Paul Ø- yé na wóyute ophé- Ø- Ø- thuŋ
town to 3SG:SUB-go and food STEM- 3SG:SUB-3SG:OBJ-buy
'Paul went to town and bought food.'
a'. * Othúnwahe ektá Paul Ø- yé na táku ophé- Ø- Ø- thuŋ he?
town to 3SG:SUB-go and what STEM- 3SG:SUB-3SG:OBJ-buy Q
*'What did Paul go to town and buy _?'
- (30) a.
Wičhaša kiŋ hé Ø- wašté na ohínnyan iyúha čhanté-Ø- uŋ- kiya- pi kte
man the that 3SG:SUB-be good and always all STEM-3SG:OBJ-1:SUB-love-PL FUT
'That man is good and we will always love him.'
a'.
*Wičhaša kiŋ hé Ø- wašté na ohínnyan iyúha tuwá čhanté-Ø- uŋ- kiya- pi kte he?
man the that 3SG:SUB-be good and always all who STEM-3SG:OBJ-1:SUB-love-
PL FUT Q
*'Who is that man is good and _ will always love him?'
- (31) a. Sam iŋs, hékta Anpétu Wakhán Mary waŋ-Ø- Ø- yaŋka na, Paul iŋs,
as for last Sunday STEM-3SG:SUB-3SG:OBJ-see and as for
htálehaŋ waŋ-Ø- bl- áke
yesterday STEM-3SG:OBJ-1SG:SUB-see
'As for Sam, Mary saw him last Sunday, and as for Paul, I saw him yesterday.'
a'. Sam iŋs, hékta Anpétu Wakhán Mary waŋ-Ø- Ø- yaŋka na, Paul iŋs,
as for last Sunday STEM-3SG:SUB-3SG:OBJ-see and as for
htálehaŋ waŋ-Ø- bl- áke he?
yesterday STEM-3SG:OBJ-1SG:SUB-see Q
*'Who, as for Sam, did Mary see him last Sunday, and as for Paul, _ saw him
yesterday?'

Other constructions that do not permit the extraction of an element in order to form a 'wh'-question either, are adverbial subordinate clauses. This type of subordinate clauses can be divided into two different groups according to the juncture-nexus linkage type exhibited. Thus, on the one hand, place and time adverbial subordinate clauses display the ad-clausal core subordination linkage combination and, on the other hand, concessive, reason and conditional adverbial subordinate clauses exhibit the ad-clausal subordination linkage type. Nevertheless, these two types of adverbial clauses share something in common: all these grammatical structures do not satisfy the principle above either because either they are sister of a core node, in the first case, or they are a sister of the clause node, in the second case, rather than a daughter of the clause node. As a result of this, extraction out of these constructions is impossible as well:

- (32) a. Mnipíga kiŋ y- Ø- atké ihákab Peter Kim waŋ- Ø- Ø- yaŋke he?
beer the 3SG:SUB-3SG:OBJ-drink after STEM-3SG:SUB-3SG:OBJ-see Q
'Did Peter see Kim after she drank the beer?'
a'. * Peter Kim táku y- Ø- atké ihákab waŋ- Ø- Ø- yaŋke he?
what 3SG:SUB-3SG:OBJ-drink after STEM-3SG:SUB-3SG:OBJ-see Q
*'What did Peter saw Kim after she drank _?'

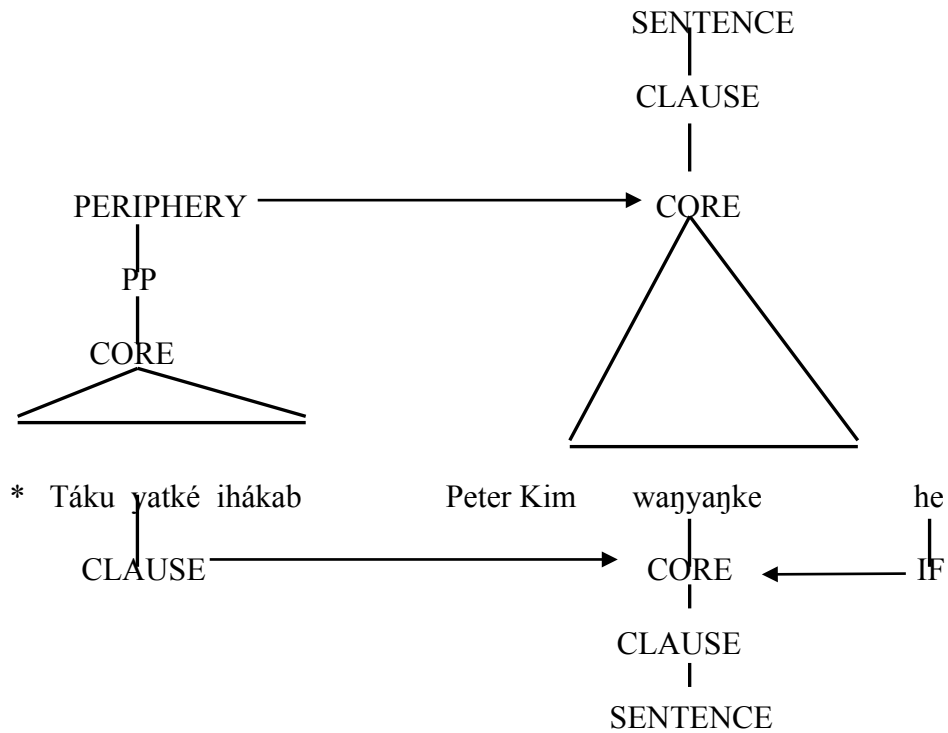


Figure 8: Representation of an adverbial subordinate clause in Lakota (ad-core subordination)

(33)

Ečh- án- uŋ o- yá- kihi šni kinháŋ o- Ø- ni- kiyiŋ kte he?
STEM-2SG.SUB-do sth. STEM-2SG.SUB-be able to NEG if STEM-3SG.SUB-2SG.OBJ-help FUT
IF

'If you can't do it, will he help you?'

*'What will he help you, if you can't do _?'

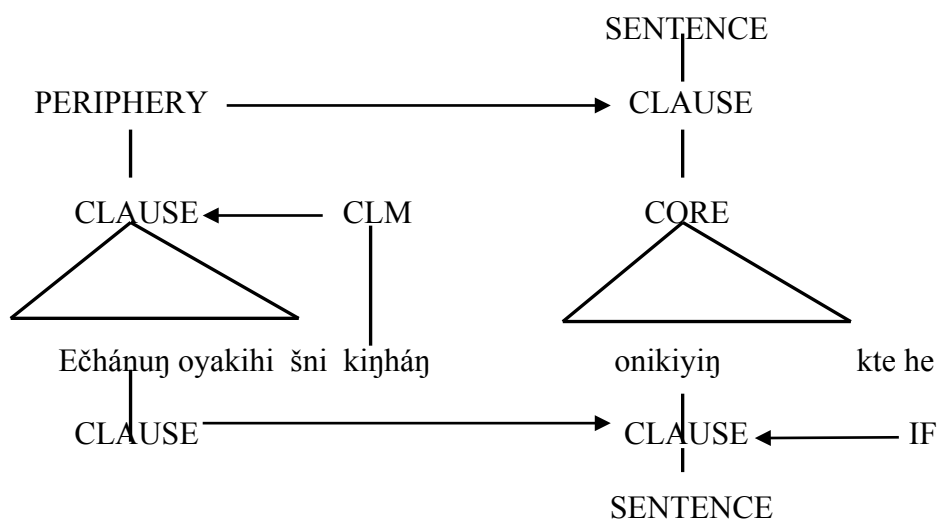


Figure 9: Representation of an adverbial subordinate clause in Lakhotā (ad-clausal subordination)

In Figures (8) and (9) there is an embedded clause that functions as an adjunct modifier of the matrix core and matrix clause respectively and consequently it bears no direct relationship to it either, thereby lying outside the scope of the IF operator, which implies that it is not possible to extract an element out of this subordinate clause in order to form a 'wh'-question.

In contrast, a situation where the principle stated above is satisfied occurs with the extraction of an element out of complement clauses. A striking situation is the one involving subject complement clauses. In an English grammatical structure involving a subject complement, extraction is impossible because the embedded clause appears as a direct core argument and consequently is not a direct daughter of the matrix clause. Nevertheless, as Lakhota is a head-marking language, only the pronominal marker appears within the core, since the embedded clause is represented branching from the clause node and therefore this construction permits extraction. English normally solves this situation by replacing the subordinate clause with a cataphoric subject "it" and placing the subordinate clause as an extraposed subject in post-core position, that is, branching from the clause node:

(34)

- a. Mnípiga kiŋ y- Ø- atké kiŋ iyúha yuš'inye- Ø - wičha- yé
 beer the 3SG:SUB-3SG:OBJ-drink CLM all be frightened-3SG:SUB-3PL:OBJ-CAUS
 'That she drank a beer shocked everybody.' /
 'It shocked everybody that she drank a beer.'
- a'. Táku y- Ø- atké kiŋ iyúha yuš'inye- Ø - wičha- yé he?
 what 3SG:SUB-3SG:OBJ-drink CLM all be frightened-3SG:SUB-3PL:OBJ-CAUS Q
 'What did that she drank _ surprise everybody?' /
 'What did it shock everybody that she drank _ ?'

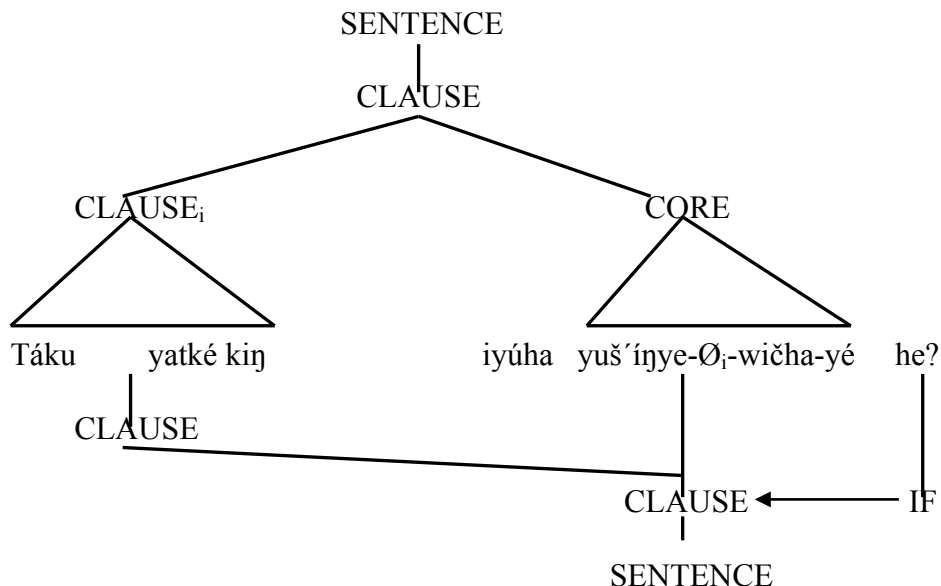


Figure 10: Representation of a 'that'-complement clause in Lakhota (daughter core subordination)

Object complement clauses pose no problem of extraction since these constructions display the clausal subordination juncture-nexus type and then are a direct daughter of

the clause node, hence they permit the extraction of an element out of the embedded clause and the subsequent formation of a 'wh'-question:

- (35) a. Peter Ø- wašté k¹⁵-é- h- a yelo.
 3SG:OBJ-be good DEM-STEM-2SG:SUB-say DECL?
 'You said that Peter is good.'
 a'. Tuwá Ø- wašté k-é- h- a he?
 Who/someone 3SG:OBJ-be good DEM-STEM-2SG:SUB-say Q?
 'Who did you say _ is good?'

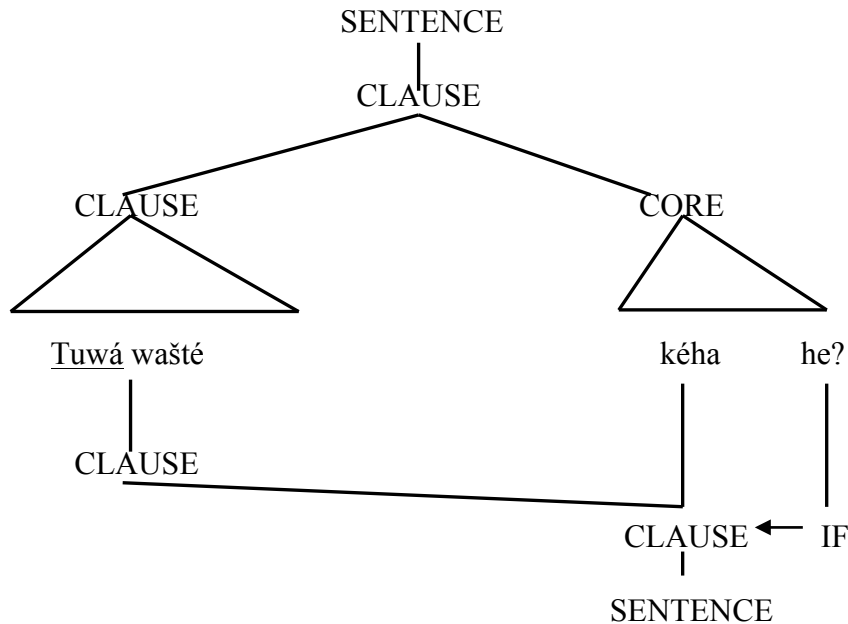


Figure 11: Representation of a 'that'-complement clause in Lakhota (daughter clausal subordination)

In this example, the embedded clause is a direct daughter of the clause modified by the IF operator, and therefore the internal constituents of the embedded clauses are included in the potential focus domain.

5. CONCLUSION

Through the comprehensive analysis of 'wh'-questions provided by this paper, it turns out evident the robustness of this theoretical framework, which demonstrates its universal orientation by being able to represent comparable constructions in English and Lakhota analogously, despite the fact that these two languages construct 'wh'-questions in a very different way. All things considered, the divergence between these languages is largely due to the different morphosyntactic properties they have, especially with respect to the fact that English is a dependent-marking language and Lakhota, in contrast, is a head-marking language and also to the position that the interrogative element occupies in the 'wh'-questions of each of these languages. Nevertheless, these constructions in both languages seem to share the same semantic and pragmatic features, as is shown by the linking of the interrogative element and the

¹⁵ The Lakhota verb *kéya* is used in indirect speech and it is formed by a demonstrative pronoun *ká*, which makes reference to an object that is not present, and *eyá* "say something"

focus structure, which perform a remarkable role in the formation and interpretation of 'wh'-questions. Likewise, we can observed that what is common to these two languages is the crucial role of pragmatics, more specifically of the potential focus domain, in constraining question formation, despite their manifest syntactic differences, which proves the representational flexibility and typological adequacy of this approach.

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The Assignment of Grammatical and Inherent Gender to English Loan Words in Lithuanian Discourse

Jone Bruno
Trinity College Dublin

Abstract

The aim of this study was to analyse the gender assignment patterns and processes to English loan nouns that were inserted into Lithuanian language during the process of natural speech. Construction Morphology and the Morpheme-based Model were fused for the purpose of the analysis creating the Integrated Construction Morphology Model which allowed the detailed analysis of phonological, morphological, syntactic and semantic procedures. The main focus of this research is the change that occurs in the word level while inserting an L2 item into L1 discourse. The findings revealed that masculine gender was assigned as a default gender regardless of stem vowel classification for inanimate nouns. Biological sex determined the gender of English nouns that are animate. Furthermore, a complex process of suffix merging from English and Lithuanian languages was observed, regarding the combined suffixes as one item. This research contributed to greater understanding of the morphological processes that occur when words are borrowed into the Lithuanian language.

Keywords

Grammatical gender, inherent gender, gender assignment, Lithuanian noun, Construction Morphology, Morpheme-based Model, Integrated Construction Morphology Model.

1. INTRODUCTION

Lithuanians, as any other non-native English speakers, who moved to an English speaking country, converse in more than one language on a daily basis. This type of bilingual or multilingual environment presents an opportunity to use English words into Lithuanian discourse. As Lithuanian is one of the languages which have inherent gender, nouns - animate or inanimate - have to be either masculine or feminine, therefore, English words have to get one of the genders assigned in the process of borrowing.

The aims of this study are to investigate the borrowed words from English into Lithuanian and to identify and examine the rules and patterns that emerge while adapting loan nouns into Lithuanian discourse. The purpose of this research is to reveal the processes of the grammatical interrelation between two different gender systems and to demonstrate the complexity of the phenomenon. In order to achieve the aims and the purposes of this study, Construction Grammar and particularly the Construction Morphology model was chosen as the main theoretical framework. The Morpheme-based Model was also applied as it clearly presents the morpheme-by-morpheme gloss and provides the detailed framework for morphological analysis. These two models were fused and a new model, the Integrated Construction Morphology Model, is proposed for the analysis.

This research is organised into six sections. The first sections introduces the phenomenon and briefly outlines the organisation of the study. The second sections

outlines the data collection method and presents the participants who are all Lithuanian nationals living in the Republic of Ireland at least three years. Section 3 introduces the main framework and theoretical models that are adapted for this research. The Morpheme-based Model is described and the main theoretical considerations are outlined in section 3.2, while Construction Grammar and Construction Morphology are discussed in section 3.3.

For the understanding of grammatical restrictions that a loan noun has to follow, section 4 presents grammatical rules and procedures that are in connection with the Lithuanian noun. Number is discussed briefly, while section 4.3 discusses gender in great detail, considering such aspects as semantic gender, grammatical gender and gender assignment rules to loan nouns. Then the discussion of case and declensions of Lithuanian noun follow. As semantic gender is considered to fall under the domain of derivational morphology, derivational rules of the noun are overviewed. The last section briefly discusses the organisation of Lithuanian noun phrase presenting major theoretical characteristics. In section 5 all the data collected is organised according to classification animate/ inanimate, firstly discussing the Integrated Construction Morphology Model, which is used for the analysis of the nouns. Animate nouns are analysed in section 5.3 following the analysis of inanimate nouns. Section 5.4, the analysis of the inanimate nouns is divided into further subsections: inanimate nouns with stem vowels *a*, *ai*, *au*; inanimate nouns with stem vowels *o* and *ou*; inanimate nouns with stem vowel *i*; inanimate nouns with stem vowels *e*, *ei*, and *en*; and finally, inanimate nouns with stem vowel *y*. Gender assignment following the adapted suffixation patterns are discussed in section 5.5 and the conclusions are drawn. The final discussion is found in the sixth sections discussing general findings and suggesting further research questions. Appendix 1 offers the list of nouns organised according the acquired gender suffix. Due to the limited space, the full gloss of all samples and the list of classified samples according to the stem vowels and affixation patterns are not provided in this paper.

2. DATA COLLECTION

As this study is concerned with the integration of English words into Lithuanian discourse, Lithuanians were subjects to be interviewed. Some members of the Lithuanian immigrant community were approached in order to get a sample of their every day speech. The participation in the study was voluntary and consents were obtained from each member.

The research was done in 2 steps. Firstly, people who agreed to take part in the research were interviewed. The interview took part in each person's home in order to get minimal distraction and keep comfort levels high. During the interview the researcher was one of the participants of the conversation, therefore all of the interviews were recorded for minimal disruption of the natural speech production. Secondly, the recordings of the interviews were destroyed after the transcription of the noun phrases in order not to violate the confidentiality agreement and to conceal the identities of the participants.

All of the participants are Lithuanian nationals and their native language is Lithuanian. All partakers have been living in Ireland for over three years and have a substantial level of English. They use the Lithuanian language while conversing with their family

and friends who are Lithuanians. Moreover, they speak Lithuanian in the house, as they live with the same nationality spouse. 5 males and 4 females took part in the research. Most of the interviews took an hour, however, in some cases it took up to two and a half. The length of the interview depended on the wishes of the participants and the natural flow of the conversation.

There were overall 88 phrases collected. There were 305 overall usages of these phrases, from which some of them were used more often than others. They consist of an adjective and a noun and were used in different cases; nonetheless, they are presented in nominative case for clarity of the analysis. The full list of collected phrases is enclosed in the Appendix 1.

3. THEORETICAL FRAMEWORK

3.1. THE MAIN QUESTIONS OF THIS RESEARCH

The main questions of this research are concerned with morphological adaptation of loan words into Lithuanian discourse and what the changes entail during the process of adaptation. This section is concerned with the theoretical consideration of two main models used in this thesis, which are Morpheme-based Model and Construction Grammar, particularly the field of Construction Morphology.

As the research is concerned with the integration of English loan nouns into Lithuanian discourse, it would be reasonable to say that in general terms, it is concerned with the process of word formation. According to Haspelmath (2002:41), one of the roles that morphological rules take is to make the language more creative while creating new words that are not listed in the lexicon.

As it will be evident from the analysis, this thesis is also concerned more with affixation rather than other types of word formation, therefore the distinction between derivational and inflectional morphology needs to be addressed. Haspelmath (2002:15) distinguishes two different morphological relations between the words commonly used in traditional grammars: ‘inflectional’ and ‘derivational’ relations, where the first one relates to “the relationship between the word-forms of a lexeme” and the latter refers to “the relationship between lexemes of a word family.” In generative grammar, as pointed out by Singleton (2000:38), derivational morphemes are thought to be concerned with word formation and lexicon, while inflectional morphemes are assigned to having grammatical function. Nevertheless, as he (Singleton 2000:42) explains, it is not always possible to distinguish whether the morpheme is inflectional or derivational. Haspelmath (2002:17) agrees with Singleton’s statement that some morphemes have a definite semantic meaning and are said to have derivational function, but other meanings are abstract and hard to describe, which is discussed under inflectional morphological analysis. He also indicates that most of the grammarians define inflectional morphemes to have just grammatical functions, consequently, they are considered to be under the domain of syntax (*ibid.*). This, however, will be questioned, as the results of this research are at least ambiguous to support this statement.

Haspelmath (2002:177) defends morphology, morphological analysis, and morphemes in particular, stating that most of the analyses in most of the scholarly works are done using morpheme-by-morpheme glosses (*ibid.*). Moreover, all of the terminology, such as ‘prefixes’, ‘affixes’, ‘suffixes’, ‘roots’ etc. are constantly used and “it would be very

difficult to do without them” (Haspelmath 2002:177). Haspelmath (ibid.:178) also mentions that most of such analysis tend to be in similar form and description to the Morpheme-based Model. As this model offers the most practical and useful method to gloss and analyse morphemes, which are crucial in analysing the phenomenon of gender assignment to English loan nouns through affixation, therefore, the overview of theoretical considerations of this model is needed which is done in this section below. The main framework for this study is adapted from the Construction Morphology. Consequently, Construction Grammar and the Construction Morphology model are discussed further in this section.

3.2. MORPHEME-BASED MODEL

In traditional grammatical theories, as Haspelmath (2002:3,16) points out, morphological analysis consists of the smallest units called ‘morphemes’. In the overview, Haspelmath (2002:17) describes a few morphological theoretical approaches, nevertheless, he still follows the notion of morphemes having meaning, whether this meaning is abstract and bears a grammatical function, or it is definitely semantic, and he motivates this stating that the main function of any grammatical construction is to carry meaning. The Morpheme-based Model (MbM)¹⁶ adds to this concept a more controversial idea, agreeing with Haspelmath’s description and stating that morphemes are the main constituents of the lexicon and grammar.

The Morpheme-based Model, according to Selkirk (1982:59), assumes that the individual phonological, syntactic and semantic meaning and function of the affix is encoded in the lexical entry of the ‘dictionary’. Furthermore, Selkirk (1982:5-10) describes the organisation of the lexicon adapting the metaphor of the ‘dictionary’, where lexical items are listed. In addition, she presents the notion of ‘extended dictionary’ which, according to Selkirk (ibid.), consists of all lexical items of language including affixes of all types; through the process of morpho-lexical insertion and transformation the word formation is completed by inserting items from the ‘dictionary’ and the ‘extended dictionary’, following the rules of the system (Selkirk 1982:5-10).

Some current researchers agree with the idea that the lexicon is constructed not only of words. For example, Singleton (2000: 12) states that the lexicon consists not only of individual words, but also includes grammatical phenomena, or at least some aspects of it. He clarifies:

¹⁶ Abbreviations:

↔	corresponds with;	M	masculine;
ω	phonological word;	MbM	Morpheme-based Model;
σ	syllable;	MS	Morphological structure;
ACC	accusative;	N	noun;
ADJ	adjective;	NOM	nominative;
CG	Construction Grammar;	NP	noun phrase;
CM	Construction Morphology;	PL	plural;
CS	Conceptual structure;	PS	phonological structure;
DAT	dative;	SG	singular;
F	feminine;	SS	Syntactic structure;
GEN	genitive;	V	verb;
ICMM	Integrated Construction Morphology Model;	VOC	vocative;
INS	instrumental;	W	transcribed word;
LOC	locative;	x	variable;
m	morpheme;		

A given word is not necessarily just a sequence of sound or letters with an overall, invisible meaning and grammatical function; a word may be made up of a whole collection of meaningful components, of which some may in other contexts stand alone as words in their own right.

(Singleton 2000, 33)

This consideration does not exclude morphemes from the lexicon. On the contrary, it is clearly stated that a word is a combination of various phonological, syntactic and semantic constituents, which may or may not freely exist in a different context.

Di Sciullo and Williams (1987), whose work is based on Selkirk and the Morpheme-based Model, introduced the notion of listedness, which assumes that all grammatical units, that cannot be predicted or formed, therefore have to be listed in the lexicon of the speaker and they call these units 'listemes'. This suggests that morphemes, their meaning, forms, and formation rules have to be stored in the mental lexicon cumulatively. They ground the feature of listedness of phrases as the consequence of unpredictability of meaning (ibid.:5). Following this idea, Di Sciullo and Williams propose the hierarchy of units, where "each unit is defined in terms of the previous one" as illustrated below:

(1) morpheme > word > compound > phrase > sentence.

(Di Sciullo and Williams 1987:14)

This hierarchy also refers to the notion of listedness stating that the smallest constituent of language which is listed in the lexicon is the morpheme (ibid.). Moreover, they claim while other components of the hierarchy are not all listed in the lexicon, all of the morphemes *are* listed (ibid.; emphasis is mine).

Haspelmath (2002:45) overviews the principles of the MbM and describes how this theory assumes morphemes to be governed by morphological rules, similar to words being governed by syntactic rules. This statement is supported by Booij (2010:1), who describes the Morpheme-based Model as the "syntax of words" where morphemes are the central constituents of the word formation patterns. Selkirk (1982:1; emphasis in the original), as one of the supporters of the correlation, clarifies that the organisation of morphology can be referred to as the "*syntax of words*" and indicates that it consists of the "*structure of words* and the *system of rules* for generating that structure". Selkirk (1982) proposes that morphemes, inflectional or derivational, convey meaning and are organised by rules in order to produce words.

Di Sciullo and Williams (1987:69) clarify that in linguistics, there is a clear distinction between the inflectional and derivational affixation; furthermore, derivational affixes are thought to be the domain of lexicon and word formation, while inflectional affixes are under syntactic government. Di Sciullo and Williams (ibid.), however, are not convinced about the differentiation, pointing out that affixes have inherent properties rather than functions alone. Selkirk (1982:1) is one of the scholars agreeing with this statement. She explains that inflectional affixes are not under the syntactic domain, but rather classed together with derivational affixes and compounding under the domain of morphology. In addition, Selkirk (1982:63) declares that noun agreement affixes denoting grammatical aspects such as number, gender, person etc. carry not only a syntactic or morphological functions, but also carry a specific semantic meaning or concept. Following these concepts, Selkirk (1982:73) similarly proposes the differentiation of two classes of affixes which she names Class I and Class II, where the

first refers to all the morphemes that have definite semantic meaning, and the second refers to affixes with grammatical function bearing an abstract meaning. In addition, she (Selkirk 1982:73) mentions that in grammatical organisation of most theories there is no device to account for the affixes in Class II and that some type of device should be introduced in order to analyse the processes relating to this class.

Referring to this problem, Haspelmath (2002:81) makes a distinction of ‘inherent inflection category’ which he describes as the category that carries independent meaning which does not rely on the syntactic setting of the word. This classification could provide one of the answers of how to describe the characteristics of the proposed Class II morphemes as the inflectional and agreement affixes fall under similar description. This, however, does not coincide with Haspelmath’s definition of inflectional affixes which he states have no identifiable meaning and just show the syntactic functions (Haspelmath 2002:61).

Haspelmath (2002:126), discussing the notion of inflectional forms being parallel to derivational lexemes, clarifies that a notation in the MbM for suffixes can be noted as an example below:

$$(2) \quad \left[\begin{array}{c} \text{/pronunciation/} \\ \text{N} \\ \text{'meaning'} \end{array} \right] \quad \left[\begin{array}{c} \text{/pronunciation/} \\ \text{N_} \\ \text{'meaning'} \end{array} \right] \quad (\text{Haspelmath 2002:47})$$

The N refers to the syntactic category of a word, and N__ is used to show where the morpheme in question is placed during the formation process of the word. This notation for word formation is concerned with phonological aspect of a noun or a suffix, despite that, this study does not touch the phonological adaptation of English loan word. In some cases phonological notation will be adapted for clarification, but mostly spelling will be used as an alternative. The notation of the inflectional phenomenon can be expressed in two different ways (Haspelmath 2002:61); this study will use only a concise notation which is used to note noun’s gender, number, and case, for example:

$$(3) \quad \text{baltas scanner}_{\text{M.SG.NOM}} \text{ ('white scanner')}$$

Selkirk (1982:11) claims that the speaker of a language has instincts about the construction of the words which is based by the knowledge of structure rules. Moreover, she makes strong suggestions that “the existing lexical items of language have structures generable by morphological component of the language” (ibid.). This statement strongly supports the main concept of the Morpheme-based Model, that languages follow the hierarchy where the morpheme is the smallest meaningful constituent of the system, whether it is inflectional or derivational. In recent grammatical approaches this model is criticized, nevertheless, in the defence of the MbM, Haspelmath (2002:44) points out that morphologist, in order to express morphological rules, attempt to develop a morphological descriptive system which closely represents the speakers’ linguistic knowledge. In addition, Haspelmath (ibid.:178) also draws attention to the similarity of the representation using morpheme-by-morpheme gloss to the Morpheme-based Model. These considerations and above mentioned inconsistencies with the theoretical distinction between the derivational and inflectional meanings of affixes, influenced the decision to incorporate the Construction

Morphology model which more fully explains the relations between the levels of morphology and semantics.

3.3. CONSTRUCTION MORPHOLOGY MODEL

Construction Grammar (CG) is one of the main grammatical theories used in this thesis. According to Goldberg (1995:1), the notion of ‘construction’ in grammatical discussions has been considered as a widely accepted phenomenon and that might be one of the reasons why this theory is new compared to most of the other theories.

The notion of ‘construction’ is not a new concept. Many famous scholars consider the construction to be the rudimentary element of the language (Brugman 1988; Fillmore, Kay and O’Connor 1988; Goldberg 1995; Lakoff 1987; Lambrecht 1994). In early scholarly works the constructions were already discussed; for example, Bloomfield (1935:222) discussed the notion of word layers dividing them into two, “an outer layer” and “an inner layer”, where the ‘outer layer’ consists of inflectional constructions and the ‘inner layer’ consists of word formation processes. Nevertheless, Booij (2010:16) points out, that the main difference between the early discussions of ‘construction’ lies in the definition of ‘construction’. Goldberg (1995:5) clarifies that the main idea behind CG is that a construction itself is “defined to exist if one or more of its properties are not strictly predictable from knowledge of the other constructions existing in the grammar”. Michaelis and Lambrecht discuss the concepts behind Construction Grammar and the organisation of constructions explaining:

In Construction Grammar, the grammar represents an inventory of form-meaning-function complexes, in which words are distinguished from grammatical constructions only with regard to their internal complexity. The inventory of constructions is not unstructured; it is more like a map than a shopping list. Elements in this inventory are related through inheritance hierarchies, containing more or less general patterns.

(Michaelis and Lambrecht, 1996: 216)

Booij clarifies that learners gradually grasp the abstract generalisations of the linguistic constructs by obtaining the knowledge and understanding of the main linguistic structures (2010:2). All of these different definitions of the main focus have one main assumption in common: the idea that a ‘construction’ is the core element of the grammatical organisation of a language and that it is the core element than needs to be acquired by the lexicon.

Booij (2010:11) clarifies that the idea of construction has long been discussed in various linguistic studies, but the most common meaning of ‘construction’, which denotes the comprising of form and meaning, is mostly used to discuss syntactic patterns where there is a correlation between the semantic meaning and the syntactic properties. These statements come into agreement with Goldberg’s (1995:7) claims that in this theory, there are no clear boundaries between lexicon and syntax, which leads to the conclusion that morphology and syntax are thought to be interrelated areas of linguistic phenomena. Furthermore, Goldberg (*ibid.*) clarifies that the only main difference between syntax and lexis and their constructions is the level of complexity and involvement of phonological representation, apart from that, both of the domains contain the same characteristics of combining form and meaning. The principle of the CG model, as described by Jackendoff (2002:125) and Booij (2010:5), is that each level is controlled by its own rules and restrictions; nevertheless there are ‘interface’ levels that explain and define the relation between each level.

Booij is one of the main scholars promoting Construction Grammar theories, particularly taking interest in Construction Morphology (CM) as it is one of the areas of the theory least analysed. The theoretical background of this particular approach is taken from Booij's recent books *Construction Morphology* (2010). In this publication the aims of Construction Morphology are presented, which is to seek better understanding of the interrelatedness of the morphological, lexical and syntactic levels, offering a theoretical model in which both, syntactic and morphological characteristics can be explained (2010:1). CM assumes that every single word combines three dimensional information containing phonological, syntactical and semantic restrictions of that word, and the morphological level influences all three levels of the word (Booij 2010:5). Booij has adapted the theoretical considerations of Culicover and Jackendoff (2005) and Jackendoff (2002). This approach shows a clear relation between three levels of a word and the correlation between these levels are explicitly presented in the Figure 1 (adapted from Jackendoff 2002, Booij 2010):

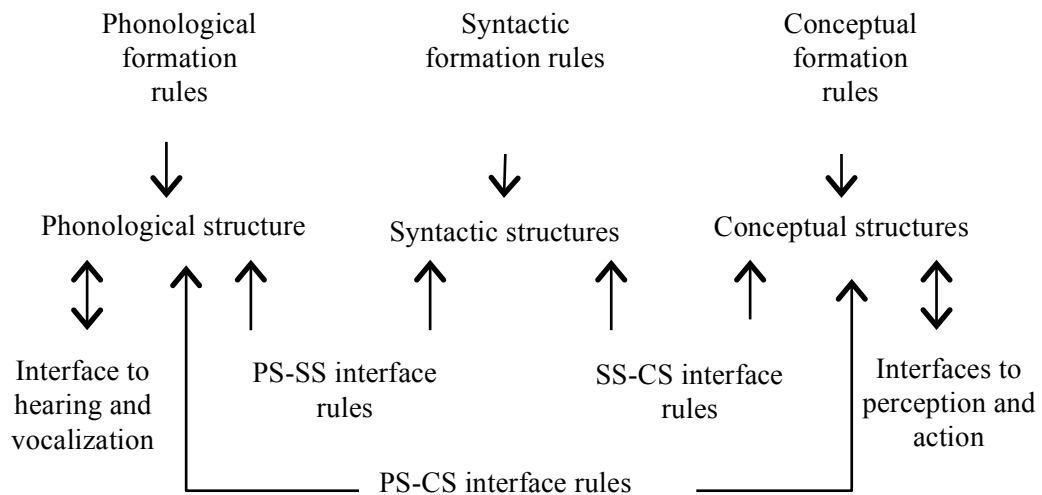


Figure 1: The tripartite parallel architecture

Booij (2010:7) explains that term ‘interface’ in this architecture signifies the coherence of the relationship between the three types of information. Phonological processes are influenced by morphological constraints to some extent taking into consideration phonological rules of a complex word, correspondingly, morpho-syntactic and semantic levels follow the same principle of relations (Booij 2010:9). According to Booij (2010:7) this architecture of processes can be expressed in the following notation, where ω stands for phonological word, σ stands for a syllable, and the symbol \leftrightarrow stands for ‘correspondence’:

$$\begin{array}{c}
 \omega_i \leftrightarrow N_i \leftrightarrow DOG_i \\
 | \\
 \sigma \\
 | \\
 \text{dog}
 \end{array}$$

Figure 2: The lexical representation of dog

According to the tripartite architecture and the lexical representation schema, the word *dog*, bearing specific phonological information, carries the syntactical information of being a noun, and denoting the semantic concept of DOG. In CG the notations of syntactic properties and the relation between the semantics are presented similarly to the example given below:

(4) [[x]Ver]N ‘one who Vs’

(Booij 2010, 2)

As Booij (2010:6) summarises, in contrast to the Morpheme-based Model, the CM model rejects the idea of lexicon consisting of only morphemes and in general adopts the view that a word is a combination of various functions, meanings and characteristics, comprised of distinct phonological information linked to specific meaning, and it has prescribed characteristics such as ‘syntactic category’; furthermore every word-formation can be generalised to a rule of construction and can be applied to build different words showing internal organisation and relations between various levels (*ibid.*). He additionally clarifies that only “independent pairings of form and meaning” have the properties and the functions to be called a type of construction, therefore, ‘morpheme’ does not satisfy these conditions (Booij 2010:15). However, Goldberg (2006:5) includes ‘morphemes’ into the list of construction types. Booij (2010:15) describes Goldberg’s choice as an archaic remainder of the Morpheme-based Model as the smallest linguistic unit in CG is considered to be the word.

In sum, the main aim of the CM is to provide a device which helps to account for the processes that occur within the three levels concerning the word: phonology, syntax and semantics. In addition, it operates within the main principles of CG which assumes that every aspect of grammatical organisation is coded in constructions, whether it is the domain of phonology, morphology or syntax.

3.4. SUMMARY

This section discussed two models and their theoretical considerations which will be adapted and used in this study. The main framework is taken from Construction Grammar and this study assumes that languages consist mainly of constructions in different levels. CG, particularly Construction Morphology is used due to a clear interrelation between the three levels of phonology, syntax and semantics. The tripartite architecture, adapted from Jackendoff 2002, and Booij 2010, was presented to demonstrate how these three levels influence each other. This model, however, does not have a clear gloss and distinction of the phenomenon of affixation, which is crucial in this analysis. Therefore, the Morpheme-based Model is also used for these purposes.

As this research is concerned with the adaptation of English loan nouns into Lithuanian discourse, the affixation and derivational processes need to be analysed in great detail. The Morpheme-based Model assumes that the smallest meaningful constituent of the lexicon is the morpheme, and that affixes, derivational or inflectional, carry meaning and, as a result, are listed in the lexicon. These theoretical considerations are partially followed in this research, assuming that some morphemes carry meaning, nevertheless, some have only functional properties. In addition, the MbM model provides a detailed morpheme-by-morpheme gloss, presenting the relations and processes of inflection and derivation, which is needed in this study. These two models are merged together to form a framework of this research and the adapted model is presented in more detail in

section 5.2. The next section deals with the theoretical background of the Lithuanian noun in order to demonstrate the morphological, syntactic and semantic restrictions and requirements that a loan word needs to obtain in order to get integrated into the Lithuanian NP.

4. LITHUANIAN NOUN

4.1. INTRODUCTION

Senn (1944:115) describes Lithuanian as being the most archaic from the branch of Baltic languages which retained a lot of unchanged forms. Kasparaitis (2005:2), Ružė (2008:22) and Paulauskienė (2007:63) claim that words in Lithuanian are classified into eleven classes following semantic meaning and syntactic relations and nouns comprise one of the main classes¹⁷. Kasparaitis (2005:3) clarifies that the main morphological features of the noun are gender classification, inflection by number, inflection by case, and to carry the meaning of a ‘thing’.

There are a few terms in Lithuanian literature that are not common in international literature discussing morphology. The terms ‘ending’ and ‘flexion’ are widely used in Lithuanian literary sources to refer to the derivational and inflectional suffixes in describing word formation and inflectional role complexity. This study, for the purpose of clarity, adopts the international terminology and refers to all affixes that are attached to the end of the stem as ‘suffixes’.

Ambrasas (2006b:90) states that as the Lithuanian language is highly inflectional, affixes carry more than one meaning at a time. Ružė (2008:8) explains that in the Lithuanian language affixes carry two functions: a) word formation functions, and b) inflectional function. He indicates that inflectional affixes, mainly suffixes, do not change the lexical meaning of the word, but change grammatical meaning, and they also carry such information as gender, number, case, person, tense, and mood; derivational affixes, on the other hand, can be not only suffixes, but likewise prefixes, which change lexical meaning of the word (Ružė 2008:8). Ružė (2008:20-21) describes a word being a combination of lexical meaning and grammatical features, therefore, every word has a lexical form, and every lexical form is expressed through a specific grammatical form, which in some cases also carries meaning. In other words, sometimes grammatical form, that a lexical item has to adapt, combines lexical meaning with grammatical function. For example, suffix *-as* in inanimate nouns expresses only the grammatical function of agreement, however, in animate nouns it functions as the marker of natural gender and as agreement marker. Gender assignment is considered to be derivational, consequently, some derivational rules concerning gender assignment are discussed in one of the sections below. Kasparaitis (2005:3) agrees that case, gender and number in the Lithuanian language are expressed together through one suffix; i.e. while inflecting the noun according by a certain declension paradigm, gender, number and case are combined into one suffix (for example, *mam-q_{F.SG.ACC}*). This section is organised accordingly to discuss the number, gender, case, and declensions of the Lithuanian noun. Moreover, an overview of the noun phrase organisation is needed, as the collected data comprises phrases including adjectives and nouns.

¹⁷ All translation from Lithuanian sources - Ambrasas (2006a), Kasparaitis (2005), Miliūnaitė (2004), Paulauskienė (2007), Ružė (2008) and Vaicekauskienė (2004a, 2004b, 2007) - are mine.

4.2. NUMBER

Modern standard Lithuanian differentiates nouns into two numbers: singular and plural which denotes the difference between ‘one’ and ‘more than one’, as stated by Ambrazas (2006b:102), Kasparaitis (2005:3), Mathiassen (1996:39), Paulauskienė (2007:73) and Ružė (2008:26). As in every language there are some nouns that do not follow general differentiation. Ambrazas (2006b:95) and Ružė (2008:26) claim that there are nouns which only have a singular number and cannot occur in plural, like *duona* meaning ‘bread_{F.SG.NOM.}’ (term ‘singulalia tantum’ is used), and there are Ns that occur only in plural, like *tymai* meaning ‘measles_{M.PL.NOM.}’ (term ‘pluralia tantum’ is used).

Ambrazas (2006b:95) further clarifies that plural nouns that do not have singular are used to refer to one and more than one of that item, for example, *žirklys_{F.PL.NOM.}* ‘scissors’ is used to refer to one or more than one item. As it will be seen further in this section, number is closely related to gender and especially declensions.

4.3. GENDER

Corbett (1991:1) states that gender is not only the classification of a part of speech, for example nouns, it is rather a category that languages possess. As claimed by Rijkhoff (2002:61), some languages distinguish the contrast between the biological gender (also called ‘semantic’, ‘natural’, or ‘sex’ gender) and ‘grammatical’ gender (based on the morphological structure of the noun). One of the main concerns that Rijkhoff (ibid.) puts forward is the speakers’ perception of gender in cases when grammatical gender and biological gender of the noun coincide; i.e. when the noun and the referent of the noun have the same gender, it is hard to understand whether the speakers take into consideration the grammatical distinction, biological distinction, or both in order to grasp the concept of the noun’s gender.

Ambrazas (2006b:91) argues that gender as a category of nouns carries a double function in Lithuanian language. As he explains, gender has derivational functions, but is also closely related to inflectional processes, therefore, in his opinion gender is treated as having a grammatical function like number and case belonging to the inflectional morphology (ibid.). Corbett (1991:30) points out that in most languages there are patterns in gender classification and mentions that the frequent differentiations are ‘animate’ /‘inanimate’ and female /male. In Lithuanian language nouns are classified into two main gender categories: masculine and feminine, and both correspond to natural or biological genders of animate nouns (Ambrazas 2006b:97; Holvoet and Semėnienė 2006:102; Kasparaitis 2005:3; Mathiassen 1996:34; Paulauskienė 2007:69; Ružė 2008:24; Senn 1944:115). The next subsection is concerned with the rules and patterns of semantic gender.

4.3.1. SEMANTIC GENDER

Corbett (1991:1) clarifies that gender can coincide with natural gender of the referent. In the Lithuanian language it is the case that gender of nouns referring to animate objects corresponds with the natural gender of the referent, which can be female or male.

As Ambrazas (2006b:98-99), Mathiassen (1996:37) Paulauskienė (2007:36) and Ružė (2008:25) describe, gender determination rules in the Lithuanian language are relatively

simple: nouns carrying the suffixes in singular nominative *-as*, *-ys*, *-us*, *-uo* (except *sesuo* ‘sister’) denote masculine, and nouns with the suffixes *-a* and *-ė* denote feminine gender (with exceptions of Ns that denote masculine natural gender). As stated by Mathiassen (ibid.) and Ružė (2008:25), the last suffix *-is* can denote both genders, but the distinction lies in genitive case: if the word has *-io* in genitive, it refers to masculine gender, and if the word has *-ies* it denotes feminine (*brolis*_{M.SG.NOM.}/ *brolio*_{M.SG.GEN.} ‘brother’; *moteris*_{F.SG.NOM.}/ *moteries*_{F.SG.GEN.} ‘woman’). According to Holvoet and Semėnienė (2006:106) and Paulauskienė (2007:72), masculine gender is used as a default gender when describing a mixed group of people; for example, when talking about a group of *studentės* (‘students’_{F.SG.NOM.}) and *studentai* (‘students’_{M.SG.NOM.}), only *studentai* is used.

Ružė (2008:17) explains that gender distinction between male and female referents of the same noun is made through suffixation. For example, in order to make a noun referring to a female ‘deer’ a word *elnias*_{M.SG.NOM.} is divided into *eln-* a meaningful stem- and suffix *-ias*, then suffix *-ė* is attached to the stem, and the word *elnė*_{F.SG.NOM.} is derived. Mathiassen (1996:37-37) declares that nouns that refer to occupation and have the suffixes *-as* and *-us*, refer to masculine nouns, which is opposed to nouns denoting occupation with the suffix *-ė* or *-a*; for example, *mokytojas*_{M.SG.NOM.}/ *mokytoja*_{F.SG.NOM.} (‘teacher’). These examples show that gender distinction of nouns is sometimes expressed through derivation, adding a different suffix. Rijkhoff (1991:2002) suggests that affixes can denote a feature of a noun rather than showing a grammatical marker, adding additional information to the noun, in this case a meaning of gender. Paulauskienė (2007: 20) points out that a derived word has a more complex meaning than the original word, for example, *vilkas* ‘wolf’_{M.SG.NOM.} has less complex meaning than *vilkė* ‘wolf’_{F.SG.NOM.} as the latter is derived from the masculine equivalent and comprises the meanings of a ‘wolf’ and ‘female’. She further clarifies that the meaning of the derived word is a set of meanings that are transferred from the elements that the word is combined off (Paulauskienė 2007:22).

As explained by Paulauskienė (2007:70), there are Ns that have gender distinction expressed not only through the process of suffixation, but different genders are expressed through different words; for example, *vyras* /*moteris* ‘man /woman’ or *karvė* /*bulius* ‘cow /bull’. Ambrazas (2006b:98) states that in cases where the gender of the animal is not relevant and the speaker is stating generally, the N denoting the animal is used mostly in masculine, nevertheless, it can also be used in feminine gender. Ružė (2008:25) describes gender in nouns denoting animals as not always motivated by semantics or natural ‘sex’ of the actual representative, i.e. there are nouns that are of feminine or masculine gender but refer to both genders of the animal. For example, *ežys*_{M.SG.NOM.} (‘hedgehog’) refers to masculine or feminine animal while having the suffix *-ys* denoting masculine gender.

Holvoet and Semėnienė (2006:105) give an explicit example of gender mismatch between the semantic and grammatical function of gender, stating that the adjective carries agreement marker of the natural gender (masculine) which refers to the noun *dėdė* meaning ‘uncle’ (*geras dėdė* ‘good uncle’); nonetheless the suffix *-ė* belongs strictly to feminine gender. In some cases, as they indicate, gender agreement in NPs is influenced by semantic reasons than grammatical (Holvoet and Semėnienė 2006:102). For example, the noun can semantically represent a masculine gender referent, but according to the grammatical features display a feminine gender suffix. Ambrazas

(2006b:101), Holvoet and Semėnienė (2006:106), Paulauskienė (2007:70) and Ružė (2008:26) likewise draw the attention to inconsistencies of nouns that describe animate objects; these Ns also follow the pattern of above mentioned *dėdė* ('uncle') and have the suffix of feminine gender, however, these nouns can refer to feminine or masculine referent. For example, *nemokša*, meaning 'person who does not know how to do things,' can refer to female or masculine animate noun and this difference is seen through the agreement markers of controlled units of the phrase like adjectives, demonstratives, numerals etc. *vienas nemokša_{M.SG.NOM}* / *viena nemokša_{F.SG.NOM}*. ('the one who does not know how to do things_{M.SG.NOM}' / ('the one who does not know how to do things_{F.SG.NOM}').

Holvoet and Semėnienė (2006:102) explain that there is a conventional agreement between the researchers to assume that all nouns are "associated with the value of gender" and this association is a part of a lexical unit. This study agrees with Holvoet and Semėnienė assuming that animate nouns carry the meaning of natural gender which is stored in the lexicon. Furthermore, as seen from the examples in this section, gender opposition between masculine and feminine can be derived by changing the suffix of the noun and adding additional meaning, as a result, gender agreement falls under derivational morphology.

Payne (1997:108) points out that natural gender is also signified by morphological agreement. Corbett (1991:32), on the other hand, draws the conclusion that in most languages semantic motivation of gender assignment is not the only process, therefore, he suggests seeking formal criteria for gender assignment. The next subsection discusses the notion of grammatical gender that is assigned to inanimate objects.

4.3.2. GRAMMATICAL GENDER

Payne (1997:107) declares that grammatical gender is perceived by linguists as systems of grammatical organisation of nouns, pronouns and other referential devices and mostly is not connected with natural taxonomy. As Holvoet and Semėnienė (2006:101-102) explain, the category of gender is motivated by the biological sex correspondence in animate nouns; consequently, the inanimate noun classification into masculine and feminine genders is strictly arbitrary. Holvoet and Semėnienė (2006:105) claim that all inanimate nouns mimic the gender of animate nouns and this is one of the reasons why all agreement markers are transferred to the controlled elements of the inanimate NP the same as they are in animate NP organisation.

According to Kasparaitis (2005:2), inflectional morphemes signify such grammatical aspects as gender, person, case etc., and never change the meaning or grammatical category, most importantly, never changes the semantic meaning of the word. Corbett (1991:115) states that gender is most frequently expressed through inflectional affixation, which is the case in the Lithuanian language. Ambrazas (2006b:98) also indicates that inanimate nouns are ascribed to a certain gender without semantic motivation, corresponding to their stem, case suffixes and modifiers. In other words, there are certain patterns that an inanimate noun follows, which are similar to animate noun patterns, but different in respect of meaning of 'gender' term itself. In animate noun gender assignment semantic meaning, or to be precise - natural gender, is followed, while in the case of inanimate nouns, gender is assigned agreeing with morphological rules. Holvoet and Semėnienė (2006:104) clarify that the main function of grammatical gender is to signal the agreement suffix in the NP. As each noun has to

carry the classification of gender in the Lithuanian language, inanimate nouns are ascribed to a gender just for syntactic purposes.

4.3.3. GENDER ASSIGNMENT TO LOAN WORDS

Corbett (1991:203) declares that in most languages that have gender differentiation, the agreement with gender has to be shown and cannot be omitted. Consequently, gender is sometimes a forced element in such cases when the gender of the head of the NP is not specified. The native speaker, on the other hand, has to know what gender to use in the production of speech (Corbett 1991:7). He suggests that there are specific patterns and rules that are followed in gender assignment, hence, native speakers, not consciously knowing the rules of gender assignment, can correctly assign gender to nouns that are not known to them (Corbett 1991:7). As it was discussed in this section, there are two different classifications of nouns, animate and inanimate, and those two classes of nouns follow similar patterns of gender assignment. The problem arises when there are loan words introduced into Lithuanian, as all nouns, animate or inanimate do not possess gender and often there are phonological, orthographical or morphological restrictions to acquiring gender. This section looks at common principles of gender assignment and some data and considerations about gender assignment to loan words.

According to Vaicekauskienė (2007:179), the speaker is using intuitive knowledge of class assignment, which is motivated by natural sex, and consequently gender is assigned through instinctive apparatus rather than following grammatical, phonological or semantic rules in Lithuanian. One of the main reasons for borrowing words is the non-existent equivalent in the base language. As stated by Miliūnaitė (2004:35), if the target language offers one word for several meanings, while the base language offers several words or phrases instead, the target language word is borrowed for combination of those meanings. It can be seen from Vaicekauskienė's findings (2004a: 24), that loanword substitution to Lithuanian equivalents is becoming more lenient in adapting and borrowing English words and purism is not as strict as it was a few decades ago. Moreover, she draws the conclusion that this might be the result of English language being *lingua franca* and therefore the borrowing process in everyday speech is more common than it used to be (Vaicekauskienė 2004a). Additionally, she predicts that if the loanword is used very often and takes over the place of the base language word, it can be added to the list of allowed loanwords (Vaicekauskienė 2007:65).

As pointed out by Senn (1944:110), under the influence of other surrounding languages in various periods of times, the Lithuanian language has encountered the problem of loan word invasion. This problem, as claimed by Senn (*ibid.*:112), was solved by introducing a translation of a loan word following the prototype of the foreign language, but also obeying the restrictions of the native language, as the result of that, various compounds and phrases appeared in Lithuanian vocabulary. According to Vaicekauskienė (2004a:9), the process and policy of standardising loanwords in Lithuania follow the main principle of purifying the language by excluding loanwords and introducing Lithuanian substitutes. Nonetheless, the phenomenon of borrowing foreign words occurs on a daily basis, hence, the adaptation of an alien item into a base language has to take place.

Corbett (1991:64) states that the semantic characteristics of the noun are sufficient enough to assign gender. However, morphological assignment system overlaps with the semantic motivation in certain ways (*ibid.*). The regular pattern of gender assignment to

borrowed nouns, as explained by Corbett (1991:81), is following regular gender assignment rules as L1 words. According to Ambrazas (2006a:82) and Ružė (2008:26), there are some loan words that have no morphological or grammatical adaptation into Lithuanian discourse as their phonological or orthographic environment does not allow the process of adaptation. These loan words are usually of two kinds: 1) nouns which have accentuated vowels *-ė*, *-i*, *-o*, and *-u*; and 2) nouns which have unaccentuated *-i*, *-o*, and *-u* (ibid.). As Vaicekauskienė (2007:160) clarifies, the nouns that end in vowels, are usually inadaptable to the Lithuanian grammatical environment, therefore they are uninflected. Nevertheless, Vaicekauskienė (ibid.) points out that there are exceptions, when this type of noun is orthographically adapted corresponding with Lithuanian standards, but the process of adaptation usually takes place in the morphological level. She also states that all nouns that are borrowed and have final vowel are subject to being recognised as loanwords, except for the nouns that have the final accentuated *-ė*; these cases are seen as equal language entries and their grammatical adaptation into inflectional and derivational system is rarely questioned (Vaicekauskienė 2007: 162). Ambrazas (2006a:64) adds that accentuated and unaccentuated final *-i*, *-o*, and *-u* are considered to denote masculine gender, while only *-ė* is denoting feminine gender in adapted loan nouns. Ružė (2008:26) similarly draws attention to the fact that nouns with suffix *-ė* which refer to animate objects and the natural gender is known to be masculine, following the semantic rules which supersede the grammatical differentiation, are assigned to masculine gender (Ružė 2008:26).

According to Vaicekauskienė (2004b:67), some borrowing tendencies are seen as derivational processes by the speakers. She indicates that there has been an inclination to consider the last part of a compound or to use an English suffix, adapting it to appear and function as a part of a derivational suffix in Lithuanian (Vaicekauskienė 2004b:67). These are such formations as:

- *-eris*, combined from *-er* and *-is*;
 - *-ingas* combined from *-ing* and *-as*;
 - *aizeris* combined from *-izer* (phon. /aizər/) and *-is*;
 - *-menas*; *-menė* combined from *-man* (phon. /mæn/) and *-as*, *-man* and *-ė*;
- (Vaicekauskienė 2004b, 2007)

In addition, Ambrazas (2006a:64) and Vaicekauskienė (2007:170) clarified that in the case of the loanwords that are not grammatically or morphologically adapted, the only indication of gender and number is understood from the descriptive words and controlled elements. Ambrazas (2006a:64) and Vaicekauskienė (2007:170) denote that all loanwords that are borrowed into the Lithuanian discourse have gender assigned to them, however the notion of gender does not denote 'sex' of the object and is assigned only for syntactic purposes. Corbett (1991:72) states that some loan nouns fall under regular declension type of a base language, therefore, the gender is assigned according to the declension rather than semantic meaning. In order to investigate gender relations with the type of declension, the next section discusses case and declensions.

4.4. CASE AND DECLENSION

Case and declension categories are considered to be under the domain of inflectional morphology (Ambrazas 2006a; Paulauskienė 2007). This section outlines the declensions in detail, but the cases of the Lithuanian language are just mentioned briefly, as the main concern of this study does not lie in syntactic organisation of the noun phrase, but rather in morphological processes of the noun.

According to Ružė (2008:26) and Ambrazas (2006b:106), cases are used for expressing syntactic relationship between words in the phrase and the sentence levels in the Lithuanian language, therefore, the noun always occurs in a certain case in accordance with the semantic requirements. In Lithuanian there are six cases that denote relations between the nouns and the rest of the constituents of the phrase or a sentence: nominative (NOM), genitive (GEN), dative (DAT), accusative (ACC), instrumental (INS) and locative (LOC) (Ambrazas 2006b:106; Kasparaitis 2005:3; Mathiassen 1996:38; Paulauskienė 2007:77; Ružė 2008:27). Vocative is considered in some literature to be the seventh case, nonetheless as Ambrazas (2006b:106) and Kasparaitis (2005:3) declare, this case does not refer to any syntactic function and is used more as a stylistic device. These cases show certain syntactic relations and they are expressed through different suffixes. Declension classes are organised according to the patterns how nouns are inflected in certain case, which is discussed below.

As stated by Ambrazas (2006b:123), Kasparaitis (2005:3-4), Paulauskienė (2007:86) and Ružė (2008:49), declensions in Lithuanian are ascribed according to the last vowel of the stem, which occurs in the plural of the dative case and there are five main declensions which are further divided into twelve paradigms. This study, however, will follow only the five declension classification as done by Ružė and Paulauskienė, as the division into paradigms is not necessary for the research. Moreover, Paulauskienė (2007:86) and Ružė (2008) declare that declensions are ascribed following the nominative and dative cases in singular, rather than nominative in singular and dative in plural. These minor inconsistencies do not influence the results of the study, consequently, Ružė's (2008) and Paulauskienė (2007) declension classification is considered valid for the analysis of the data.

Paulauskienė (2007:86) adds that declensions are enumerated according to the number of words that fall under the specific declension. As Kasparaitis (2005:4) clarifies, all declension classes and paradigms are combined in relation to phonological similarities of the noun suffixes. All five paradigms are presented in Table 1 (adapted from Ambrazas 2006b, Kasparaitis 2005, Paulauskienė 2007, and Ružė 2008).

Number	Case	Declension				
		I -(i)as, -is, -ys	II -(i)a, -i, -ė	III -is	IV -(i)us	V -uo, -ė
Singular	NOM.	-(i)as, -is, -ys	-(i)a, -i, -ė	-is	-(i)us	-uo, -ė
	GEN.	-(i)o	-(i)os, -ės	-ies	-(i)aus	-s
	DAT.	-(i)ui	-(i)ai, -ei	-iai, -iui	-(i)ui	-iui, -iai
	ACC.	(i)q, -į	-(i)q, -ę	-į	-(i)ų	-i
	INS.	-(i)u	-(i)a, -e	-imi	-(i)umi	-iu, -ia
	LOC.	-e, -yje, -uje	-(i)oje, -ėje	-yje	-(i)uje	-yje
	VOC.	-e, -ai, -(i)au, -i, -y	-(i)a, -i, -e	-ie	-(i)au	-ie
Plural	NOM.	-(i)ai	-(i)os, -ės	-ys	-ūs, -iai	-ys
	GEN.	-(i)ų	-(i)ų	-(i)ų	-(i)ų	-ų
	DAT.	-(i)ams	-(i)oms, -ėms	-ims	-ums, -iams	-ims
	ACC.	-(i)us	-(i)as, -es	-is	-(i)us	-is
	INS.	-(i)ais	-(i)omis, -ėmis	-imis	-umis, -iais	-imis
	LOC.	-(i)uose	-(i)ose, -ėse	-yse	-(i)uose	-yse

Table 1: Lithuanian noun declensions

According to Ružė (2008:49) and Paulauskienė (2007:86), the first declension is comprised of Ns that are of masculine gender and have suffixes *-as*, *-ias*, *-is*, and *-ys* in the singular of the nominative case and *-(i)o* in the singular of dative. They further clarify that this declension usually consists of nouns that have *a* or *ia* as the last vowel of the stem (Ružė 2008:49, Paulauskienė 2007:86). As Ružė (2008:50) and Paulauskienė (2007:86) declare, the second declension consists of Ns that have *-(i)a*, *-ė*, and *-i* as their suffixes in the SG. NOM. and *-(i)os* and *-ės* in SG. DAT., also having *o*, *io* and *ė* as the last vowel of the stem. These nouns are mostly of feminine gender and only a small group of masculine nouns fall under this declension, like *dėdė*_{M.SG.NOM.} ‘uncle’ or *Smetona*_{M.SG.NOM.} which denotes a last name of a male individual (Ružė 2008:50). The third declension consists of Ns that have *-is* in the SG. NOM. and *-ies* in SG. DAT. (Ružė 2008:52; Paulauskienė 2007:87). Moreover, these Ns have *i* as the vowel of their stem and are mostly of feminine gender (ibid). The fourth declension, as stated by Ružė (2008: 53) and Paulauskienė (2007:87), contains nouns that denote masculine gender and have in SG. NOM. *-(i)us* while in SG. DAT. *-(i)aus* suffixes. All of these nouns have *u* and *iu* as their stem vowels (ibid.). Finally, the fifth declension comprises all nouns that have suffixes *-uo* and *ė* in the SG. NOM. and *-s* in the SG. DAT. (Ružė 2008:55; Paulauskienė 2007:87). These are the nouns that have *-en*, *-n*, and *-er* vowel, vowel and consonant combinations in the stem and denote masculine gender, except for the two feminine gendered words *duktė* ‘daughter’ and *sesuo* ‘sister’ (ibid.).

As claimed by Holvoet and Semėnienė (2006:103), gender is one of the aspects that determine the noun’s declension paradigm and its suffixes and not only in the nominative case, therefore, the gender can be determined according to the suffix. Nevertheless, there are exceptions in determining gender following this principle; a few nouns in Lithuanian language have feminine gender suffix, however, the semantic meaning of it denotes a masculine referent, as mentioned above in the example of *dėdė* meaning ‘uncle’.

Ambrasas (2006b:124) explains that in Modern Lithuanian there is a tendency to combine or merge the declensions using more common patterns, and this process is encouraged by the existence of identical inflectional forms in several declensions. He draws the conclusion that this is the reason why the declension system in Modern Lithuanian is becoming less complicated (Ambrasas 2006b:124). This might be the reason why some of the declension classes have more nouns than others. Furthermore, this can be a valid explanation why some gender suffixes are assigned more often than others.

4.5. NOUN DERIVATIONAL RULES

As stated before in this study, gender is considered to fall under derivational rather than inflectional classification in certain circumstances, therefore, some derivation rules and restrictions need to be addressed. Ružė (2008:58) declares that mostly words in Lithuanian are derived through morphological prefixation and suffixation, and compounding is used occasionally. Mostly used, as described by Ružė (2008:58-69), is the suffixation method to create nouns. He also points out that there are hundreds of suffixes that can be used to derive new Ns and most of them have masculine and feminine equivalents if they denote animate nouns, and the gender of other nouns depends upon the semantic meaning of the derivative (Ružė 2008:58-69). For example, there is a category of suffixes specifically to derive a different gender from the existing nouns: a) using different suffixes, like *-ininkas*, denoting profession, and a feminine suffix *-ė*, denoting feminine gender, to derive a female equivalent from the nouns that describe a person; b) *-ienė* and *-iuvienė* to derive feminine equivalents from masculine nouns denoting people; and c) *-inas* to derive masculine equivalents from feminine names of the animal (Ružė 2008:67):

- | | |
|--|--|
| (5) Lithuanian (Ružė 2008:67)
<i>darb-inink-ė</i>
work-er-F.SG.NOM
'female worker' | (6) Lithuanian (Ružė 2008:67)
<i>graf-ienė</i>
count-F.SG.NOM.
'countess' |
| (7) Lithuanian (Ružė 2008:67)
<i>puodž-iuvienė</i>
potter- F.SG.NOM.
'the wife of the potter' | (8) Lithuanian (Ružė 2008:67)
<i>lap-inas</i>
fox-M.SG.NOM.
'male fox' |

Each suffix that is used to derive nouns has a meaning, and if the noun is inanimate, gender is assigned automatically according to the grammatical form of the suffix. Ružė (2008:58-69), for example, lists only a few suffixes that can be used to derive different nouns as all of them cannot be listed due to their vast number. Nevertheless, it can be seen from a few examples given by Ružė (2008) that the suffix determines the gender of the inanimate noun in the derivative. For example, some suffixes that are classified into the category of denoting tools have feminine gender like *-yklė* (*šaudyklė* 'shuttle_{F.SG.NOM.}'), but the majority has masculine *-eklis*, or *-tukas* (*žarsteklis* 'rake_{M.SG.NOM.}' / *plaktukas* 'hammer_{M.SG.NOM.}') (Ružė 2008:63).

The rules of noun derivation consists of numerous suffixes which are listed in the literature, however, this is just a brief overview and the main rules and principles are enough to conduct the analysis. The next section discusses the organisation of the noun phrase.

4.6. THE ORGANISATION OF A NOUN PHRASE

Rijkhoff (2002:23) points out that the inner organisation of a NP can be significantly different in respect to other NPs. It is also claimed that a spoken language and its NPs are less complex in grammatical structure compared to the written noun phrases (Rijkhoff 2002:23; Linell 1982, Perkins 1992:89). This study is not concerned with complex noun phrases as the data was collected from spoken language, therefore, all the examples that were gathered are presented in a noun phrase containing an adjective and a loan noun that were used by the speaker.

Di Sciullo and Williams (1987:23) explains that the morphological and syntactic head is determined by its control over other constituents and Haspelmath (2002:90) presents the syntactic head or the 'controller' of the phrase having such properties and functions:

- Being the "morphosyntactic locus;"
- Having control over the constituents of the phrase;
- Agreeing with the rest of the constituents in person/number.

Consequently, the head of the NP is the noun, which is the case in Lithuanian language as a noun is the main unit carrying meaning while other constituents of the phrase follows syntactic characteristics of the noun.

Syntactic relations, as stated by Paulauskienė (2007:25) are interrelated with morphological forms of the word, therefore, sometimes it is hard to separate the two domains. Nevertheless, syntactic relations always follow the hierarchy of the noun phrase in the Lithuanian language. As mentioned in this section, the noun carries the information of gender, number and case together with the meaning of 'a thing' (Kasparaitis 2005:3). Ambrazas (2006b:134), Paulauskienė (2007:64) and Ružė (2008:72) argue that adjectives (ADJ) are words denoting the qualities of an object, according to the syntactic rules they have to agree with head of the phrase and, as a result, they are inflected for gender, number and case the same as the head noun. It can be seen from this characterisation, that the noun is the head of the noun phrase in the Lithuanian language, controlling other constituents, in this study mostly adjectives.

Ambrazas (2006b:138) and Ružė (2008:78) claim that adjectives also have comparative and superlative forms and have different declensions, however this information is not used in the research and therefore not presented.

4.7. SUMMARY

This section discussed the grammatical characteristics of the Lithuanian noun for the purpose of better understanding the processes and restrictions imposed upon the loan word while adapting it into the Lithuanian discourse. Number, semantic gender, grammatical gender, gender assignment rules to loan words, case, declension, noun derivational rules, and the organisation of the noun phrase were presented.

It was established that Lithuanian nouns are inflected by two numbers: singular and plural, which denote the opposition between semantic meaning of 'one' and 'more than one'. According to Holvoet and Semėnienė (2006:120), in the Lithuanian language 'gender' is motivated on the basis of semantic differentiation and this explains the

overlapping grammatical and natural genders of the Ns in most cases; additionally, they argue that this correspondence is the basis of the gender differentiation into two, masculine and feminine gender classes (*ibid.*). They further clarify that the distinct suffix of gender classes support the requirements that are usually made for grammatical categories, therefore 'gender' can be seen as carrying two different functions: a) denoting a semantic category of masculine and feminine distinction, and b) conveying the grammatical category of agreement (Holvoet and Semėnienė 2006:204).

As Paulauskienė (2007:70) states, all nouns can be classified into three main classes following gender assignment rules and classification: a) humans, b) animals, and c) all other nouns denoting objects, names of actions etc. This classification is made according to the rules applied while distinguishing and assigning gender. Humans are assigned gender following the corresponding biological gender; and inanimate nouns, names of actions etc. acquire gender corresponding with morphological and phonological similarities to animate nouns. Ambrazas (2006b:98) declares that, following the stem, case suffix and modifiers, the inanimate nouns acquire specific gender.

In the section discussing loan nouns and their integration into the Lithuanian language, it was established that there are specific patterns that are similar to gender assignment for Lithuanian nouns. As stated by Ružė (2008:58) there are some nouns that are indeclinable in the Lithuanian language and all of those nouns are of foreign origin. These nouns have accentuated vowel suffixes *-ė*, *-i*, *-o* and *u*, un-accentuated vowel suffixes *-i*, *-o*, and *-u*, and proper nouns that refer to last names of women and end in consonants (Ružė 2008:58). All of these nouns, as expressed by Ružė (2008), are ascribed to certain genders following semantic and grammatical rules while all other borrowings follow the classification corresponding the similarity between L1 and L2 words. As Vaicekauskienė (2007:223) explains, Lithuanian and its grammar is highly influential and a strong system, therefore borrowed words are easily integrated into the speakers' discourse; the adaptation process follows the main rules of morphological derivational and inflectional principles and keeping the authenticity of the Lithuanian grammar.

In Lithuanian there are six cases that are closely related to five declensions and all nouns are classified into one of them. As discussed, all five declension classes are closely related to gender and nouns are ascribed into a certain declension according to gender, stem vowel and case suffixes.

Some derivational processes were discussed in section 4.5. In Lithuanian, as gender assignment for animate nouns follows derivational processes, some of the rules were overviewed. As Kasparaitis (2005:2) declares, the main function of suffixes in the Lithuanian language is to show syntactic relations between the words like accusative case, gender or number in the phrase or sentence levels. The same suffix, as stated by Kasparaitis (*ibid.*), can carry more than one grammatical distinction and a different meaning at the same time. Therefore, when a noun is said to have masculine gender, it inevitably belongs to a certain declension, following certain inflectional and derivational patterns.

As seen from the short overview of the noun phrase organisation, the noun is the controller of the syntactic characteristics of the entire phrase. All other units, such as

determiners, numerals, adjectives etc. have to agree with the noun and express the same syntactic restrictions. However, it needs to be pointed out that in some cases, as mentioned in the gender section, some nouns that have masculine semantic gender, but are expressed through feminine grammatical gender, transfer the semantic gender to other constituents of the phrase.

5. GENDER ASSIGNMENT ON ENGLISH LOAN NOUNS IN LITHUANIAN

5.1. INTRODUCTION

In this study the main question is the assignment of gender to English loan nouns when they are used in Lithuanian discourse. As mentioned in section 4, there are certain grammatical and semantic patterns that occur while assigning gender. This depends on the noun whether it is animate or inanimate, on the last vowel of the stem, and there are certain emerging patterns involving suffixes which were combined from L1 and L2 morphemes.

Overall, 88 phrases with loan words were collected which occurred 305 times during the informal interviews. After the gathered data was processed, some patterns occurred in loan word adaptation. All of these phrases were organised according to the suffix used and there were 28 phrases used with masculine suffix *-is*, 51 phrases used with masculine suffix *-as*, 5 phrases used with feminine suffix *-ė*, and one phrase that the noun was adapted to correspond with Lithuanian noun having only plural and masculine gender with the suffix *-iai*. This information with all examples is presented in Appendix 1 (Table 1, Table 2, Table 3, and Table 4). All of these findings are discussed in this section analysing the loan nouns according to the classification animate/ inanimate, and corresponding the emerging patterns using suffixes that were derived from English and Lithuanian. This study adapts the model of Construction Morphology and some features of the Morpheme-based Model as discussed in section 3. These two models were merged into one model called the Integrated Construction Morphology Model and this is presented in the next section.

5.2. ADAPTED MODEL

As discussed in section 3, this research will be following the Construction Grammar model, in particular Construction Morphology, and the Morpheme-based Model. For an optimal analysis and the detailed representation of processes, both models are combined to form a unitary system. This section discusses the correlation between the two models and presents schemas following which the analysis is conducted. There is no unitary agreement between the models and scholars following these models, whether morphemes are, or are not, listed in the lexicon as conveying separate meanings. Di Sciullo and Williams (1987) discuss the notion of listedness of the elements whose meanings cannot be predicted, as a result, they have a separate entry in the lexicon. This unpredictability concerns the meanings of morphemes (*ibid.*). Goldberg (1995:4) correlates Morpheme-based and the CG theories by agreeing with Di Sciullo and Williams and calling these 'listemes' constructions. Goldberg (1995) clarifies this by agreeing with Saussure (1916) that morphemes are constructions as they cannot be broken down to smaller parts; they also carry specific meaning and this meaning cannot be predicted from their form.

Additionally, it has been discussed in early scholarly work by Wierzbicka (1988:1) that morphemes, bound or free, as well as constructions, carry a specific meaning; this is motivated by structural semantic differences existing between similar or related constructions pointing out that language is cohesive structure in which every unit in every subsystem is bound to be meaningful like words, grammatical rules or intonations. Following the above mentioned points of view, both models, Morpheme-based and Construction Grammar, can be adapted as valid theoretical basis for the analysis.

As described by Jackendoff (2002) and Booij (2010), the architecture of the construction processes correlate three main levels of word: phonological, syntactic and semantic. These three levels contribute to the form and meaning of the word. This model's limitation is the non-existent level of morphological representation, which is needed to explain and analyse the phenomenon of word insertion from one language to another. Lithuanian is a highly inflectional language and most of the derivational and inflectional processes need to be analysed using morpheme-by-morpheme glosses, therefore the MbM is the ideal model for this purpose. In section 3 a tripartite architecture was presented which shows the correlation between the three word levels (see Figure 1). The morphological level can be added to this schema to include the interface levels between the phonology, syntax and semantics. This is presented in the Figure 3.

This structure shows how morphological formation rules influence the morphological system, which ultimately influences other three levels. Taking into consideration the phonological constraints, morphological rules form the word through the processes of word formation. Consequently, following the rules of syntactic interface, the morphological system is adapted into the syntactic environment. As morphemes carry meaning and the word is a construction of morphemes, the semantic level is directly influenced by the morphological system through the morpho-conceptual interface rules. This structure shows that all three levels - phonological, syntactic and semantic - are influenced by morphological structure and accordingly, morphological structure is influenced following the rules and constraints of the other three systems.

As the Construction Morphology model has its limitations in presenting a clear relation between the meaningful morphemes in the word structure, a new model is proposed and will be referred to as the Integrated Construction Morphology Model (ICMM).

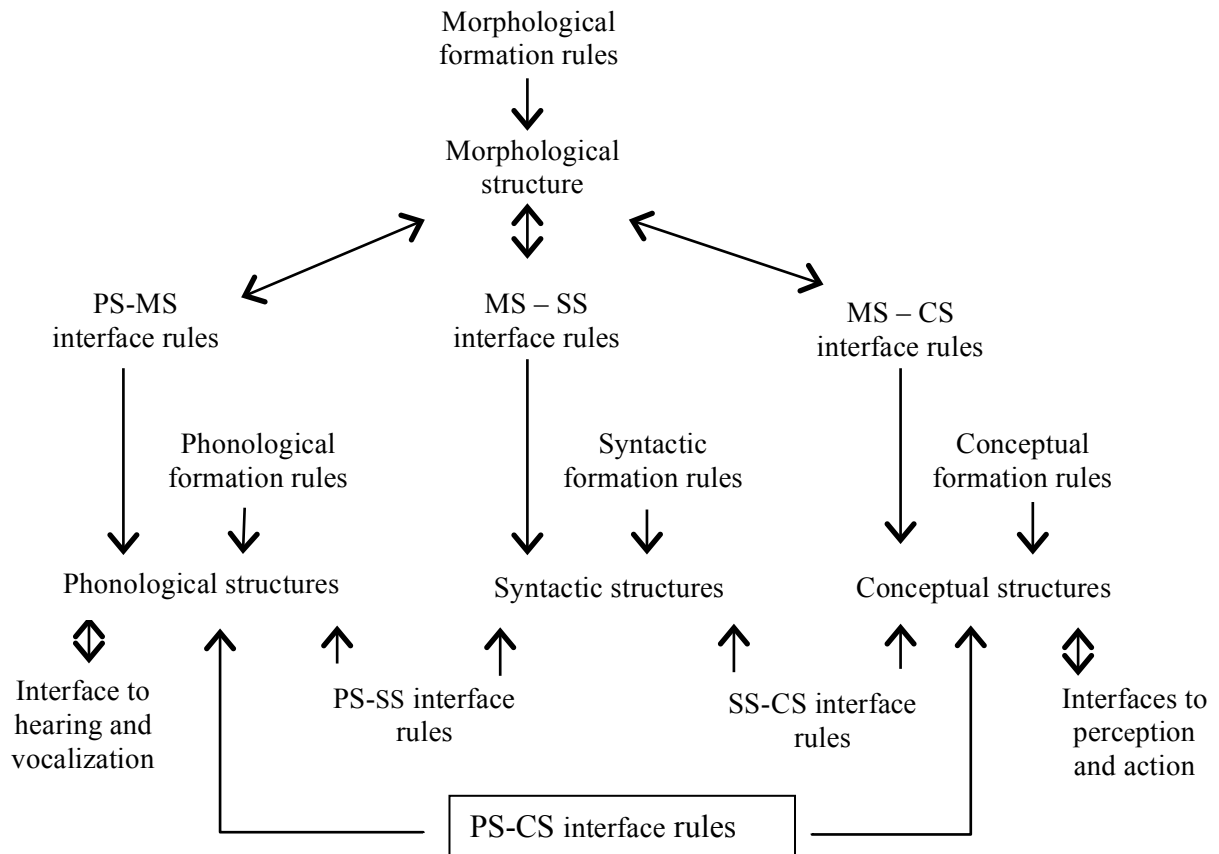


Figure 3: Adapted schema of four level architecture

When adapting the tripartite parallel architecture, the lexical representation needs to be reviewed also, to match the needs of the analysis, following the MbM. In this research phonological notations will be used when needed, however in the most cases only the spelling will be presented. This is presented in Figure 4 where notation from Figure 2 is adapted to represent construction phenomenon and notation from example (2) is adapted for morpheme processes; ω stands for phonological word, σ stands for a syllable, W stands for a transcribed word, m stands for morpheme and \leftrightarrow stands for ‘correspondence’:

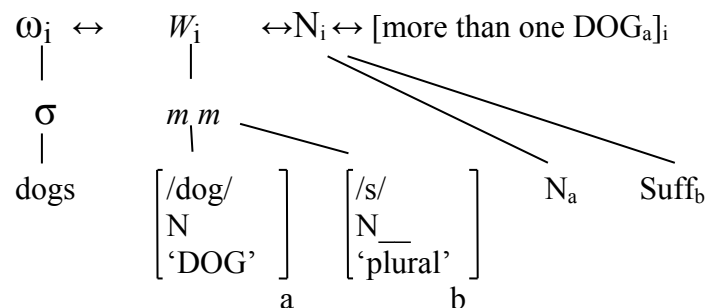


Figure 4: The adapted lexical representation of dog

As this research is mostly concerned with the processes of morphological adaptation, phonological representation is rarely used. Therefore the simplified lexical representation will be used, omitting phonological level following the meanings of Figure 4:

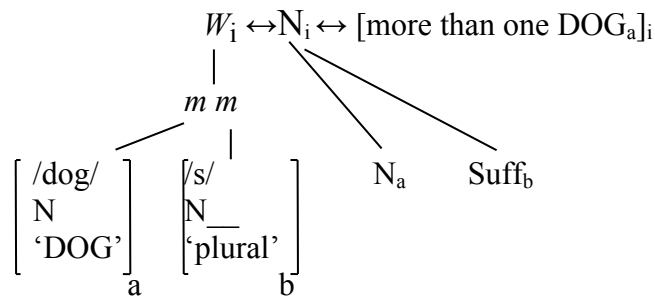


Figure 5: The simplified lexical representation of dog

The schemas in Figure 4 and Figure 5 are the main two schemas that will be used in the analysis in order to represent phonological, morphological, syntactic and semantic processes.

To conclude, the ICMM, which fuses the elements of the MbM, helps to show interrelation between morphemes and syntactic rules that need to be adapted in the syntactic interface and CM's main theory is adapted to show the correlation between phonology, morphology, syntax and semantics. Both models on their own could not give the flexibility to show all of the processes at once and their main ideas do not reflect the complex differentiation of gender in Lithuanian language.

5.3. ANIMATE LOAN NOUNS

Out of all phrases collected during the research there were 17 Lithuanian phrases with the English loan word denoting animate objects, more accurately, human beings. Out of these phrases there are 14 that denote masculine gender, like in example (9) and that denote feminine gender referents such as in example (10):

- (9) a. English
big loser
 | big 'lu:sə |
 b. Lithuanian with a loan word
didel-is lūzer-is
 big-M.SG.NOM loser- M.SG.NOM
 'big loser'
 c. Lithuanian equivalent
didel-is nevykėl-is
 big-M.SG.NOM loser- M.SG.NOM
 'big loser'

- (10) a. English
usual member
 | 'ju:ʒvəl 'membə |
 b. Lithuanian with a loan word
pastov-i member-ė
 usual-F.SG.NOM member-F.SG.NOM
 'usual member'
 c. Lithuanian equivalent
pastov-i nar-ė
 usual-F.SG.NOM member-F.SG.NOM
 'usual member'

It needs to be noted that English nouns are adapted either phonologically or orthographically when incorporated into Lithuanian discourse. In the Lithuanian language, words are usually written as they are pronounced and sounds like long vowels have their own individual orthographic representation. For example, in example (9) the word *loser* is transcribed in English with *o* which produces the long vowel [u:] in speech. When it is inserted into Lithuanian, pronunciation of the long vowel [u:] is transcribed *ū* and still pronounced as an English equivalent [u:], and, therefore, the loan word *loser* becomes *lūzer-is*. Most of the data collected was orthographically and phonologically adapted.

Besides the phonological and orthographical adaptation, the word *loser* had to acquire grammatical characteristics of gender, which is the main focus of this study. Following the ICM model, the example (1) is analysed using the proposed schema in Figure 4 and presented in Figure 6. This schema presents the adaptation processes that are involved while adapting the loan word following phonological changes, morphological changes that are related to syntactic changes, and finally semantic changes that occur to the word *loser*.

As Haspelmath (2002:57) argues, when applying derivational or inflectional rules to the word or morpheme one of the changes that can occur is semantic change. In this case, semantic meaning of a ‘one male person’ is added to this word.

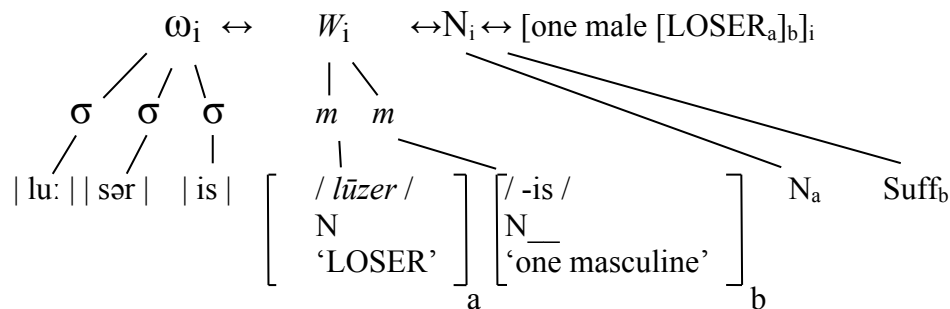


Figure 6: Phonological, morphological, syntactic, and semantic representation of *lūzeris*

Vaicekauskienė (2007:175) claims that only animate nouns whose sex is known to the speaker are ascribed the natural, semantically relevant gender. Ambrazas (2006b:90) states that as Lithuanian language is highly inflectional, suffixes carry more than one meaning at a time. In the example (9) the speaker was referring to a one male person, therefore, the suffix referring to masculine gender, singular number was assigned. This schema can evoke some ambiguous discussion, as number is considered to be carrying a grammatical function rather than semantic. As discussed in section 4, number in Lithuanian is closely related to gender and case as all three categories are expressed through one suffix. This study follows the differentiation of gender and number falling under different morphological processes, number being a grammatical category in the case of animate nouns and gender adding a semantic meaning to the noun, consequently, number will not be reflected further in the analysis unless needed under specific circumstances.

Moreover, as phonological adaptation is not the focus of this research, a simplified schema, which was proposed and presented in Figure 5, will be used through the rest of the analysis as presented in Figure 7 for the same word *lūzeris*:

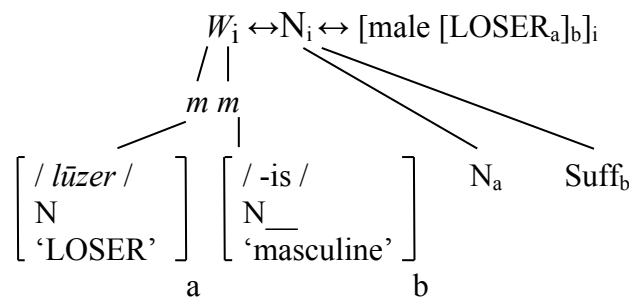


Figure 7: Morphological, syntactic, and semantic representation of *lūzeris*

As mentioned above, from the data collected there were 14 instances of masculine gender and only 3 feminine gender assignments to borrowed English nouns. 14 masculine examples contain 13 examples that contain loan patterns mentioned by Vaicekauskienė (2004b, 2007) relating to the derived suffixes from English and Lithuanian. These nouns involve such examples as *didelis lūzeris* ‘big loser’ (suffix *-eris*), analysed earlier in this section in Figure 7, and *geras bliuzmenas* ‘good bluesman’ (suffix *-menas*). The type of adaptation using pattern suffixation is discussed in section 5.5 in detail. The only noun phrase that was used not according to the Vaicekauskienė’s pattern of suffixation is *jūlus stafas* ‘rude staff’ and the full gloss is presented in the example (11). The meaning of the phrase in English is ambiguous as it is not clear whether the referents are animate objects, or it is a noun referring to a unit which contains live objects.

In this case, the noun ‘staff’ is classified as animate as Lithuanian equivalent refers to ‘workers’.

- (11) a. English
 rude staff
 | ru:d sta:f |
- b. Lithuanian with a loan word
 jūl-us staf-as
 rude-M.SG.NOM staff-M.SG.NOM
 ‘rude staff’
- c. Lithuanian equivalent
 jūl-ūs darbuotoj-ai
 rude-M.PL.NOM workers-M.PL.NOM
 ‘rude staff’

The loan noun *staff* is a singular noun, while the Lithuanian equivalent *darbuotojai* ‘workers’ is plural. Moreover, masculine gender is assigned to the loan word and it acquires suffix *-as*, as presented in the Figure 8:

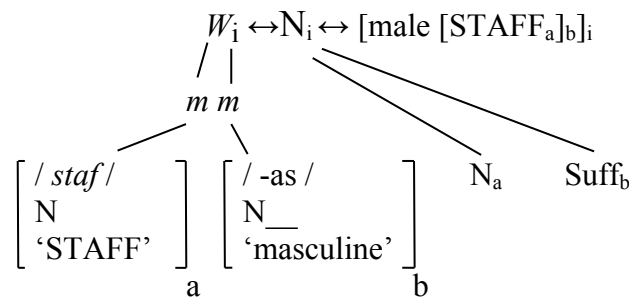


Figure 8: Morphological, syntactic, and semantic representation of stafas

The noun *staff* which does not have a gender in English, acquired masculine gender after adaptation into Lithuanian discourse. This gender can be treated as semantic, as it refers to Lithuanian word *darbuotojai*_{M.PL.NOM} ‘workers’ which are of masculine gender, however, in the plural number. The assignment of masculine gender can be triggered according to a) the Lithuanian gender assignment rule for the group of people with mixed gender where masculine is a default gender as in *studentės* ‘students_{F.PL.NOM}’ and *studentai* ‘students_{M.PL.NOM}’ can be referred to as *studentai* ‘students_{M.PL.NOM}’; or b) following the last vowel of the stem and ascribing a certain

declension, which automatically assigns certain gender. In this case, *staff* has vowel *a* therefore automatically it acquires declension I and suffix *-as*.

There were only 3 examples of feminine gender assignment for animate nouns from the collected data *bloga tyneidžerė* ‘bad teenager_{F.SG.NOM}’, *pakeičiama slakerė* ‘replaceable slacker_{F.SG.NOM}’, and *pastovi memberė* ‘usual member_{F.SG.NOM}’. As mentioned in section 4 feminine gender is distinguished according by suffixes *-a*, and *-ė*. For all of three loan nouns the gender and the L1 equivalent gender corresponded accurately including the suffixes *-ė* as presented in the examples (12), (13) and (14). The main reasons for feminine gender assignment, as stated by Vaicekauskienė (2007:174), are phonological similarities of loanwords to feminine Lithuanian nouns and gender transfer to all nouns that have final vowel *-a*. These examples, on the other hand, show that gender was transferred according to the biological gender while speaking about female human beings and instead of proposed vowel *-a*, vowel *-ė* was used. One of the nouns *slakerė* from example (13) is analysed following the ICM in Figure 9.

In addition, the data shows that all three female loan nouns have *-er* suffixes in the English equivalents. Therefore, one of the conclusions that can be drawn is that firstly, one of the Vaicekauskienė’s proposed patterns was used containing suffix *-eris*, and then from that a feminine equivalent was derived.

- | | |
|--|---|
| <p>(12) a. English
 <i>bad teenager</i>
 bəd 'ti:neɪdʒə </p> <p>b. Lithuanian with a loan word
 <i>blog-a tyneidžer-ė</i>
 bad-F.SG.NOM teenager-F.SG.NOM
 ‘bad teenager’</p> <p>c. Lithuanian equivalent
 <i>blog-a paaugl-ė</i>
 bad-F.PG.NOM teenager-F.SG.NOM
 ‘bad teenager’</p> | <p>(13) a. English
 <i>replaceable slacker</i>
 rɪ'pleɪsəbəl 'slækə </p> <p>b. Lithuanian with a loan word
 <i>pakeičiam-a slaker-ė</i>
 replaceable-F.SG.NOM slacker-F.SG.NOM
 ‘replaceable slacker’</p> <p>c. Lithuanian equivalent
 <i>pakeičiam-a tingin-ė</i>
 replaceable-F.SG.NOM slacker-F.SG.NOM
 ‘replaceable slacker’</p> |
| <p>(14) a. English
 <i>usual member</i>
 'ju:ʒʊəl 'membə </p> <p>b. Lithuanian with a loan word
 <i>pastov-i member-ė</i>
 usual-F.SG.NOM member-F.SG.NOM
 ‘usual member’</p> <p>c. Lithuanian equivalent
 <i>pastov-i nar-ė</i>
 usual-F.SG.NOM member-F.SG.NOM
 ‘usual member’</p> | |

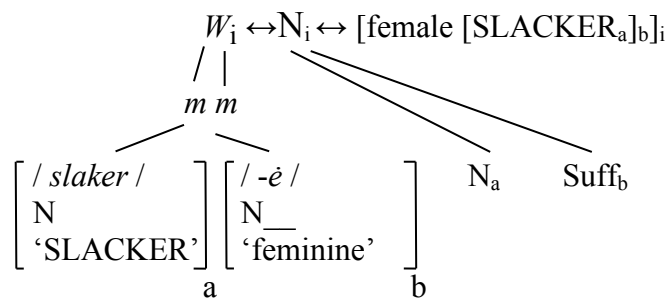


Figure 9: Morphological, syntactic, and semantic representation of *slakerė*

Paulauskienė (2007: 20) gives an example how a feminine meaning of a wolf is derived from *vilkas* ‘wolf_{M.SG.NOM}’ dividing the word into the stem *vil-* and a suffix *-as*, then using the stem and adding a feminine suffix *-ė* a feminine noun is constructed *vilkę* ‘wolf_{F.SG.NOM}’. The same pattern can be seen from the examples above, suffix *-eris* is divided into the two original suffixes *-er* and *-is*, then *-er* is used with feminine suffix *-ė* to gain the result *-erė*, and then it is added to the word *slack*. As Haspelmath (2002:241) indicates that there are specific affixes for feminine gender marking in most languages, while masculine does not; this phenomenon can be explained by the organisation of the societal distributions of gender roles, where men are usually associated with most of the occupations and specialised roles. Lithuanian feminine equivalents of the nouns are also derived from the masculine as seen from the example *vilkas* ‘wolf_{M.SG.NOM}’ / *vilkę* ‘wolf_{F.SG.NOM}’.

The number of animate loan nouns with masculine gender is greater than with feminine gender. One of the reasons for this phenomenon is the discourse of the conversation as most of the times there were male referents involved rather than females. The number of inanimate nouns in the data prevails over the number of animate loan nouns and the processes involved with gender assignment to inanimate nouns is discussed in the next section.

5.4. INANIMATE LOAN NOUNS

During the interviews there were 68 phrases with inanimate loan nouns collected. 66 of them were in masculine, like *didelis pintas* ‘big pint_{M.SG.NOM}’ in example (15) and only 2 in feminine and as in example (16) *brangi puzzle* ‘expensive puzzle_{F.SG.NOM}’.

- | | |
|--|---|
| <p>(15) a. English
 <i>big pint</i>
 bɪɡ paɪnt </p> <p>b. Lithuanian with a loan word
 <i>didel-is paint-as</i>
 big-M.SG.NOM pint-M.SG.NOM
 ‘big pint’</p> <p>c. Lithuanian equivalent
 <i>didel-is bokal-as</i>
 big-M.SG.NOM pint-M.SG.NOM
 ‘big pint’</p> | <p>(16) a. English
 <i>expensive puzzle</i>
 ɪkˈspensɪv ˈpʌzəl </p> <p>b. Lithuanian with a loan word
 <i>brang-i puzzl-ė</i>
 expensive-F.SG.NOM puzzle-F.SG.NOM
 ‘expensive puzzle’</p> <p>c. Lithuanian equivalent
 <i>brang-i delion-ė</i>
 expensive-F.SG.NOM puzzle-F.SG.NOM
 ‘expensive puzzle’</p> |
|--|---|

Out of 66 phrases that were assigned to masculine gender there are 18 that follow Vaicekauskienė’s proposed patterns using *-eris* suffix and 3 with *-ingas* suffix. These cases will be discussed in section 5.5 in greater detail. The rest of the 45 phrases have acquired masculine gender using *-as* and *-is* suffixes. As discussed in section 4, in the Lithuanian language gender for inanimate nouns is not motivated by semantics and is used purely for syntactic features of agreement. There are certain gender assignment characteristics that Lithuanian nouns have to follow in order fall under certain declensions, which are closely related to certain genders. In short, all five declensions have certain exceptions. The main rules that a noun has to follow in order to fall under a certain declension are presented in a Table 2 below adapted from Ružė (2008) and Paulauskienė (2007):

Declension	I	II	III	IV	V
Stem vowel	<i>a, ia</i>	<i>o, io, é</i>	<i>i</i>	<i>u, iu</i>	<i>-en, -n-, -er</i>
SG. NOM.	<i>-as, -ias, -is, -ys</i>	<i>-(i)a, -é, -i</i>	<i>-is</i>	<i>-(i)us</i>	<i>-uo, é</i>
SG. DAT.	<i>-(i)o</i>	<i>-(i)os, -és</i>	<i>-ies</i>	<i>-(i)aus</i>	<i>-s</i>
Gender	masculine	mainly feminine	mainly feminine	masculine	masculine

Table 2: Lithuanian noun declension patterns

In this section the analysis is carried out in order to distinguish whether the nouns are assigned corresponding with the grammatical requirements imposed by declensions and whether gender assignment is related to a noun being assigned to a certain declension. The analysis is presented following the data classification into the nouns with similar last vowel of the stem. Firstly, the nouns that have *a*, *ai* and *au* are analysed, then analysis of nouns having *o* and *ou* follows. Thirdly the nouns with stem vowel *i* are analysed, followed by the nouns having *e*, *ei*, and *en*. Finally, the nouns that have the last stem vowel *y* are analysed.

5.4.1. INANIMATE NOUNS WITH STEM VOWELS A, AI and AU

All of the inanimate loan nouns were classified according to the last stem vowel and there are 14 nouns that have *a*, *ai* and *au* vowels. These vowels are grouped under one section because the pronunciation of vowel *a* is more articulated. The data produce such phrases as *baltas vanas* ‘white van_{M.SG.NOM}’, *greitas baikas* ‘fast bike_{M.SG.NOM}’, and *didelis diskauntas* ‘big discount_{M.SG.NOM}’ glossed in the example (17), example (18), and example (19). These nouns in the singular nominative acquired *-as* suffix and in singular dative suffix *-o* was acquired producing *balto vano* ‘white van_{M.SG.DAT}’, *greito baiko* ‘fast bike_{M.SG.DAT}’, and *didelio diskaunto* ‘big discount_{M.SG.DAT}’. Furthermore, these nouns can be analysed according to the ICM schema. The integrated loan noun *vanas* schema is presented in Figure 10.

It needs to be clarified that all inanimate nouns do not acquire an extra semantic meaning of masculine or feminine gender when it is assigned to them. According to Singleton (2000:37) inflectional morphemes do not form words; their function is not to change the actual grammatical category of the word, which is one of the main processes of word formation, but they slightly modify the words making “important grammatical consequences.”.

- (17) a. English
 white van
 | waɪt væn |
 b. Lithuanian with a loan word
 balt-as van-as
 white-M.SG.NOM van- M.SG.NOM
 ‘white van’
 c. Lithuanian equivalent
 balt-as autobusiuk-as
 white-M.SG.NOM van- M.SG.NOM
 ‘white van’

- (18) a. English
 fast bike
 | fa:st baɪk |
 b. Lithuanian with a loan word
 greit-as baik-as
 fast-M.SG.NOM bike-M.SG.NOM
 ‘fast bike’
 c. Lithuanian equivalent
 greit-as motocikl-as
 fast-M.SG.NOM bike-M.SG.NOM
 ‘fast bike’

- (19) a. English
 big discount
 | big 'diskaʊnt |
- b. Lithuanian with a loan word
 didel-is diskaut-as
 big-M.SG.NOM discount-M.SG.NOM
 'big discount'
- c. Lithuanian equivalent
 didel-ė nuolaid-a
 big-F.SG.NOM discount-F.SG.NOM
 'big discount'

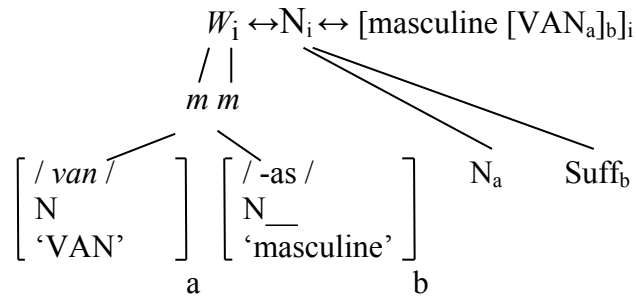


Figure 10: Morphological, syntactic, and semantic representation of *vanas*

He gives the examples of noun inflections denoting number or grammatical case to support this statement. In this case gender is considered to be a grammatical feature not carrying a semantic meaning. As mentioned before, in Haspelmath's (2002:61-65) opinion, inflectional categories are thought to be carrying strictly grammatical agreement and syntactic functions and having no identifying semantic meaning. Gender in animate nouns is thought to add an additional meaning of male or female, however, in the case of inanimate nouns, gender is purely arbitrary. Following this difference, in the semantic section of Figure 10 'male' semantic meaning is changed into term 'masculine' denoting a grammatical feature that an inanimate noun has to gain in accordance with syntactic restrictions. Moreover, as seen from the analysis, nouns that have the last vowel *a*, *ai* and *au* in their stem fall under the pattern of the first declension, therefore, acquiring masculine gender.

5.4.2. INANIMATE NOUNS WITH STEM VOWELS *O* and *OU*

Following the second declension, nouns that have vowels *o* as their last vowels of the stem, should fall under the inflectional pattern of this declension usually acquiring feminine and rarely masculine gender. In singular nominative case they should have –(i)*a*, –*ė*, or –*i* suffixes and in singular dative –(i)*os*, –*ės* suffixes. There were 8 phrases that occurred having *o* and 1 having *ou* vowels in the stem of the noun. These are such phrases as *didelis šopas* 'big shop_{M.SG.NOM}' as presented in the example (20) and *skanus fomas* 'tasty foam_{M.SG.NOM}' as in example (21):

- (20) a. English
big shop
 | big ʃɒp |
 b. Lithuanian with a loan word
didel-is šop-as
big-M.SG.NOM shop-M.SG.NOM
 ‘big shop’
 c. Lithuanian equivalent
didel-ė parduotuv-ė
big-F.SG.NOM shop-F.SG.NOM
 ‘big shop’
- (21) a. English
tasty foam
 | 'teisti fəʊm |
 b. Lithuanian with a loan word
skan-us foun-as
tasty-M.SG.NOM foam-M.SG.NOM
 ‘tasty foam’
 c. Lithuanian equivalent
skan-i put-a
tasty-F.SG.NOM foam-F.SG.NOM
 ‘tasty foam’

It is apparent that they do not follow the pattern of declension II and have suffixes *-as*, denoting masculine gender. The analysis of example (20) is presented in Figure 11:

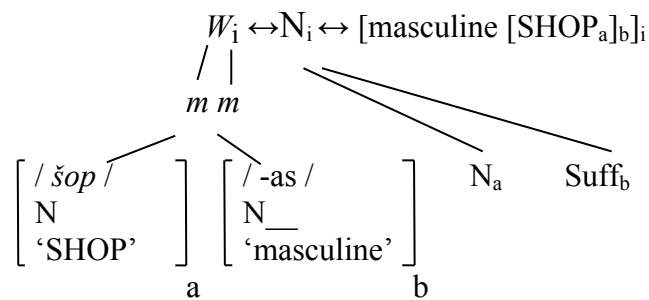


Figure 11: Morphological, syntactic, and semantic representation of *šopas*

In addition, in the dative case of declension II the noun has to acquire suffixes *-(i)os*, *-ės*, while these loan nouns acquire suffix *-o* as in *didelio šopo* ‘big shop_{M.SG.DAT}’ and *skanaus founo* ‘tasty foam_{M.SG.DAT}’. This suggests that these nouns do not fall under the second declension and the patterns are identical to the first declension.

5.4.3. INANIMATE NOUNS WITH STEM VOWELS /

From the data collected there were 6 phrases that contained loan nouns with the stem vowel *i* such as *žalias binas* ‘green bin_{M.SG.NOM}’, and the gloss of this phrase is presented in example (22):

- (22) a. English
green bin
 | gri:n bɪn |
 b. Lithuanian with a loan word
žal-ias bin-as
green-M.SG.NOM bin-M.SG.NOM
 ‘green bin’
 c. Lithuanian equivalent
žal-ia šiūkšl-ių dėž-ė
green-F.SG.NOM rubbish-F.PL.GEN. bin-F.SG.NOM
 ‘green bin’

Following the ICM the noun can be analysed accordingly as presented in Figure 12.

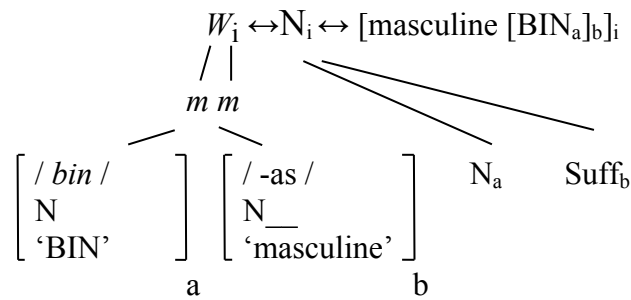


Figure 12: Morphological, syntactic, and semantic representation of binas

The nouns in Lithuanian language that have last stem vowel *i* are ascribed to the third declension class, are usually of a feminine gender and acquire suffix *–is* in the singular nominative and *–ies* in the singular dative. This example, on the other hand, has *–as* in the SG. NOM. and in SG. DAT. it acquires suffix *–o*, as in *žalio bino* ‘green bin_{M.SG.DAT.}’. This similarly happens to the rest of the examples with the same stem vowel. The suffix in the NOM. and DAT. cases indicate that the nouns with the *i* stem vowel belong also to the first declension acquiring masculine gender.

5.4.4. INANIMATE NOUNS WITH STEM VOWELS *E*, *Ei*, and *EN*

In the data collected there are 14 nouns that have *e*, *ei* and *en* stem vowel and vowel consonant combinations. In Lithuanian *en* is the only one that is considered to be a possible stem vowel consonant combination, leaving *e* and *ei* ungrouped. As the main vowel of *en* is *e*, in this study nouns having *e*, *ei* and *en* are grouped together. The nouns, according to the declension classification, containing *en* are ascribed to the last, fifth, declension. This declension has *–uo* and *ė* in the SG. NOM. and *–s* in SG. DAT. and nouns are of masculine gender. The data produced such examples as *juodas baketas* ‘black bucket_{M.SG.NOM.}’ glossed in example (23), *geras leiblas* ‘good label_{M.SG.NOM.}’ glossed in example (24), and *didelis gardenas* ‘big garden_{M.SG.NOM.}’ glossed in example (25):

- | | |
|--|--|
| <p>(23) a. English
 <i>black bucket</i>
 blæk 'bʌkɪt </p> <p>b. Lithuanian with a loan word
 <i>juod-as baket-as</i>
 black-M.SG.NOM bucket-M.SG.NOM
 ‘black bucket’</p> <p>c. Lithuanian equivalent
 <i>juod-as kibir-as</i>
 black-M.SG.NOM bucket-M.SG.NOM
 ‘black bucket’</p> | <p>(24) a. English
 <i>good label</i>
 gʊd 'leɪbəl </p> <p>b. Lithuanian with a loan word
 <i>ger-as leibl-as</i>
 good-M.SG.NOM label-M.SG.NOM
 ‘good label’</p> <p>c. Lithuanian equivalent
 <i>ger-a etiket-ė</i>
 good-F.SG.NOM label-F.SG.NOM.
 ‘good label’</p> |
| <p>(25) a. English
 <i>big garden</i>
 bɪɡ 'ɡɑːdn̩ </p> <p>b. Lithuanian with a loan word
 <i>didel-is garden-as</i>
 big-M.SG.NOM garden-M.SG.NOM
 ‘big garden’</p> <p>c. Lithuanian equivalent
 <i>didel-is sod-as</i>
 big-M.SG.NOM garden-M.SG.NOM
 ‘big garden’</p> | |

Furthermore, these examples are analysed according to the ICMM and the schema of a noun *baketas* ‘bucket’ is presented in Figure 13.

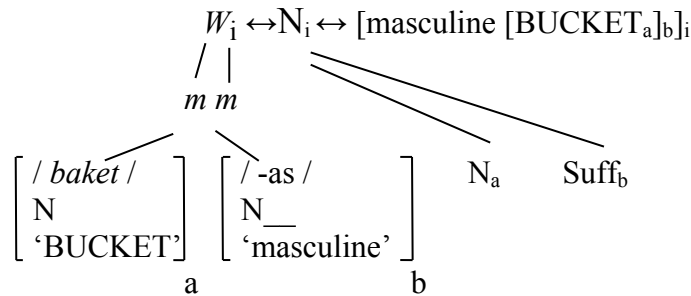


Figure 13: Morphological, syntactic, and semantic representation of *baketas*

As in previous examples from sections 5.4.2 and 5.4.3 which discussed nouns containing such stem vowels as *o*, *ou* and *i*, these nouns also follow the pattern of the first declension and have *–as* suffix in the singular nominative and *–o* suffix in the singular of dative (*juodo baketo* ‘black bucket_{M.SG.DAT}’, *gero leiblo* ‘good label_{M.SG.DAT}’, and *didelio gardeno* ‘big garden_{M.SG.DAT}’).

5.4.5. INANIMATE NOUNS WITH STEM VOWELS Y

The last group of nouns are the ones that have long vowel *y* (pronounced [i:]) and they do not fall under any declension stem vowel requirements. There were only 2 phrases with such nouns obtained. One of the phrases, *ilgas risytas* ‘long receipt_{M.SG.NOM}’ is glossed in the example (26) below:

- (26) a. English
 long receipt
 | lɒŋ rɪ'si:t |
 b. Lithuanian with a loan word
 ilg-as risyt-as
 long-M.SG.NOM receipt-M.SG.NOM
 ‘long receipt’
 c. Lithuanian equivalent
 ilg-as ček-is
 long-M.SG.NOM receipt-M.SG.NOM
 ‘long receipt’

Figure 14 shows the processes of the gender assignment of the noun *risytas* using the ICMM.

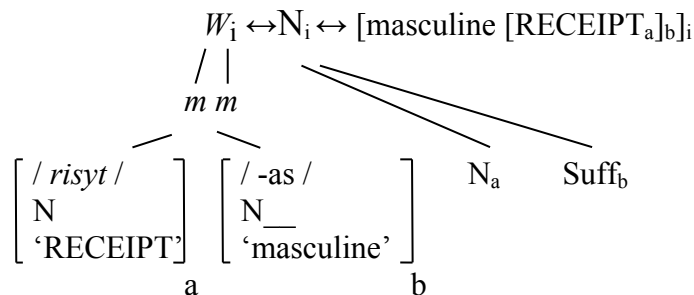


Figure 14: Morphological, syntactic, and semantic representation of *risytas*

It needs to be pointed out that this noun is used with the suffix *-as* in the nominative case and with the suffix *-o* in the dative case (*ilgo risyto* ‘long receipt_{M.SG.DAT.}’). From the grammatical patterns and from the analysis it is evident that this group of nouns also follows the inflectional pattern of the first declension and has masculine gender assigned.

5.4.6. SUMMARY OF INANIMATE LOAN NOUNS

From the data collected, all inanimate nouns were classified according to the last stem vowel in order to answer such questions: is the noun assigned to a certain declension and therefore assigned to a gender imposed by the requirements of the declension?

The phrases were classified into five groups, where the first group of nouns has *a*, *ai* and *au* stem vowels, the second group has *o* and *ou* stem vowels, the third group is comprised of nouns with stem vowel *i*, followed by the group of nouns with *e*, *ei*, and *en*. Finally, the last group of nouns has the last stem vowel *y*.

The analysis revealed that all five groups followed the pattern of the first declension gaining suffixes *-as* in the SG. NOM. and *-(i)o* in the SG. DAT. case. In addition, all of the nouns were assigned to masculine gender. The stem vowels of certain nouns, however, suggested that they should be assigned to a different declension and assigned to feminine gender. Nevertheless, all of the inanimate nouns were assigned to the first declension and gained masculine gender suffix. Vaicekauskienė (2007:174) points out that in her research, masculine gender was assigned to most of the borrowed nouns reaching 88 per cent, while feminine gender was assigned only to 12 per cent of the borrowed cases. In this study 100 per cent of inanimate nouns acquired masculine gender.

The conclusion can be drawn following the results of this analysis that masculine gender is seen as a default gender in inanimate nouns. Paulauskienė (2007:86) states that declensions are enumerated according to the number of nouns that fall under that declension. This might also be a valid explanation, that all inanimate nouns were ascribed to the first declension as the majority of Lithuanian nouns are declined following this pattern.

5.5. GENDER ASSIGNMENT ACCORDING TO ADAPTED PATTERNS

One of the proposed methods of loan words integration into Lithuanian discourse is the use of emerging suffixation patterns, where suffixes are derived from the fusion of morphemes from two languages. Vaicekauskienė (2004b:67) declares that there are tendencies in adapting an English noun into Lithuanian language using specific suffixes which are combined from an English and a Lithuanian suffix. In the data collected, some patterns were noted that involve suffixes mentioned by Vaicekauskienė.

These suffixes, *-eris*, *-ingas* and *-menas*, were used 33 times out of 88 phrases and occur both with animate and inanimate nouns. Suffixes *-ingas* and *-menas* were used 3 times each and 27 instances were recorded using the suffix *-eris*. Suffix *-ingas* was used strictly with inanimate nouns, suffix *-menas* occurred with all human referents, while suffix *-eris* was used with both, animate and inanimate loan nouns. The example (27) with suffix *-ingas* is glossed below:

- (27) a. English
 wide parking
 | waɪd 'pa:kɪŋ |
- b. Lithuanian with a loan word
 plat-us parking-as
 wide-M.SG.NOM parking-M.SG.NOM
 'wide parking'
- c. Lithuanian equivalent
 plat-i stovėjim-o aikštel-ė
 wide-F.SG.NOM parking-M.SG.GEN. site-F.SG.NOM.
 'wide parking'

The analysis of the noun *parkingas* using ICM is presented in Figure 15:

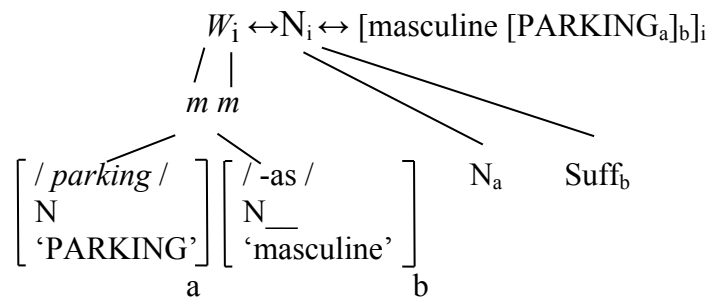


Figure 15: *Morphological, syntactic, and semantic representation of parkingas1*

The loan noun has the suffix *-as* in the singular nominative case, while in the singular dative it has the suffix *-o* (*plataus parkingo* 'wide parking_{M.SG.DAT.}'). This analysis also suggests that this noun follows the pattern of the first declension.

This analysis, however, raises additional questions as the affixation in this can be seen from two different perspectives: a) as analysed above assuming that the suffixation was made on the level of *parking* acquiring the suffix *-as*; or b) as suggested by Vaicekauskienė (2004b: 67) on the level that *park* acquired the suffix *-ingas*. If the latter occurred then a separate analysis is needed. Firstly, the derivation has occurred, on the different level: a verb *to park* was taken as an initial word from which a noun, denoting a name of the action and having masculine gender was derived adding a 'hybrid' suffix *-ingas*. This process is presented in the Figure 16:

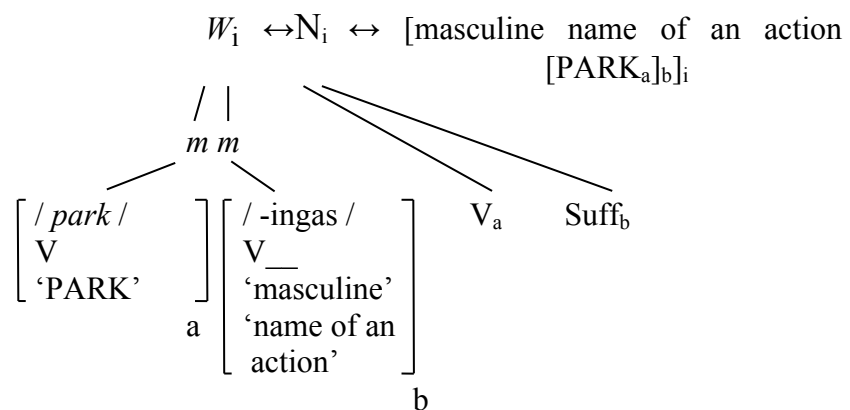


Figure 16: *Morphological, syntactic, and semantic representation of parkingas2*

Both of the processes are valid possibilities as most of the speakers that were interviewed know English and Lithuanian languages to an extent that these processes are known to them. Furthermore, this brings new perspective on the processes that are occurring in the languages when two are in a close contact with each other. If the process of suffixation is perceived by the users as a regular derivational process, using the suffix –*ingas* will become a standard procedure in order to derive nouns with the meaning ‘name of an action’ and there will be no question regarding gender assignment while using this suffix. The gender in that case will be assigned automatically as it will be encoded mechanically in the entire meaning of the suffix.

The same processes occur to the nouns that have –*eris* and are inanimate. For example, a noun *skaneris* from the phrase *baltas skaneris* (‘white scanner_{M.SG.NOM}’) can be analysed following the two processes; first, assuming that the adaptation process occurs to the noun *scanner*, or assuming that the verb *to scan* is being adapted using suffix –*eris* adding the meaning ‘the item which performs the action’. It needs to be noted, that if the speaker understands the adaptation to occur following the second pattern, then the process no longer belongs to the domain of the inflectional morphology. These suffixes, –*ingas* and –*eris* change the category of the part of speech adding an extra meaning, therefore, it falls under derivational morphology. Gender, however, in this case is not considered to reflect the natural gender as the nouns are inanimate and shows grammatical organisation and agreement rather than adding meaning, but is encoded in the meaning of the suffix.

Other types of processes occur with animate nouns. Vaicekauskienė (2004b, 2007) mentions the suffix –*menas* which refers to human beings and there were 3 examples in the data with this suffix used. One of the examples, *geras bliuzmenas* ‘good bluesman_{M.SG.NOM}’, is glossed in the example (28) below:

- | | |
|---|--|
| <p>(28) a. English
 <i>good bluesman</i>
 gʊd blu:zmæn </p> <p>b. Lithuanian with a loan word
 <i>ger-as bliuzmen-as</i>
 good-_{M.SG.NOM} bluesman-_{M.SG.NOM}
 ‘good bluesman’</p> <p>c. Lithuanian equivalent
 <i>ger-as bliuz-o atlikėj-as</i>
 good-_{M.SG.NOM} blues-_{M.SG.GEN} performer-
 M.SG.NOM
 ‘good bluesman’</p> | <p>(29) a. English
 <i>good skater</i>
 gʊd 'sketə </p> <p>b. Lithuanian with a loan word
 <i>ger-as skeiter-is</i>
 good-_{M.SG.NOM} skater-_{M.SG.NOM}
 ‘good skater’</p> <p>c. Lithuanian equivalent
 <i>ger-as riedutinink-as</i>
 good-_{M.SG.NOM} skater-_{M.SG.NOM}
 ‘good skater’</p> |
|---|--|

The noun *bliuzmenas* also follows inflectional pattern of the first declension and acquired –*o* suffix in singular dative case, *gero bliuzmeno* ‘good bluesman_{M.SG.DAT}’. A very similar course of action takes place in the animate loan nouns that acquired –*eris* suffix. For example, *geras skeiteris* ‘good skater_{M.SG.NOM}’ was used with the suffix –*as* in singular nominative and when dative case is used it is inflected using the suffix –*io* which also belongs to the declension I (*gero skeiterio* ‘good skater_{M.SG.DAT}’). The gloss of the phrase is presented in the example (29).

The processes that happen to these nouns, however, are slightly different from the ones that happen to the inanimate nouns. As discussed in section 4 and explained in detail in section 5.3, animate loan nouns acquire the meaning of masculine or feminine gender

depending on the natural sex of the referent. Similarly, these processes occur in these instances, as presented in Figure 17 for the word *bliuzmenas* ‘bluesman’ and Figure 18 for the noun *skeiteris* ‘skater’:

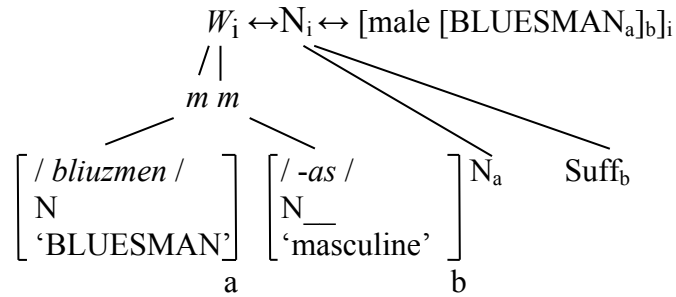


Figure 17: Morphological, syntactic, and semantic representation of *bliuzmenas*1

It can be seen that in the semantic field of the schema, ‘male’ term is used in order to represent the meaning added to the noun:

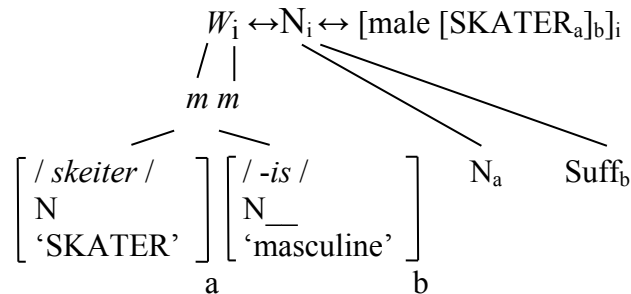


Figure 18: Morphological, syntactic, and semantic representation of *skeiteris*1

Moreover, if one follows the second type of process, when derivation is involved assuming that *-menas* and *-eris* are separate suffixes, the situation is more complicated. As presented in Figure 19 and Figure 20, there are more complicated steps that need to be followed in order to derive these nouns:

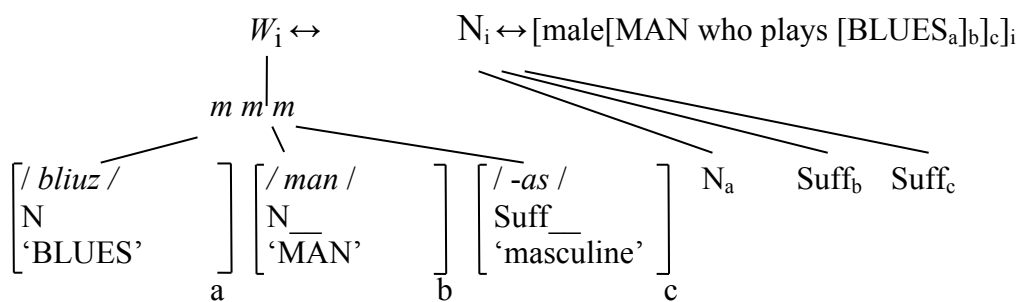


Figure 19: Morphological, syntactic, and semantic representation of *bliuzmenas*2

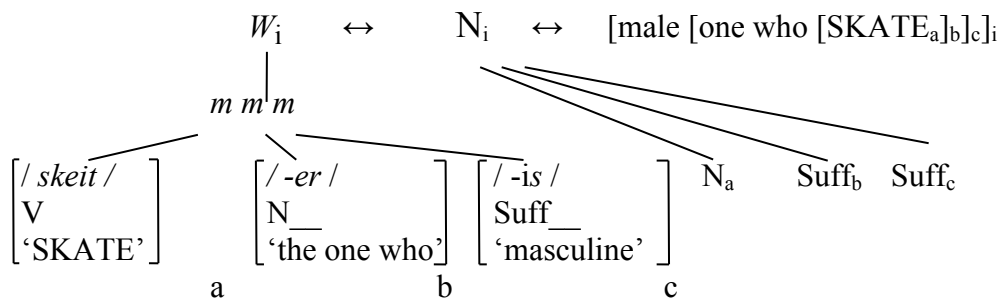


Figure 20: Morphological, syntactic, and semantic representation of *skeiteris*₂

Adaptation process in inanimate nouns is less complicated as gender is a grammatical category and does not change or add any meaning to the noun, however, in the case of animate nouns gender is perceived as adding a lexical meaning and, together with other lexical items adds the meaning of male or female. In the case of *bliuzmenas* ‘bluesman’, compounding process of N and N is in place and additional suffix *-as* to add masculine gender. In the case of *skeiteris* ‘skater’, the derivational process from V to N takes place adding suffix *-er* and a suffix *-as* to add gender meaning. These processes can be more complicated in cases where feminine gender is involved as feminine gender is derived from masculine. In order to derive a feminine equivalent for *skeiteris*, firstly, the processes that are presented in Figure 20 need to be followed and then *-is* suffix needs to be substituted by the suffix *-ė* constructing *skeiterė* ‘skater_{F.SG.NOM.}’.

5.6. SUMMARY OF ANALYSIS

In this section all of the data collected was analysed following the adapted model. This model, Integrated Construction Morpheme Model, clearly presented phonological, morphological, syntactic and semantic processes that occurred during the adaptation of the English noun into Lithuanian discourse. The integration of the Morpheme-based Model into Construction Morphology allowed morphological processes to be presented.

All phrases that were obtained were divided according the classification of animate/inanimate. The analysis of the animate nouns confirmed that natural gender plays a major role in assigning gender to loan nouns. Nevertheless, most of the nouns were ascribed to masculine gender. The analysis also revealed that while assigning gender to loan nouns, English nouns gain extra meaning that is encoded with the suffix which expresses gender. If the noun refers to a male referent, the concept of ‘male’ is added to the meaning of an English noun through the suffix *-as* or *-is*. For these reasons, gender assignment to animate loan nouns is categorized to be a derivational process.

As Goldberg (1995:24) points out, the grammatical category of a speech unit (the construction) is not governed only by syntactic rules and it is not only a “top-down” process that takes place; Furthermore, morphological rules and syntactical rules are interrelated and that all constructions undertake “top down” and “bottom-up” processes (Goldberg 1995:24). The process of natural gender assignment includes grammatical gender assignment. This is obvious from gender assignment to the noun *stafas* (‘staff_{M.SG.NOM.}’) which is glossed in the example (11) and analyses presented in Figure 8. The noun denoted masculine gender according to the discourse and refers to males. However, it also follows the restrictions of the first declension having the stem vowel *a*, therefore, grammatical and natural genders coincide.

All inanimate nouns were classed into five main groups according to the last vowel of the stem: nouns with the *a*, *ai* and *au* stem vowels, nouns with *o* and *ou* stem vowels, nouns with stem vowel *i*, nouns with stem vowels *e*, *ei* and *en*, and finally nouns with stem vowel *y*. Example phrases were analysed from each group and the results revealed that all nouns do not follow the restrictions of adequate declension classes. On the contrary, they all fall under the first declension gaining masculine gender and syntactic restrictions of certain inflectional suffixation even if some nouns should gain different declension and consequently different gender. Vaicekauskienė (2007:174) explains that masculine gender is assigned most likely as a default or neuter gender to the majority of loan nouns. The results of this study support Vaicekauskienė's conclusion. Moreover, if masculine gender for inanimate nouns is becoming the default gender, feminine gender is becoming relevant only in the cases of nouns that are refereeing to animate objects. In this case, Lithuanian is becoming less complex and this phenomenon should be investigated in greater detail.

The last section analysed animate and inanimate nouns that follow Vaicekauskienė's (2004b:67) proposed suffixation patterns. These nouns gained such suffixes as *-menas*, *-ingas* and *-eris*. Analysing the data collected, it was suggested that the adaptation of these nouns can be treated as a) loan noun inflectional processes for inanimate nouns or b) a loan noun derivational processes. The inflectional processes of inanimate nouns which have *-ingas* suffix follow the same stages of adaptation as other inanimate nouns discussed in the section 5.4 where all loan nouns were ascribed to the first declension and masculine gender (see Figure 15). The derivational processes of the loan noun incorporation into Lithuanian discourse occur in both, animate and inanimate nouns. If the speaker perceives suffixes *-ingas*, *-eris* and *-menas* as derivational suffixes, word formation rules need to be followed and gender is perceived as either grammatical category for inanimate nouns, or as a lexical meaning for animate nouns, encoded in the meaning of the suffix. The conclusion can be drawn that the close contact of Lithuanian and English languages produced new suffixes that make Lithuanian discourse more productive.

Singleton (2000:6) explains that the idea of 'semantic content' of a word is just a metaphor and that the meaning is given not by words or dictionaries; people assign meanings to words and words are just the tools of meaning transfer. In this case, the speakers assigned meaning to suffixes that were coined from two languages. This study confirmed the statement made by Haspelmath (2002:98), that both processes, the word-formation and inflection, are productive. As seen from the analysis above, the incorporation of English loan nouns into the Lithuanian language produces new phrases and new grammatical patterns emerged.

6. CONCLUSIONS AND DISCUSSION

6.1. MEETING THE AIMS OF THIS STUDY

Bilingualism and language mixing are phenomena that surround everyone due to large migration of people. This environment produces opportunities for loan word borrowing from L2 to L1. The aim of this study was to identify the patterns and rules of gender assignment to English loan words while incorporating them into Lithuanian. This was done in order to analyse the contact of two different grammars and investigate how morphological, syntactic and semantic restrictions are met during the processes of loan

noun integration. This research was done by conducting an informal interview with Lithuanian nationals who live in Ireland.

6.2. THEORETICAL FRAMEWORK

This study adapted the main framework of Construction Morphology (CM) and followed the main theoretical consideration presented in *Construction Morphology* written by Booij (2010). As stated by Booij (2010), Goldberg (1995), Jackendoff (2008) and other researchers that follow the CG approach, the construction is the smallest element that exists in the lexicon carrying specific meaning, and the morpho-syntactic restrictions are encoded in the lexicon together with its meaning. This approach, however, is mainly concerned with the organisation of syntax. Booij (2010) following some theoretical considerations proposed by Jackendoff (2008) was the first to discuss in greater detail the morphological processes in phrases and words. The tripartite architecture of processes (see Figure 1), adapted from CM, represents in great detail the interrelation between phonological, morpho-syntactic and semantic levels. Nevertheless, this model does not allow detailed analysis of morphological processes concerning suffixation, which is the main focus of this research.

The Morpheme-based Model, on the other hand, offers an in-depth analysis of processes. MbM, leaving aside the main consideration that morphemes are the smallest constituents of the lexicon, was fused with the tripartite architecture of the CM to form an Integrated Construction Morphology Model (ICMM) (see Figure 3). The new model allows the detailed description and analysis of the processes that occur in the four levels: phonological, morphological, syntactic and semantic levels. The lexical representation of these models was adapted and the schema was used in the analysis of the nouns and gender assignment processes (see Figure 4 and Figure 5). The ICMM model demonstrates not only syntactic restrictions of the word, but also reveals the adaptation process that occurs inside the word.

6.3. EMPIRICAL FINDINGS

The main empirical findings are summarized within the respective sections: section 5.3 discussed animate loan nouns, section 5.4 discussed inanimate loan nouns following the classification according to the last vowel of the stem, and section 5.5 discussed loan nouns that followed the patterns of suffixation. This section will synthesize the empirical findings to answer the study's research question: what are the patterns and rules of gender assignment to English loan nouns in Lithuanian discourse?

The analysis revealed that animate nouns are ascribed to gender corresponding with their natural sex and an extra categorisation of masculine or feminine is acquired by a noun. As the suffix that is ascribed to the noun refers to a male referent and carries a lexical meaning of 'male', the English loan noun gains its meaning. This process is considered derivational as after gender is assigned to the noun, the meaning of the noun is altered.

The analysis of inanimate nouns revealed that loan nouns do not follow the grammatical patterns of gender assignment. Inanimate nouns do not acquire the meaning of masculine or feminine and gender is perceived as an agreement marker following inflectional processes. Lithuanian nouns are classified into declension classes according to their last vowel of the stem and each declension is closely related to

masculine or feminine gender. The inanimate loan nouns did not follow this gender assignment rule and all were ascribed to the first declension and to masculine gender. The findings of this research suggest that masculine gender is thought as a default gender.

Finally, the analysis was conducted on loan nouns that followed Vaicekauskienė's (2004b:67) suggested suffixation patterns where suffixes *-menas*, *-ingas* and *-eris* are involved. These suffixes were derived from the fusion of English and Lithuanian suffixes. The analysis revealed that there are two types of processes involved: a) inflectional for inanimate nouns, where the English word containing an original suffix gains gender agreement suffix for syntactic purposes; and b) derivational processes, where an animate noun gains the meaning of a specific gender. Moreover, the analysis revealed that there is another type of derivational processes that can occur in these specific cases. Derivational processes where the suffixes *-menas*, *-eris* and *-ingas* are considered to be one unit comprised of the two meaningful elements. In this case, the derivational processes do not occur to the noun, for example *parking*, but the word formation processes take place on a verb or noun involving a suffix that carries masculine or feminine gender automatically (*park-ingas* 'parking_{M.SG.NOM.}'/ *slak-erė* 'slacker_{F.SG.NOM.}').

These findings reveal the complexity of processes that occur in the bilingual person while mixing languages. They also show that the Lithuanian language is losing the feminine gendered inanimate nouns and masculine gender is becoming a default gender in these cases. Furthermore, new derivational patterns are noted that combine the fused suffixes of two languages, which suggests that if this tendency continues, these suffixes will be used as valid derivational suffixes in spoken language, or even added to the list of the allowed derivational suffixes. Furthermore, this study confirmed the notion of two different 'genders': grammatical and inherent, where the first one functions as syntactic marker, and the latter conveys meaning which is encoded in the lexicon.

6.4. SUGGESTIONS FOR FURTHER RESEARCH

This research was focused on gender assignment to English loan nouns while being adapted to the discourse of Lithuanian. A new model was introduced that combined two different grammatical approaches and allowed detailed analysis of morphological processes to be revealed. This study, however, did not take into consideration the phonological adaptation process which occurs during insertion of loan nouns. Further research is suggested in order to fully reveal the interrelation of phonology and morphology.

Moreover, further research needs to be done in order to understand morphological and syntactic relations of such phrases. In this study, only spoken language was analysed and mainly the nouns of the phrases. In order to fully understand the phenomenon of integration and gender assignment, data from written sources containing loan nouns needs to be analysed in detail. Such research can reveal more complex processes and display tendencies of language change in progress.

7. APPENDIX 1

7.1. Loan words according to the acquired suffix:

Table 1: List of loan phrases with acquired suffix –is:

No	Lithuanian with a loan word	Gloss		English Equivalent
1	<i>balt-as skaner-is</i>	white-M.SG.NOM	scanner- M.SG.NOM	‘white scanner’
2	<i>didel-is lūzer-is</i>	big-M.SG.NOM	loser- M.SG.NOM	‘big loser’
3	<i>ger-as supervaizer-is</i>	good-M.SG.NOM	supervisor- M.SG.NOM	‘good supervisor’
4	<i>balt-as stymer-is</i>	white-M.SG.NOM	steamer- M.SG.NOM	‘white steamer’
5	<i>ger-as skeiter-is</i>	good-M.SG.NOM	skater- M.SG.NOM	‘good skater’
6	<i>juod-as dajer-is</i>	black-M.SG.NOM	diary- M.SG.NOM	‘black diary’
7	<i>juod-as printer-is</i>	black-M.SG.NOM	printer- M.SG.NOM	‘black printer’
8	<i>juod-as toner-is</i>	black-M.SG.NOM	toner- M.SG.NOM	‘black toner’
9	<i>kvail-as menedžer-is</i>	stupid-M.SG.NOM	manager- M.SG.NOM	‘stupid manager’
10	<i>kvail-as refer-is</i>	silly-M.SG.NOM	referre- M.SG.NOM	‘silly referee’
11	<i>juod-as toster-is</i>	black-M.SG.NOM	toaster- M.SG.NOM	‘black toaster’
12	<i>maž-a dišvošer-is</i>	small-F.SG.NOM	dishwasher-F.SG.NOM	‘small dishwasher’
13	<i>maž-as steipler-is</i>	small-M.SG.NOM	stapler- M.SG.NOM	‘small stapler’
14	<i>maž-as vaučer-is</i>	small-M.SG.NOM	voucher- M.SG.NOM	‘small voucher’
15	<i>medin-is loker-is</i>	wooden-M.SG.NOM	locker- M.SG.NOM	‘wooden locker’
16	<i>pastov-us jūzer-is</i>	usual-M.SG.NOM	user-M.SG.NOM	‘usual user’
17	<i>sen-as bukmeiker-is</i>	old-M.SG.NOM	bookmaker-M.SG.NOM	‘old bookmaker’
18	<i>skan-us kukumber-is</i>	tasty-M.SG.NOM	cucumber-M.SG.NOM	‘tasty cucumber’
19	<i>skan-us hamburger-is</i>	tasty-M.SG.NOM	hamburger-M.SG.NOM	‘tasty hamburger’
20	<i>suged-ęs adapter-is</i>	broken-M.SG.NOM	adapter-M.SG.NOM	‘broken adapter’
21	<i>suged-ęs trol-is</i>	broken-M.SG.NOM	trolley-M.SG.NOM	‘broken trolley’
22	<i>suged-ęs taimer-is</i>	broken-M.SG.NOM	timer-M.SG.NOM	‘broken timer’
23	<i>šun-ų handler-is</i>	dog-M.SG.NOM	handler-M.SG.NOM	‘dog handler’
24	<i>tikr-as kiler-is</i>	real-M.SG.NOM	killer-M.SG.NOM	‘real killer’
25	<i>visišk-as slaker-is</i>	total-M.SG.NOM	slacker-M.SG.NOM	‘total slacker’
26	<i>žal-ias gliter-is</i>	green-M.SG.NOM	glitter-M.SG.NOM	‘green glitter’
27	<i>žol-ės kater-is</i>	grass-M.SG.GEN	cutter-M.SG.NOM	‘grass cutter’
28	<i>nešvar-us kaunter-is</i>	dirty-M.SG.NOM	counter- M.SG.NOM	‘dirty counter’

Table 2: List of loan phrases with acquired suffix –as:

No	Lithuanian with a loan word	Gloss		English Equivalent
1	<i>balt-as</i> <i>van-as</i>	white-M.SG.NOM	van- M.SG.NOM	‘white van’
2	<i>didel-is</i> <i>diskaunt-as</i>	big-M.SG.NOM	discount-M.SG.NOM	‘big discount’
3	<i>didel-is</i> <i>garden-as</i>	big-M.SG.NOM	garden-M.SG.NOM	‘big garden’
4	<i>didel-is</i> <i>paint-as</i>	big-M.SG.NOM	pint-M.SG.NOM	‘big pint’
5	<i>didel-is</i> <i>šiuboks-as</i>	big-M.SG.NOM	shoebox-M.SG.NOM	‘big shoebox’
6	<i>didel-is</i> <i>trafik-as</i>	big-M.SG.NOM	traffic-M.SG.NOM	‘big traffic’
7	<i>ger-as</i> <i>prezenteišen-as</i>	good-M.SG.NOM	presentation-M.SG.NOM	‘good presentation’
8	<i>ger-as</i> <i>pab-as</i>	good-M.SG.NOM	pub-M.SG.NOM	‘good pub’
9	<i>graž-us</i> <i>čest-as</i>	beautiful -M.SG.NOM	chest -M.SG.NOM	‘beautiful chest’
10	<i>greit-as</i> <i>baik-as</i>	fast-M.SG.NOM	bike-M.SG.NOM	‘fast bike’
11	<i>didel-is</i> <i>prezent-as</i>	big-M.SG.NOM	present-M.SG.NOM	‘big present’
12	<i>didel-is</i> <i>šop-as</i>	big-M.SG.NOM	shop-M.SG.NOM	big shop’
13	<i>ger-as</i> <i>bliuzmen-as</i>	good-M.SG.NOM	bluesman-M.SG.NOM	‘good bluesman’
14	<i>ger-as</i> <i>biznismen-as</i>	good-M.SG.NOM	bluesman-M.SG.NOM	‘good businessman’
15	<i>ger-as</i> <i>leibl-as</i>	good-M.SG.NOM	label-M.SG.NOM	‘good label’
16	<i>ger-as</i> <i>relaks-as</i>	good-M.SG.NOM	relax-M.SG.NOM	‘good relax’
17	<i>ger-as</i> <i>sekond-hend-as</i>	good-M.SG.NOM	second-hand-M.SG.NOM	‘good second-hand’ (store)
18	<i>įdom-us</i> <i>horor-as</i>	interesting-M.SG.NOM	horror-M.SG.NOM	‘interesting horror’(movie)
19	<i>įdom-us</i> <i>mač-as</i>	interesting-M.SG.NOM	match-M.SG.NOM	‘interesting match’
20	<i>ilg-as</i> <i>draft-as</i>	long-M.SG.NOM	draft-M.SG.NOM	‘long draft’
21	<i>ilg-as</i> <i>imeil-as</i>	long-M.SG.NOM	email-M.SG.NOM	‘long email’
22	<i>ilg-as</i> <i>lanč-as</i>	long-M.SG.NOM	lunch-M.SG.NOM	‘long lunch’
23	<i>ilg-as</i> <i>risyt-as</i>	long-M.SG.NOM	receipt-M.SG.NOM	‘long receipt’
24	<i>juod-as</i> <i>baket-as</i>	black-M.SG.NOM	bucket-M.SG.NOM	‘black bucket’
25	<i>laiming-as</i> <i>end-as</i>	happy-M.SG.NOM	end-M.SG.NOM	‘happy end’
26	<i>lėt-as</i> <i>barmen-as</i>	slow-M.SG.NOM	barman-M.SG.NOM	‘slow barman’
27	<i>linksm-as</i> <i>vykend-as</i>	fun-M.SG.NOM	weekend-M.SG.NOM	‘fun weekend’
28	<i>maž-as</i> <i>trak-as</i>	little-M.SG.NOM	truck-M.SG.NOM	‘little truck’
29	<i>maž-as</i> <i>laptop-as</i>	small-M.SG.NOM	laptop-M.SG.NOM	‘small laptop’
30	<i>didel-is</i> <i>stor-as</i>	big-M.SG.NOM	stor-M.SG.NOM	‘big store’
31	<i>įžūl-us</i> <i>staf-as</i>	rude-M.SG.NOM	staff-M.SG.NOM	‘rude staff’
32	<i>nuobodus</i> <i>fiting-as</i>	boring-M.SG.NOM	fitting-M.SG.NOM	‘boring fitting’
33	<i>patog-us</i> <i>kauč-as</i>	comfortable-M.SG.NOM	couch -M.SG.NOM	‘comfortable couch’
34	<i>pig-us</i> <i>beibysiting-as</i>	cheap-M.SG.NOM	babysitting-M.SG.NOM	‘cheap babysitting’
35	<i>pašt-o</i> <i>spam-as</i>	postal-M.SG.GEN.	spam-M.SG.NOM	‘postal spam’

36	<i>pig-us</i>	<i>karvoš-as</i>	cheap-M.SG.NOM	carwash-M.SG.NOM	‘cheap carwash’
37	<i>plat-us</i>	<i>parking-as</i>	wide-M.SG.NOM	parking-M.SG.NOM	‘wide parking’
38	<i>skan-us</i>	<i>foum-as</i>	tasty-M.SG.NOM	foam-M.SG.NOM	‘tasty foam’
39	<i>skan-us</i>	<i>hot-dog-as</i>	tasty-M.SG.NOM	hot-dog-M.SG.NOM	‘tasty hot-dog’
40	<i>skan-us</i>	<i>sanvidž-as</i>	tasty-M.SG.NOM	sandwich-M.SG.NOM	‘tasty sandwich’
41	<i>skan-us</i>	<i>snek-as</i>	tasty-M.SG.NOM	snack-M.SG.NOM	‘tasty snack’
42	<i>skan-us</i>	<i>steik-as</i>	tasty-M.SG.NOM	steak-M.SG.NOM	‘tasty steak’
43	<i>stipr-us</i>	<i>drink-as</i>	strong-M.SG.NOM	drink-M.SG.NO	‘strong drink’
44	<i>stipr-us</i>	<i>šot-as</i>	strong-M.SG.NOM	shot-M.SG.NOM	‘strong shot’
45	<i>sunk-us</i>	<i>asainment-as</i>	difficult-M.SG.NOM	assignment-M.SG.NOM	‘difficult assignment’
46	<i>tinkam-as</i>	<i>dedlain-as</i>	suitable-M.SG.NOM	deadline-M.SG.NOM	‘suitable deadline’
47	<i>trump-as</i>	<i>breik-as</i>	short-M.SG.NOM	break-M.SG.NOM	‘short break’
48	<i>uždaryt-as</i>	<i>til-as</i>	closed-M.SG.NOM	till-M.SG.NOM	‘closed till’
49	<i>vien-as</i>	<i>šopstryt-as</i>	one-M.SG.NOM	shop-street-M.SG.NOM	‘one shop-street’
50	<i>žal-ias</i>	<i>bin-as</i>	green-M.SG.NOM	bin-M.SG.NOM	‘green bin’
51	<i>žaisming-as</i>	<i>piknik-as</i>	fun-M.SG.NOM	picnic-M.SG.NOM	‘fun picnic’

Table 3: List of loan phrases with acquired suffix –ė:

No	Lithuanian with a loan word	Gloss		English Equivalent
1	<i>blog-a</i> <i>tyneidžer-ė</i>	bad-F.SG.NOM	teenager-F.SG.NOM	‘bad teenager’
2	<i>brang-i</i> <i>puzl-ė</i>	expensive-F.SG.NOM	puzzle-F.SG.NOM	‘expensive puzzle’
3	<i>įdom-i</i> <i>fantaz-ė</i>	interesting-F.SG.NOM	fantasy-F.SG.NOM	‘interesting fantasy’
4	<i>pakeičiam-a</i> <i>slaker-ė</i>	replaceable-F.SG.NOM	slacker-F.SG.NOM	‘replaceable slacker’
5	<i>pastov-i</i> <i>member-ė</i>	usual-F.SG.NOM	member-F.SG.NOM	‘usual member’

Table 4: List of loan phrases with acquired suffix –iai:

No	Lithuanian with a loan word	Gloss		English Equivalent
1	<i>didel-i</i> <i>taks-ai</i>	big-M.PL.NOM	tax-M.PL.NOM	‘big tax’

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Persian cleft constructions: A Role and Reference Grammar analysis

Farhad Moezzi-pour
moezzi-pf@tcd.ie
Trinity College Dublin

Abstract

The present paper embarks on the study of Persian cleft construction within the framework of Role and Reference Grammar (RRG henceforth). RRG intends to investigate the interaction of syntax, semantics and pragmatics via the constituent, logical and focus structure as independent but interrelated domains of the paradigm. To start with, an attempt will be made regarding demonstrating the specification role of the cleft construction, which is a universally semantic property of the construction, in the syntactic, semantic and information structures. In Persian clefts, despite that the clefted constituent is the semantic argument of the predicator of the cleft clause, it bears the role of pragmatic predicate assigned by the matrix predicator and the optional presence of the cleft pronoun as well, originating from the non-isomorphic nature of the cleft construction which expresses a single semantic proposition through a bipartition syntax. Given that the copula does not agree with the clause-initial cleft pronoun, albeit with the clefted constituent, and also that the matrix grammatical elements are considered to be merely focalizers, the so-called demonstrative, i.e. "in" is regarded as emphatic pronoun. The syntax-information structure interface in the cleft-like constructions in Persian, such as extraposition and preposed adverbials forms one of the central analyses of this paper where it will be displayed that RRG is much more equipped than the other theories to reflect the linguistic interfaces within various grammatical constructions. Of the most important findings is the necessity to distinguish the anaphoric "in", 'this' in the extraposition construction and the emphatic "in" 'it' in the cleft construction.

List of Abbreviations

ACC: accusative, **CLM:** clause linkage marker, **CONJ:** conjunctive, **DEIC:** deictic, **DEM:** demonstrative, **det:** determiner, **DCA:** direct core argument, **EZ:** ezafé, **IMPF:** imperfective, **IU:** information unit, **LDP:** left detached position, **MR:** macrorole, **NEG:** negative, **NOM:** nominative, **OM:** object marker, **PC:** pronominal clitic, **PN:** pronoun, **PREV:** preverbal particle, **PSA:** privileged syntactic argument, **PSPT:** past participle **SUB.CL.:** subordinate clause, **SUBJ:** subjunctive,
Notations: -: affix boundary, =: clitic boundary

1. Theoretical approaches to cleft construction

Thus far, different approaches have been adopted in order to reveal the true nature of cleft construction among which generative ones enjoy more popularity. These studies fall broadly into two categories: extrapositional and expletive approaches. It is necessary to introduce the cleft construction before reviewing these approaches.

Lambrecht (2001) considers the cleft construction as a complex grammatical structure consisting of a matrix clause and a relative-like clause that collectively express one single semantic proposition which can also be expressed in the form of a single clause without a change in truth-conditions. Matrix clause is headed by a copula whose predicative argument, namely the clefted constituent is coindexed with the shared relativized argument of the cleft clause. On the other hand, Declerck (1988) defines cleft constructions as a series of 'specificational' sentences whose semantic role is to assign a value to a variable. In (1), *John* is a value occupying the position *x* in the variable "*x* opened the door".

(1) It was John who opened the door.

Extrapositional approach, originating from Jespersen's analysis (1927), treats the cleft pronoun and the cleft clause as a discontinuous semantic unit which correlates with the clefted constituent via the copula. The cleft pronoun, in fact, takes a referential interpretation as the extraposed cleft clause serves a modifying function for that. The identity relationship in (2) accentuates the copular nature of the cleft construction.

(2) It was John that I saw. \longrightarrow [it+ that I saw] was [John]

Expletive approach, having precedent in Jespersen's later-on analysis (1937) focuses on the relationship borne by the clefted constituent and the cleft clause leading to the consideration of the matrix elements, including the cleft pronoun and copula, as semantically inert elements as if they were not existent in the sentence. Now consider (3) in which the matrix elements make no semantic contributions to the meaning of the sentence and the cleft sentence and its non-cleft counterpart are semantically interpreted equally.

(3) It was John + that I saw. \longrightarrow [John I saw]

It should be noted that the derivational analyses of the cleft construction mainly suffer the shortcoming that the relation between the matrix clause and the cleft clause in the extrapositional approach as well as the one between the internal constituents of the matrix clause in the expletive approach have been sidelined. There are of course alternative approaches which take a non-derivational view on cleft construction in contrast to the above-mentioned approaches, which are essentially concerned with the derivational models of grammar. For instance, Hedberg (2000) argues that neither the extrapositional nor the expletive approaches can present a thorough analysis for examining the semantic and syntactic properties of the cleft construction. She is inclined to provide a comprehensive analysis instead, using both the foundational blocks of the afore-mentioned approaches. In Hedberg's analysis, opposed to the expletive approach, the cleft pronoun is not semantically and syntactically pleonastic. Rather, the cleft pronoun in association with the cleft clause forms a discontinuous semantic unit which is pragmatically interpreted as a definite referring expression in which the cleft pronoun plays the role of definite article. Following Abney (1987), the importance of her analysis pivots around the assumption that the cleft pronoun and the cleft clause together indicate a definite referring expression where the cleft pronoun pragmatically functions as determiner and the cleft clause functions as its nominal complement, as illustrated in figure 1.

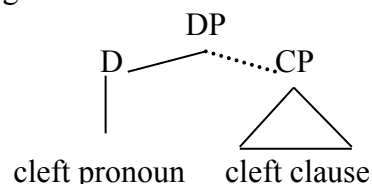


Figure 1: The cleft pronoun and the cleft clause as definite referring expression

Hedberg (ibid) introduces a new insight to the syntactic analysis of *it*-cleft sentences which embodies both the extrapositional and expletive accounts along with the simultaneous semantic and pragmatic analysis of *it*-clefts in terms of the analogy drawn

between definite determiner phrase and cleft pronoun plus cleft clause. Hedberg introduces cleft clause as bearing direct semantic and pragmatic relation to the cleft pronoun and direct syntactic relation to the clefted constituent. In syntactic terms, cleft clause is “a complement extraposed from the subject DP and adjoined to the clefted constituent” (ibid: 912). The adjunction premise is the contribution of Hedberg’s analysis not only to abandon the conjecture that the cleft clause in cleft constructions is restrictive, but also to clarify the non-restrictiveness nature of the cleft clause.

Lambrecht (2001) proposes a discourse-functional framework for the analysis of the cleft construction. He makes use of Jespersen's non-derivational approach (1937) in which the matrix sequence of *it is* and the relative pronoun or the complementizer are treated as grammatical elements which do not enter into the semantic composition of the sentence. He attempts to accommodate a construction grammar basis for the explanation of the non-compositionality of *it*-clefts which implies that the matrix clause and the cleft clause constitute together a constructional unit whose meaning does not correspond to the meaning of the individual semantic units in the cleft construction. In his non-derivational account, Lambrecht (ibid: 468) considers the cleft pronoun as empty category, but as he mentions, “*it is not devoid of all meaning but merely that it does not play a semantic role in its clause*”. On the other hand, since the bi-clausal realization of *it*-clefts denotes a single semantic proposition, one of the two present predicators in the matrix and cleft clause must be semantically empty, and that is the copula in the matrix clause. Therefore, copula cannot assign theta roles to its arguments. However, the only indirect way to assign a theta role to the copular predicative argument is via relative clause predicator. The main question regarding Lambrecht's account is that if the cleft pronoun and cleft clause are semantically empty and the clefted constituent receives its theta role from the relative clause predicator, then what is their function? Lambrecht hypothesizes that the clefted constituent bears a pragmatic role, viz. *pragmatic predicate* assigned by the cleft pronoun and the cleft clause, while the clefted constituent receives its semantic role through the relative clause predicator. What differentiates Lambrecht's analysis from Jespersen's is that the former interprets the sequence of *it is* as both semantically and syntactically expletive as if they were not present. Conversely, Lambrecht takes the matrix predicator as bivalent predicator by which the focus phrase receives the role of syntactic predicate.

Davidse’s approach (2000) also pioneers a constructional account of clefts. She argues that there are two semantic relations in *it*-clefts; one is coded between the relative clause and the clefted constituent as the antecedent that evokes a value-variable interpretation than a head-modifier or restrictive relation; and the other is established within the elements of the matrix clause. In Davidse’s account, the cleft pronoun is not an expletive and the matrix clause imposes a specific ‘quantificational value’¹⁸ on its complement. In order to dig into the constructional foundation of *it*-clefts, she utilizes Huddleston’s analysis (1984) in which the basic distinctive feature of an *it*-cleft is that

¹⁸ . Quantificational value indicates an inherent property of cleft constructions which implies the fact that the clefted constituent due to being placed in the postcopular position is the only value satisfying the variable embodied in the form of relative clause. Put it differently, it specifies exhaustively from a total set of instances, potentially capable of being the value expressed by the clefted constituent, an elements that corresponds to the variable. The quantificational value in Davidse’s terminology is akin to the “exhaustiveness implicature” used in Halvorsen (1978), Horn (1981), Decleek (1988), among others.

the postverbal complement of the matrix clause and the relative clause do not form a grammatical unit even though the complement has an anaphoric relation to the relative clause; that is why Huddleston (ibid: 462) considers the relative clause in a cleft construction as “*sui generis*” which means ‘unique to the construction’. In her attempt to disprove the claim that the relative clause in the cleft constructions is restrictive, Davidse (ibid:1103) makes a comparison regarding the type of the relative clause in the *it*-cleft sentences and identifying sentences such as (4) where it is displayed that the addressee is able to identify the referent via the restrictive relative clause (RRC henceforth) whereas it is the clefted constituent per se that assists the addressee to pick up the intended referent in (5), leaving aside the relative clause which is pragmatically presupposed in the preceding context.¹⁹

(4) A: Who was that on the phone?

B: It was [the boy [who that caused all the trouble] _{RRC}] _{NP}.

(5) A: Who caused all the trouble?

B: It was [the boy] _{NP} [(who/that) caused all the trouble] _{RC}.

More interestingly, despite that the most literature on RRG treats the whole postcopular NP as the antecedent; Davidse demonstrates that the RRC modifies only the nominal head whose combination with the RRC is grounded or identified by the determiner. This is in accordance with Langacker’s cognitive modeling of RRC constructions (figure 2) in which the internal assembly of the RRC and the nominal head is regarded as an element of ‘type specification’ which restricts the head noun’s type specification (1991: 432 cited in Davidse ibid: 1109). This contrasts with the antecedent in the cleft constructions which is the full NP (nominal head plus the determiner). Given that, the cognitive-semantic relation between the relative clause and its antecedent in the restrictive constructions and cleft constructions are respectively type specification and grounding as in the former the head noun designates a general type of an entity and in the latter the full NP designates a grounded instance.

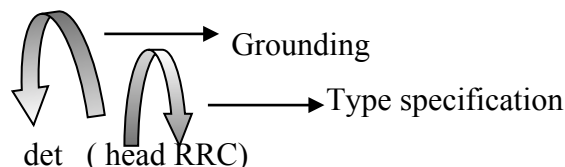


Figure 2: Internal dependency structure of a NP with a restrictive relative clause

Pavey (2004) presents an insightful analysis of English *it*-cleft construction within RRG framework. Since I will employ the same paradigm for the analysis of Persian cleft constructions, I would prefer to provide a detailed characterization of her treatment of the English cleft construction here along with a sketch of RRG organization in the meanwhile. It is interesting to mention that Pavey also advocates the premise that clefts are required to be dealt with respect to the fact that they constitute a unique construction with unique syntactic, semantic and pragmatic features which are not

¹⁹ . The contrastive intonational pattern in the earlier-mentioned sentences is another criterion that supports the view that the relative clause in the cleft constructions is not by its very nature restrictive as *it*-cleft sentences are uttered on a compound fall-rise tone which enables the speaker to mark the clefted constituent as information focus denoting a contrastive reading. On the other hand, the identifying sentences are normally uttered with falling tone-final salient element, namely the RRC cannot intonationally constitute a separate tone unit (Haliday (1967: 237).

applicable to their non-clefted counterparts. To account for the constructional architecture of English *it*-clefts, Pavey attempts to integrate the syntactic, semantic and informational characteristics of the cleft construction into a sort of an interlink between syntax, semantic and pragmatics modules of RRG so as to illustrate the adequacy of an interactional framework that enunciates the non-isomorphic substance of the cleft construction. Given that the derivational approaches either extrapositional or expletive focus only on one aspect of the cleft constructions whether the copular nature of the matrix clause in the former or the close affinity shared with the non-clefts in the latter, she maintains that the cleft pronoun is a syntactic core argument whose semantically dummy nature is represented through its absence in the semantic representation. *It* is dummy in the sense that it does not denote or describe a referent. Taking into account a discourse-deictic function for the cleft pronoun with respect to the cognitive status of the cleft clause based on Hedberg (2000) as well as its quantificational role regarding specifying an exhaustive value for the clefted constituent based on Davidse (2000), Pavey explicitly says, “it is simplistic to characterize the cleft pronoun as dummy expletive elements” (ibid: 154). Further, she disputes that the referential status of the cleft clause which leads to the selection of *it* or demonstratives (*that* or *this*) as cleft pronoun attributes a determiner-like function²⁰ which also consolidates the hypothesis that the cleft pronoun is not just dummy syntactic place-filler. It is worth noting that Pavey benefits from the distinction made by Lambrecht (1994) between semantic and *pragmatic predicate* in order to explain the mismatch between syntactic structure and semantic composition of the cleft construction. She believes that the traditionally semantic definition of predicate as ‘what is said about the subject/topic’ sets aside the pragmatic considerations as the clefted constituent in the *it*-cleft narrow focus construction has a “pragmatically predicative function and yet is not semantically predicational”.

Pragmatic predicate in the specificational sentences is defined as a predicate the designatum of which “is construed simultaneously as an argument on the level of semantics and as a predicate on the level of information structure” (Lambrecht 1994: 231). Thus, there is no constraint against the claim that a referring expression as clefted constituent plays the role of identification/specification rather than of predication. As for the referential status of clefted constituent, Pavey raises an issue where the clefted constituent might be a definite or an indefinite noun phrase. In case of definite noun phrase, the clefted constituent takes on a specific, referential, identifiable interpretation resulting from inclusiveness in the clefted constituent as the only value corresponding to the description expressed in the cleft clause. However, when an indefinite noun phrase appears as the clefted constituent, it is interpreted as specific but not as referential despite that the clefted constituent is already identifiable to some degree by the connection it holds to the cleft clause through coindexation. For example, in (6) what is being highlighted is that something ‘specific’ (a dog not a cat) meets the description in the cleft clause, not that a specific dog whose identity is clear to the hearer is involved in the eating act. Notably, the use of a referential indefinite noun phrase as clefted constituent triggers the rendering that the speaker gives only descriptive not identifying information about an identifiable entity due to his probable

²⁰ . It is argued in Hedberg (2000) that Givenness Hierarchy (Gundel, Hedberg and Zacharsky 1993) can help the speakers select the appropriate form of the cleft pronoun. Since the cleft pronoun and the cleft clause serve as a discontinuous definite referring expression, by being aware of the givenness category of the cleft clause, the speakers will end up with the most appropriate form of the cleft pronoun.

reluctance or unawareness in revealing the full identification of the referent at the time of utterance, not that the speaker assists the hearer to build up a new representation for a previously unidentifiable entity. She argues that on one hand, the clefted constituent is identifiable because of its coindexed relationship to the generally presupposed variable, and its identifiability is not, to some degree, tied to the cognitive status of the variable, on the other. She suggests that the cleft constituent and the cleft clause, though coreferentially related, are semantically separate referring expressions.

(6) It is a dog that is eating your shoe.

The syntactic representation of *it*-clefts is diagrammed through the use of constituent and operator projection that are iconic by nature. The cleft pronoun is headed by the NP node. The node NUC anchoring the copula and the clefted constituent depicts the predication nature of the clefted constituent. The cleft clause stands as periphery to the core in the matrix clause. One reason for the peripheral position of the cleft clause lies in that the cleft clause can be ellipted²¹. The constituent structure of the English *it*-cleft sentence in (7) is represented below in figure 3.

(7) It was Caroline that hit Patrick.

Pavey also proposes the following logical structure for *it*-clefts in which the main predicate is **be'** rather than the predicate in the subordinate cleft clause. The main predicate owns two arguments; the first one matches the semantic content of the cleft clause containing a coindexed element which corresponds to the second argument in the logical structure and is realized in the form of the clefted constituent. The logical structure with two distinct arguments concurs with the specificational function of *it*-clefts as specifying a value for a variable. The point is that the logical structure of *it*-clefts roughly parallels their information structure despite that such straightforward equivalence does not necessarily arise in the cleft sentences (Pavey 2004: 217).

(8) a. It is Martha that eats octopus.

be' ([**do'** (x_i , [**eat'** (x_i , octopus))]), Martha_i)

b. It's Martha who eats octopus.

be' ([**do'** (who_i, [**eat'** (who_i, octopus))]), Martha_i)

²¹ . When the cognitive status of the relative clause is in-focus or activated according to the Givenness Hierarchy (Gundel et al 1993), the cleft clause can be ellipted as it has been straightforwardly referred to in the prior discourse. This fact gives rise to the appearance of truncated *it*-clefts. Moreover, in case of relative pronoun in *it*-clefts, Pavey (2004: 206) assigns the pre-core slot to the relative pronoun. The syntactic structure of *it*-clefts with relative pronoun is not within the scope of the Persian clefts analysis and has been factored out for the sake of simplicity.

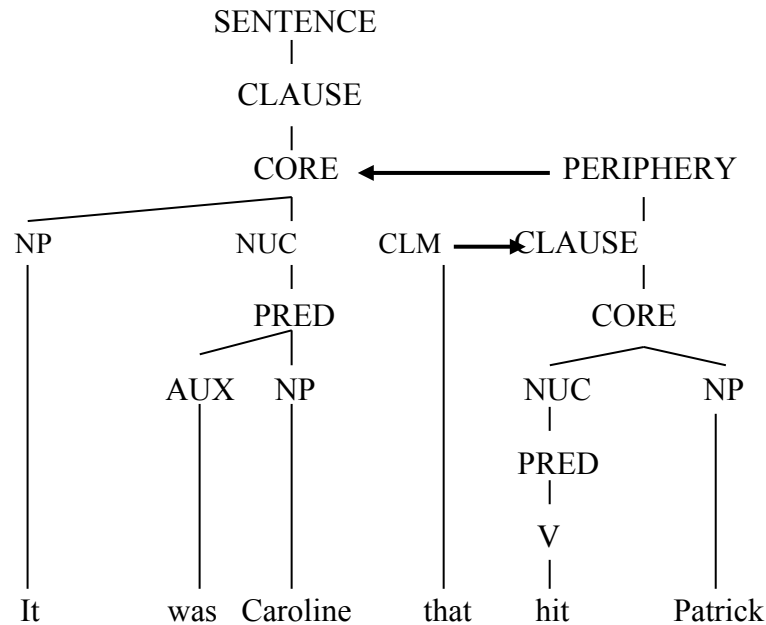


Figure 3: Syntactic structure of an English *it*-cleft

As for the information structure in *it*-clefts, the cleft clause is syntactically subordinate, thus interpreted as presupposition, and the clefted constituent is regarded as asserted information representing argument/narrow focus structure. The peripheral status of the cleft clause in relation to the matrix core results in its placement outside the actual focus domain. This can be shown by the infelicity occurring if an element within the cleft clause is questioned. The information structure in complex sentences is governed by a general constraint that Van Valin (2005: 214) puts in (9). The focus structure projection in (7) is represented below in figure 4.

(9) *The potential focus domain in complex sentences*

A subordinate clause may be within the potential focus domain if it is a direct daughter of (a direct daughter of...) the clause node which is modified by the illocutionary force operator.

(10) Q: Was it Kim that arrived at the party late?

A: NO, Pat.

A: ?? NO, early.

A: ?? No, the concert.

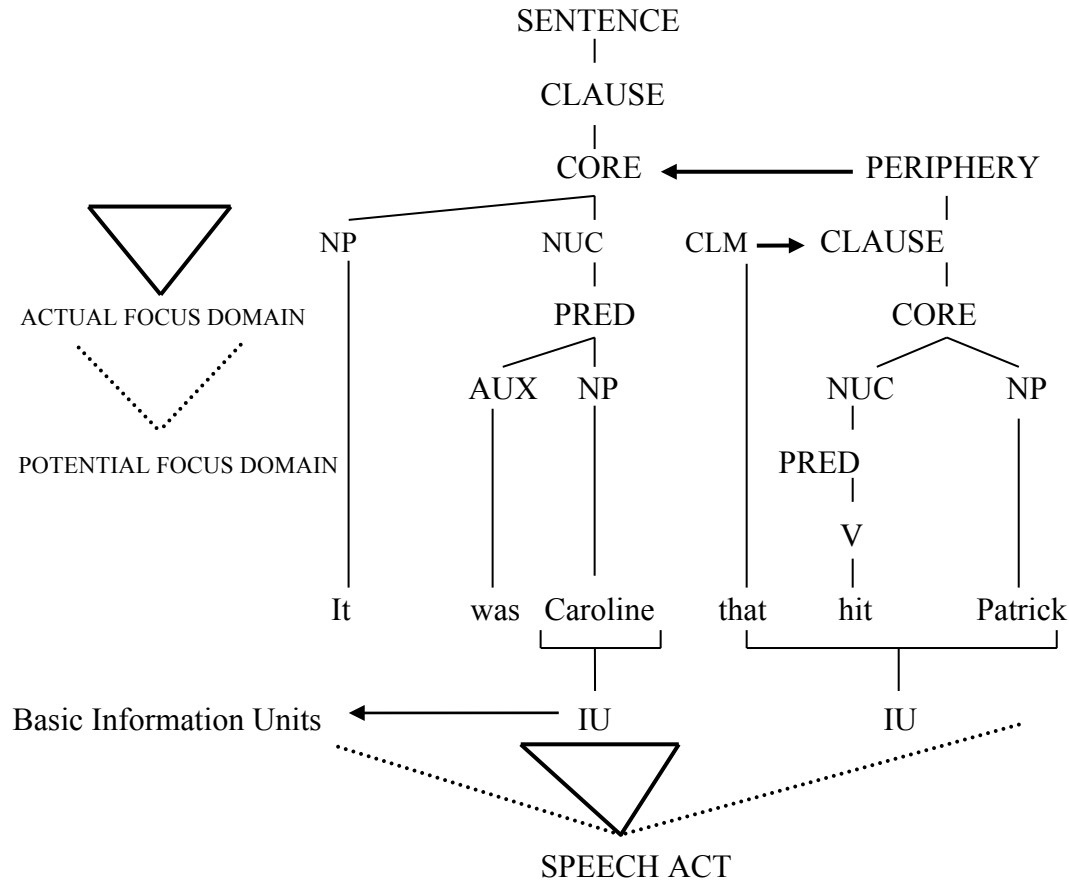


Figure 4: Formal expression of information structure in *it*-clefts

2. An introduction to Persian clefts and pseudoclefts

To date, few studies have been undertaken to explore the nature of Persian cleft and pseudo-cleft constructions. Following the works of Mahootian (1996), Gholam Alizade (1998), Karimi (2005), and Khormai and Shahbaz (2010), Persian exhibits three patterns of cleft and pseudo-cleft constructions viz. *it*-cleft sentences, basic *Wh*-cleft sentences and reverse *Wh*-cleft sentences. Clefting in Persian involves moving the focused element from its unmarked position to the start of the sentence followed by a copula (*bud-an* 'to be [PAST]') or (*hast-an* 'to be [PRES]') and a *ke* 'that' relative clause.

- (11) in farhād bud ke širin=rā dust dāšt.
 this Farhad be.PAST.3SG that Shirin=OM love have.PAST.3SG
 'It was Farhad who loved Shirin.'

It is possible to cleft the direct core arguments (DCAs) and oblique core arguments (OCAs) as well as peripheral adjuncts in Persian. Now consider the examples in (12), (13) and (14) which allow for the possibility for an indirect object, a prepositional adverbial and also a bare NP adverbial to occur in the clefted constituent slot.

- (12) be rahju bud ke man ketāb=o dād-am.
to Rahju be.PAST.3SG that PN.1SG book=OM give.PAST-1SG
'It was to Rahju that I gave the book.'

- (13) tu xiyābun bud ke man did-am=eš.
in street be.PAST.3SG that PN.1SG see.PAST-1SG=PC SG
'It was on the street that I saw her.' (karimi 2005: 92)

- (14) diruz bud ke mehmun-ā res-id-an.
Yesterday be.PAST.3SG that guest-PL arrive-PAST-3PL
'It was yesterday that the guests arrived.'

Mahootian (ibid: 118) defines pseudoclefting in terms of the movement of the non-focused elements from their canonical positions preceded by phrases like *kasi ke* 'the one who', *čizi ke* 'the thing which', *jāi ke* 'the place where', *hengāmi ke* 'the time when', etc.

- (15) kasi ke asb dus dār-e minā-st.
someone that horse like have.PRES-3SG Mina-be.PRES.3SG
'The one who likes horses is Mina.'

- (16) čizi ke rāmin diruz bā sang šekast šiše bud.
thing that Ramin yesterday with stone break.PAST.3SG glass be.PAST.3SG
'The thing that Ramin broke with a stone was a pane of glass.'

The example in (17) is a reverse pseudocleft sentence, taken originally from Khormai and Shahbaz (ibid: 54).

- (17) in ketab čizi-st ke mo>>arref=e nazariyy=e me>>yār mi-bāš-ad.
this book thing=be.PRES.3SG that introducer=EZ theory=EZ standard
IMPF-be.PRES-3SG
'This book is what introduces Standard Theory.'

The structure of basic and reverse pseudoclefts can be formulated by (18) and (19) respectively.

- (18) $\left\{ \begin{array}{l} Kasi \\ čizi \\ jāi \\ zamāni \\ dalili \end{array} \right. \begin{array}{l} \text{'the one'} \\ \text{'the thing'} \\ \text{'the place'} \\ \text{'the time'} \\ \text{'the reason'} \end{array} + ke\text{-clause} + \text{clefted constituent} + \text{copula}$

- (19) Clefted constituent + $\left\{ \begin{array}{l} Kasi \\ čizi \\ jāi \\ zamāni \\ dalili \end{array} \right. \begin{array}{l} \text{'the one'} \\ \text{'the thing'} \\ \text{'the place'} \\ \text{'the time'} \\ \text{'the reason'} \end{array} + \text{copula} + ke\text{-clause}$

3. Syntactic Structure of Persian Clefts

In this section, I attempt to take up the nexus-juncture relation in the first step to explore the layered structure of the clause in Persian cleft sentences. Working through the analysis proposed by Pavey (2004), the nexus-juncture relation in cleft constructions has to do with an ad-core subordination, which is largely motivated by adjoining a subordinate cleft clause to a matrix core through the complementizer, which is referred to as ‘clause linkage maker’ in RRG terminology. Naturally, the linkage type in *it*-clefts is an example of asymmetrical linkage, since the linked unit, the embedded clause, is contained within a sub-clausal unit, namely the matrix core. Why the cleft clause is placed in the periphery of the matrix core can be explained broadly by the two main reasons; one would be the fact that the cleft clause is a pragmatic presupposition by which the speaker signals the hearer to take for granted the proposition contained in the cleft clause. Secondly, the coindexation between the variable in the cleft clause and the value in the matrix clause will stimulate a syntactic dependency²² leading to the placement of the cleft clause in the periphery. The layered structure of the clause for Persian cleft in (11) is given in figure 5. In this figure, I deliberately ignore going through the *in* RRG projection and look into that later.

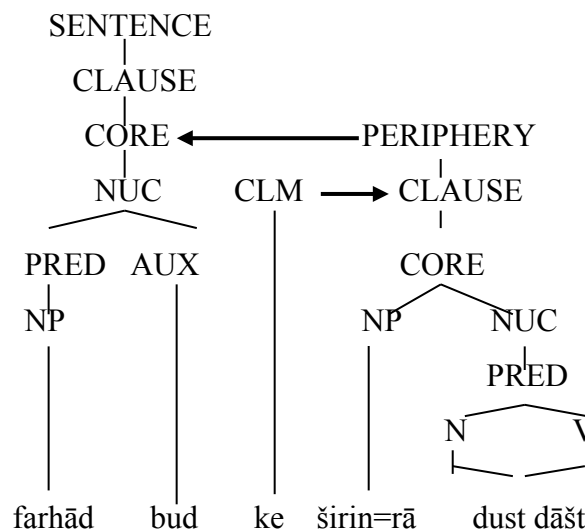


Figure 5: Layered Structure of Clause in Persian clefts

As diagrammed in figure 5, the clefted constituent is placed under the PRED node tracing back to the earlier proposal which offers that the clefts need to be treated as a type of specificational construction in which the clefted constituent functions as a pragmatic predicate. This is because of the predicative function of the clefted constituent that it is projected in the nucleus of the main pragmatic predicate. It was also pointed out that Lambrecht (2001:471) interprets the presence of the cleft pronoun (optional in null-subject languages like Persian and obligatory in non-prodrop languages like English) and the copula as if they did not exist in the sentence. Hence, they do not make significant contribution to the semantic appraisal of the sentence.

²² . Abbott (2000) uses the term ‘grammatical presupposition’ to refer specifically to the grammatical constructions reflecting the fact that what is presupposed vs. what is asserted depends in part on the syntactic structure of the sentence.

Notwithstanding, the empty syntactic structure of an *it*-cleft viz. the presence of the copula in the first place along with the overt or covert pronominal subject entails that this sequence should be accounted for as a kind of focus marker affecting the information structure of the sentence alone, that is, a two-level analysis, whereby the clefted constituent receives its pragmatic role from the matrix predicator and its semantic role from the embedded predicator. Consequently, a thoroughly constructional account for the analysis of *it*-clefts requires that the focus relation between the clefted constituent and the cleft clause be captured by the conceptual distinction between the expressions ‘pragmatic predicate’ and ‘pragmatic subject’ on one hand, and ‘semantic subject’ and ‘semantic predicate’, on the other hand (Lambrecht 1994: 231). I can indicate the cited contrast by the examples in (20), where both signal a narrow focus structure, represented by primary stress on the initial NP in (a) and a syntactically-arranged device, namely clefting in (b). The focus structure representation of the two sentences is as in (21).

- (20) a. **māšin=am** xarāb šod.
 Car=Pc.1SG broken-down become.PAST.3SG
 ‘My car broke down.’
 b. in **māšin=am** bud ke xarāb šod.
 this car=PC.1SG be.PAST.3SG that broken-down become.PAST.3SG
 ‘It was my car that broke down.’

(21) Presupposition: “Speaker’s x broke down”

Assertion: “x= car”

Focus: “car”

Focus domain: NP

Pragmatic predicate: (copula) car

In (20a), the semantic predicate is the syntactic predicate phrase (or verb phrase) *xarāb šod* ‘broke down’ and it simultaneously codes the pragmatic subject *x ke xarāb šod* ‘the x that broke down’, whereas *māšinam* ‘my car’ is the semantic subject and the pragmatic predicate. In other words, the representation of information structure and syntactic structure in (20) can be displayed as in (22).

- (22) a. x ke xarāb šod māšinam bud.
 ↓ ↓
 Pragmatic subject Pragmatic predicate
 b. māšin=am xarāb šod.
 ↓ ↓
 Semantic subject Semantic predicate

In (20b), the clefted constituent *māšinam* is the pragmatic predicate which is syntactically coded as a syntactic predicate phrase, i.e. the left-hand complement of the copula, while the semantic predicate is syntactically expressed by a relative clause. The pragmatically structuring of (20b) is identical with that of (20a) on the grounds that both sentences are representative of a narrow focus structure; one is represented prosodically and one is represented via a grammatical strategy of clefting. ‘Copula’ in the focus structure in (21) is an indication that the open proposition “x *xarāb šod*” ‘x broke down’ must be realized by clefting the undetermined value and relativizing the variable, which is reserved for the coding of the pragmatic presupposition. This claim is also supported by Pavey (ibid: 174). To sum up, Lambrecht (1994: 232) states that a

narrow focus construction is a non-isomorphic mapping relation between syntactic and semantic categories on the one hand and syntactic and information structure categories on the other, and cleft constructions can be viewed as “grammatical strategies for overcoming disparities between semantic structure and information structure”. This proves that cleft constructions are ‘sui generis’ (Huddleston 1984), ‘awkward’ (Sornicola 1988) ‘value-for-variable specifying’ (Declerck 1988; Davidse 2000) sentences the complexities of which cannot be grasped by concrete notions.

The interesting point about Persian cleft sentences is the fact that when the clefted constituent is a prepositional phrase (25 & 26) or an adverbial (27), the sentence is grammatically incorrect if *in* is included; but in case of a noun phrase (22 & 23) in the clefted constituent position, the sentence is definitely grammatical when *in* is present. Furthermore, the presence of *in* ‘this’ is optional when NPs are clefted.

- (23) (in) šomā-hā bud-in ke mamlekat=o be in ruz andāxt-in.
 (this) PN.2PL-PL be.PAST-2PL that country=OM to this day brought.PAST-2PL
 ‘It was you who brought the country to this state.’

- (24)
 (in) kimiya bud ke tunest bā un be-sāz-e.
 (this) Kimiya be.PAST.3SG that can.PAST.3SG with PN.3SG SUBJ-put up.PRES-3SG
 ‘It was Kimiya who was able to put up with him.’

- (25) (*in) be rahju bud ke man ketāb=o dād-am.
 (this) to Rahju be.PAST.3SG that PN.1SG book=OM give.PAST-1SG
 ‘It was to Rahju that I gave the book.’

- (26) (*in) tu xiyābun bud ke man did-am=eš.
 (this) in street be.PAST.3SG that PN.1SG see.PAST-1SG=PC SG
 ‘It was in the street that I saw her.’

- (27) (*in) ruz=e šambe bud ke man un=o did-am.
 (this) day=EZ Saturday be.PAST.3SG that PN.1SG PN.3SG=OM see.PAST-1SG
 ‘It was Saturday when I saw him.’

Karimi (2005: 92) believes that Persian as a richly agreeing null-subject language lacks overt expletive. Comparing the sentences in (23)-(27), she analyzes that the optional presence of ‘*in*’ in (23) and (24) and the impossibility of its presence in (25)-(27) advocate the view that ‘*in*’ needs to be treated as a demonstrative and not a real expletive. She also maintains that the absence of the impersonal ‘there’ as in existential constructions is another consideration that Persian does not have an overt expletive. I agree in part with Karimi’s viewpoint that ‘*in*’ can only be used in cleft constructions when the clefted constituent is an NP, and also her other claim that the inclusive occurrence of ‘*in*’ with NPs would necessitate its deictic anaphoricity. However, this view would be problematic in terms of the analysis I will propose subsequently.

Time is ripe to determine the true nature of ‘*in*’ in Persian clefts regarding an RRG account. I raise the same question posed by Karimi (ibid): “Can *in* in (23) and (24) be considered a demonstrative rather than an expletive?” To answer this, I would like to cite the distinction made in RRG with respect to head- or dependent-marking

languages. It should be pointed out that Persian is a pro-drop language that the agreement between verb and its subject both in number and person is coded by bound morphemes, which are marked on the verb. Correspondingly, Van Valin and LaPolla (1997: 331) indicate that in pro-drop dependent-marking languages such as Italian, Spanish, Icelandic, Croatian, etc, the overt independent NPs count as the core arguments, with the bound morphemes merely being agreement markers. In case of independent NPs absence, it is the bound morphemes that function as core arguments. This is the situation in Persian that bound morphemes are considered merely agreement marker when NP subjects are directly available in the sentence. To illustrate this fact, I represent the layered structure of the clause in the examples in (28) in figure (6).

- (28) a. ānhā šīše=rā šekast-and. b. šīše=rā šekast-and.
 they glass=OM break.PAST-3pl
 ‘They broke the glass.’

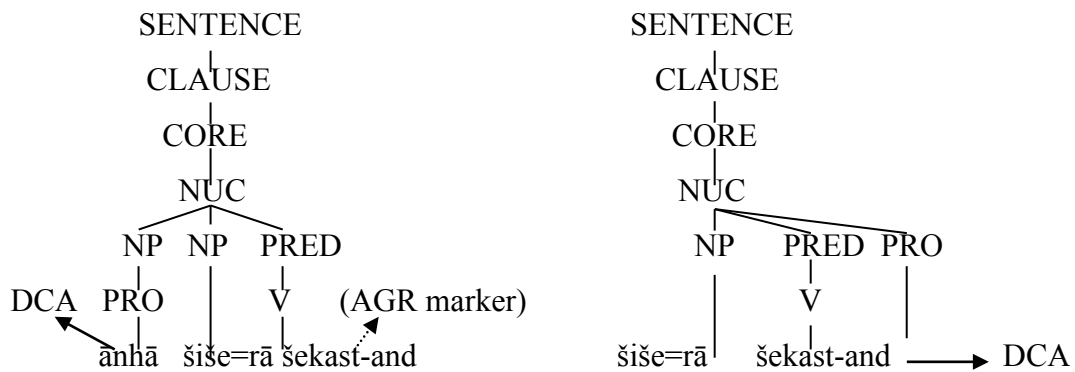


Figure 6: Overt NP and bound morpheme as DCA in Persian

In spite of the straightforward pattern of subject agreement in core transitive and intransitive clauses, as shown in (28), Persian NP-clefted sentences exhibit agreement inconsistency such that the form of the matrix core verb (copula) does not co-vary with the phi-features of the so-called demonstrative; instead it co-varies with the phi-features of the clefted NP, although it must be the case that agreement correlates with the nominative case assignment in null-subject languages. Moreover, in case of PP- or adverbial-clefted sentences, the so-called demonstrative cannot appear in the clause-initial position, as shown in (25)-(27) and the verb agreement in the matrix core of the cleft sentence appears as default value of third singular. This inconsistent agreement pattern raises doubt on the axiom that first NPs in the Persian clauses decide the verb agreement. Clefts provide evidence not to rule out the contingency that Persian deviates from the generally accepted pattern of the verb agreement with the first NP in the clause.

Since the copula agrees with the phi-features of the clefted NPs in Persian, not with that of the optional ‘*in*’, ‘*in*’ cannot be considered as direct core argument of matrix predicator. Given that the privileged controller for agreement in the matrix clause is the clefted constituent, one would ask what the status of ‘*in*’ in Persian clefts is. As discussed earlier, Lambrecht’s (2001) constructional approach analyses the empty syntactic structure of the matrix clause, namely the succession of the copula and its overt or covert pronominal subject, to be a kind of ‘focus marker’ for the argument of another predicator. I believe that focus-assigning function of the matrix clause holds in

Persian with such a nuisance that the optional cleft pronoun or the same so-called demonstrative is not a pronominal subject because copula fails to agree with it. Syntax cannot apparently provide an answer to our question. This is where information structure succeeds in accounting for the status of ‘*in*’ which appears to be an overt expletive that plays a supportive, emphatic role when it is present in the matrix clause. By supportive, I mean that copula is the main instigator of the focus-marking function in cleft constructions as E.Kiss (1998) displays that copula has a [+focus] feature in the SPEC of AUX which triggers the focused-to-be element to possess the spec slot in the AUX node; the arbitrary presence of the expletive intensifies the focus-marking function of the copula. It is the case that Persian as opposed to non-prodrop languages like English does not require a dummy filler to be in the subject position so that the sentence be grammatical. The placement of the overt expletive ‘*in*’ complies with the pragmatic competence of Persian speakers to maximize the focalizing task of Persian cleft constructions.

According to the issue raised above, I represent the overt expletive in the periphery of the clefted NP to highlight these facts:

1. Overt expletive in Persian clefts is not a DCA due to the verb agreement failure
2. The peripheral status of the overt expletive signals its arbitrariness as well as its contribution to double the focus marking function of clefts²³.

²³ . The emphatic contribution of ‘*in*’ in Persian clefts is also confirmed by its combinability with *ham* and *če* as **emphatic** prefixes to form what Phillott (1919: 87) calls ‘emphatic demonstrative pronouns’, i.e. *ham-in* and *čon-in*. The examples below were taken from Mace (2003:59)

- (i) *ham-in ketāb=rā xarid.*
 same-this book=OM buy.PAST.3SG
 ‘He bought the same book.’
- (ii) *čon-in asb-hā=ye qašangi tā be hālā did-e-id.*
 Such-this horse-PL=EZ beautiful till to now see-PSPT-be.PRES-2PL
 ‘Have you ever seen such beautiful horses?’

The emphatic function of *ham* can be observed by the stress falling on it (Mace, *ibid.*), and also on closer inspection, we realize that there is no indication of deictic expression in the English gloss of *hamin* ‘the same’ and *čonin* ‘such’. Lazard (1957: 145) and Lambton (1966: 32) mention that Persian demonstratives, *in* ‘this’ and *ān* ‘that’ can be ‘strengthened’ by *ham*. This emphatic function has also been denoted by Persian grammarians such as Shafai (1984: 611); Anvari and Ahmadi Givi (1989: 263); Kalbasi (1992: 97); Nobahar (1993:205); Meshkatoddini (2005: 104).

It is interesting to know that Persian can exhibit the possibility that a proper noun is preceded by *in*. In this situation, one would have to consider the demonstrative as emphatic element which appears to strengthen the emotional load of the sentence, not to help the addressee identify the referent of the NP, because the proper nouns are inherently referential, hence no need to make them definite, unless the speaker intends to affect the addressee’s emotion. Consider the following examples by which I attempt to convey what I mean by emotional load.

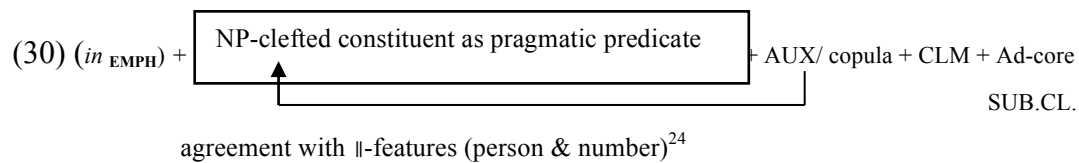
- (i) A: *be farhād goft-am age mašin=eš=o lāzem na-dār-e, be=het qarz=eš be-d-e,*
 To Farhad say.PAST-1SG if car=PC.3SG=OM need NEG-have.PRES-3SG,
 to=PC.2SG lend=PC.3SG SUBJ- give.PRES-3SG
vali alaki goft ke lāzem=eš dār-e.
 but dishonestly say.PAST.3SG that need=PC.3SG have.PRES=3SG
 ‘I told Farhad to lend you his car if he didn’t need it, but he told me dishonestly that he did.’

- B: *in farhād ājab ādam=e mozaxrafi-ye.*
 this Farhad what guy=EZ nasty-be.PRES.3SG

To make this point clear, I will display the syntactic representation of the example in (29) in figure 7.

- (29) in man bud-am ke raft-am taraf=e xāhar=am.
 this PN.1SG be.PAST-1SG that walk.PAST-1SG towards=EZ sister=PC.1SG
 ‘It was me who walked towards my sister.’

Here, I formulate the structural properties of Persian clefts following the argument provoked in the preceding lines in (30) and (31). Then, I will also show how these distinctive properties are stored in the syntactic inventory in figures 8 and 9.



‘What a nasty guy Farhad is.’

I would like to set up another context in which little Farhad and Neda are quarrelling and Neda asks her father to stop Farhad teasing her.

- (ii) Neda: bābā!!! be *in* farhād ye čizi be-gu, man=o azyat mi-kon-e.
 daddy to this farhad one thing IMP-tell.Ø, PN.1SG bother IMPF-do.PRES-3SG
 ‘Daddy!!! Plz tell Farhad not to tease me.’

²⁴ . In Persian, plural inanimate subjects may appear with 3rd /default morphology without number agreement (Sedighi 2006: 38). Consider the following examples.

- (i) in šaye?e-ha mardom=rā be xānde andāxt or (-an)
 this rumor-PL people=OM to laughter drop.PAST.3SG or (-3PL)
 ‘These rumors made people laugh.’

In RRG formulation of Persian clefts, the [\pm animacy] feature must be attended because it leads us to an argument against that the clefted constituent is not in the subject position. Look at the examples below.

- (ii) a. [*in* tāktik-hā]_{DP} bud ke irān=rā be jām=e jahāni bord.
 this tactics-PL be.PAST.3SG that Iran=OM to cup=Ez world take.PAST.3SG
 ‘It was these tactics that took Iran to the World Cup.
 b. [*in* tāktik-hā]_{DP} bud-and ke irān=rā be jām=e jahāni bord-and.
 this tactics-PL be.PAST-3PL that Iran=OM to cup=Ez world take-PAST-3PL

A closer look at (ii) reveals that in (a) the clefted constituent is an inanimate DP with which neither matrix clause nor relative clause verb agrees; however, both appear in default morphology agreement, namely third person. The reason behind considering the clefted constituent as DP is the fact that ‘*in*’ in (a) and (b) is a demonstrative. Further, prosody can help us identify that the DP is an integrated tonic group with primary stress falling on the NP, i.e. *tāktik-hā*. Now consider the pair in (iii).

- (iii) a. *in*’ [tāktik-hā]_{NP} bud-and ke irān=rā be jām=e jahāni bord-and.
 this tactics-PL be.PAST-3PL that Iran=OM to cup=Ez world take-PAST-3PL
 ‘It was the tactics that took Iran to the World Cup.’
 b. **in*’ [tāktik-hā]_{NP} bud ke irān=rā be jām=e jahāni bord.
 this tactics-PL be.PAST.3SG that Iran=OM to cup=EZ world take.PAST.3SG

Above, I have illustrated the emphatic ‘*in*’ being separated from the clefted constituent by a pause (’), which means prosodically that both ‘*in*’ and the clefted constituents carry the primary stress. In other words, ‘*in*’ in (iia) and (b) is a part of the clefted constituent and functions as deixis, whereas ‘*in*’ in (iiia) and (b) is separated from the clefted constituent by a pause and functions as emphatic marker. Moreover, the agreement failure with ‘*in*’ in (iiib) and agreement success with the clefted constituent can provide the proof that the second NP is in the subject position of the matrix clause along with the fact that the

(31) (**in* _{EMPH}) { PP-or ADV-clefted constituent as pragmatic predicate + AUX /copula +CLM +
 ↓
 Ad-core SUB.CL.
 Default agreement: 3rd SG

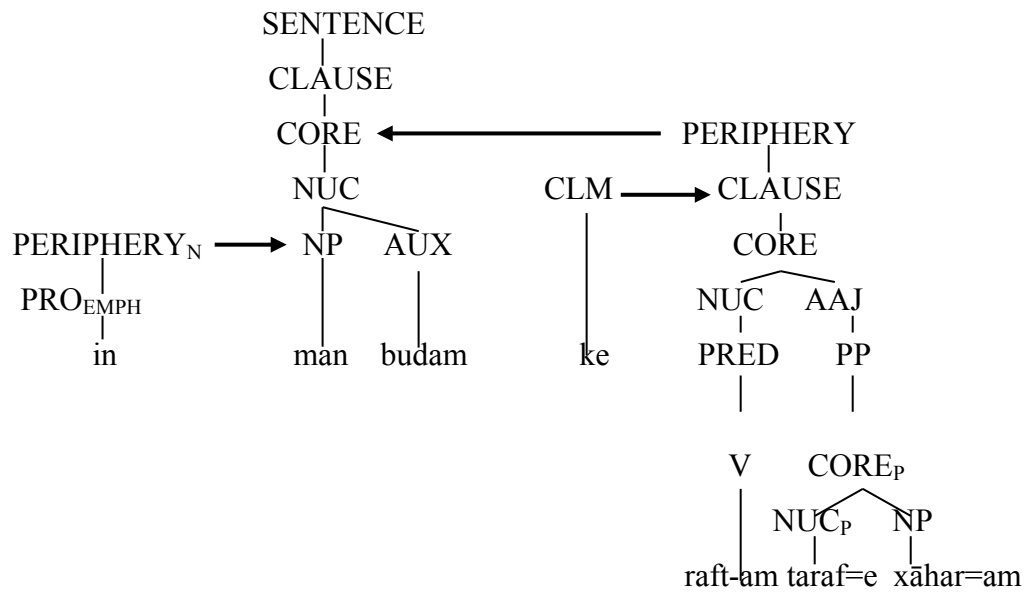


Figure 7: RRG projection of the Persian cleft Pronoun

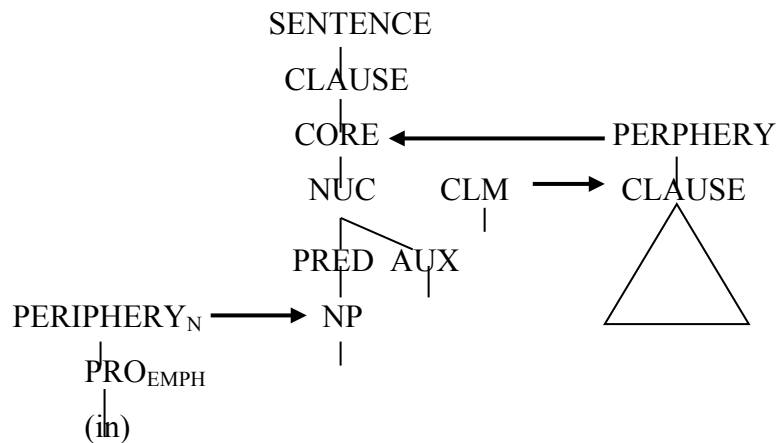


Figure 8: Syntactic template for Persian NP-clefted construction

emphatic function of 'in' must be distinguished from its deictic function, which is illuminated by syntactic, prosodic and informational considerations.

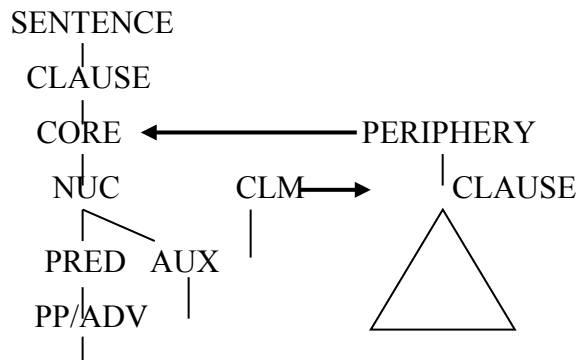


Figure 9: Syntactic template for Persian PP- or ADV-clefted construction

4. Semantic Structure of Persian Clefts

Along the lines proposed by Pavey (2008), I employ an identical approach to the semantic representation of Persian clefts. She claims the function of noun phrases to alter from reference to predication. NPs which are non-specific and non-referential function as semantic predicate, whereas NPs which are specific and referential are referring expressions which probably function as pragmatic predicate in specificational sentences. Nominal semantic predicates are found in identificational sentences which provide descriptions, as in (32), while nominal pragmatic predicates are found in specificational sentences such as clefts and pseudoclefts, which serve to provide the hearer with the full identity of the particular entity the speaker has in mind, as in (33).

(32) Monica is a chef. (chef: Semantic predicate with descriptive function)

(33) George is the winner. (winner: Pragmatic predicate with specificational function)

She argues convincingly that it is in the communicative exchange that participants are able to cope with the cognitive and grammatical coding of the discourse referents. The communication procedure in uttering a specificational sentence operates in a way that the hearer is not able to identify fully a particular referent, although recognizing or guessing somehow; hence, the speaker assists the hearer to make a full identification of the underspecified referent. To settle such underspecification, it is urgent for the variable to be specific, non-referential and for the value to predicate something of the variable; the reason Lambrecht exploits the pragmatic predicate term. As Pavey (ibid) discusses, *the bank robber* in the communicative exchange in (34) can be described as identifiable, specific and non-referential in (a); thus, the speaker B starts with the same theme to enable the hearer to come up with intended referent.

(34) a. Who is the bank robber?

b. The bank robber is John Thomas.

As discussed earlier, the cleft sentences are considered as a type of copular specificational constructions that provide a value for a variable. So, the specificational function of *it*-clefts must be reflected in their logical structure. Following Van Valin (2005: 48), the logical structure of different types of copular sentences is represented as in (35).

(35)

- | | |
|--|------------------|
| a. Pat is small: be' (Pat, [small']) | Attributive |
| b. Kim is a lawyer: be' (Kim, [a lawyer']) | Identificational |
| c. George is the winner: be' (George, [the winner']) | Specificational |
| d. Kim's sister is Sandy's lawyer: equate' (Kim's sister, Sandy's lawyer) | Equational |

Pavey (2004) indicates the specifying function by exploitation of **be'** as the main predicate in the semantic structure of *it*-cleft constructions. This is the predicate used in the logical structure of the specificational sentences, as shown in (35c). It turns out that the specificational predicate is different from the English auxiliary *be* as it comes to mark specificational on a par with attributive and identificational predication. *Be* as auxiliary is not part of the predication in copular sentences.

The discrepancy between simple specificational sentences like (35c) and specificational cleft sentences can be identified by the value and variable being NPs in the former which contrasts with that the variable discourse referent not expressed syntactically as a noun phrase, although a relative-like clause in the clefts. **be'** predicate contains two arguments represented as *x* and *y*. *x* equals the semantic content of the cleft clause (variable) and *y* corresponds to the clefted constituent (value). Since specification is the most remarkable property of *it*-clefts, we should make adequate provision to envisage it in syntactic, semantic and information structure representation of the sentences. The copula as well emphatic cleft pronoun in Persian clefts is the syntactic device in doing so. As for the semantic participation in accomplishing such a cooperative task, the internal logical structure of the cleft clause has an unfilled argument that is coindexed with the second argument of specificational **be'**, i.e. *x*, representing the value. Therefore, I can illustrate the logical structure for Persian clefts in (11) as in (36).

(36) **be'** ([**love'** (*x_i*, shirin)], Farhad_{*i*})

The point I would like to make out is that the emphatic *in* has not been represented in the logical structure in (36); it implies that this emphatic element in the Persian clefts makes no syntactic or semantic contribution to their analysis; hence an expletive, it only cooperates with the copula to affect the information structure of the sentence and strengthen the focus marking nature of Persian clefts.

Predicative and non-predicative PPs can be clefted and placed in the focus position of Persian clefts. Based on the RRG-based account, argument-adjunct and adjunct prepositions are predicative by nature; thus, this semantic property must be mirrored in the logical structure of the predicative PP-clefted sentences. To this end, Pavey deploys the abstract logical structures, which were adopted in RRG theory by Van Valin and Lapolla (1997) for representing the English *wh*-words in the precore slot. The history of abstract logical structures dates back in Jurafsky (1992). **be-LOC'** and **be-TEMP'** are abstract logical structures in (37b') and (38b').

(37) a. qazal māni=ro tu madrese did.

- Ghazal Mani=OM in school see.PAST.3SG
 ‘Ghazal saw Mani in the school.’
 a'. [**be-at'** (madrese, [**see'** (Ghazal, Mani)])]
 b. qazal māni=ro kojā did?
 Ghazal Mani=OM where see.PAST.3SG
 ‘Where did Ghazal see Mani?’
 b'. [**be-LOC'** (kojā, [**see'** (Ghazal, Mani)])]
- (38) a. qazal māni=ro ba>>d=e madrese did.
 Ghazal Mani=OM after=EZ school see.PAST.3SG
 ‘Ghazal saw Mani after the school.’
 a'. [**be-after'** (school, [**see'** (Ghazal, Mani)])]
 b. qazal māni=ro kei did?
 Ghazal Mani=OM when see.PAST.3SG
 ‘When did Ghazal see Mani?’
 b'. [**be-TEMP'** (key, [**see'** (Ghazal, Mani)])]

If the clefted constituent is an argument-marking preposition with its NP complement, the NP is coindexed with an unvalued argument in the complex logical structure. This is shown in (39b). Pavey maintains that in the semantic representation, clefted argument-marking prepositional phrases are treated the same as clefted noun phrases and not represented in the logical structure of the sentence.

- (39) a. be rahju bud ke man ketāb=o dād-am.
 to Rahju be.PAST.3SG that PN.1SG book=OM give.PAST-1SG
 ‘It was to Rahju that I gave the book.’
 b. **be'** ([[**do'** (1SG, Ø) CAUSE BECOME **have'** (x_i, ketāb)], Rahju_i)

In case the clefted constituent is an argument-adjunct prepositional phrase, the abstract logical structure **be-LOC'** is used.

- (40) a. ruy=e miz bud ke ketāb=o gozāšt-am.
 on=EZ desk be.PAST.3SG that book=OM put.PAST-1SG
 ‘It was on the desk that I put the book.’
 b.
be' ([[**do'** (1SG, Ø) CAUSE BECOME **be-LOC'** (x_i, ketāb_j)]], [**be-on'** (miz, y_j)]_i)

As can be seen, the variable in the specificational logical structure contains an abstract logical structure the first argument of which x, representing the unvalued argument of the predicative preposition, is coindexed through ‘i’ with the value as the second argument of specificational predicate **be'**. (y) in the value element of **be'** flags the second argument of the locative predicate, coindexed with it by ‘j’. This semantic representation covers up the specificational function of the Persian cleft constructions via **be'** insertion, represented by coindexation in the logical structure.

When an adjunct prepositional phrase is clefted, Pavey (2004: 225) recommends to use locative or temporal abstract logical structures, i.e. **be-LOC'** and **be-TEMP'**.

- (41) a. tu xiyābun bud ke man did-am=eš.
 in street be.PAST.3SG that PN.1SG see.PAST-1SG=PC SG
 ‘It was on the street that I saw her.’
 b. **be’** ([**be-LOC’** (x_i, [**see’** (1SG, 3SG)] j)], [**be-in’** (xiyabun, y_j) i])

According to logical structure of the adjunct prepositional phrases as clefted constituent, there is no missing argument in the logical structure of the cleft clause, but since clefts are specificational, it is necessary to identify a value for a variable in the logical structure of prepositional phrase.

Temporal adjunct can also function as focus phrase in Persian clefts, as already noted. To represent the logical structure of adverbial-clefted constructions, the **be-TEMP’** is used again.

- (42) a. diruz bud ke farhād mahdi=ro be pārk bord.
 yesterday be.PAST.3SG that Farhad Mahdi=OM to park take.PAST.3SG
 ‘It was yesterday that Farhad took Mahdi to the park.’
 b.
be’ ([**be-TEMP’** (x_i, [[**do’** (Farhad, Ø)] CAUSE [BECOME **be-in’** (park, Mahdi)]] j)], [**yesterday’** (y_j) i])

5. Focus Structure of Persian Clefts

Having taken a constructional approach to the analysis of Persian clefts so far, I follow up the taxonomy of focus structure, proposed by Lambrecht (1994), also adopted in RRG, with respect to the Persian clefts. Persian clefts are functionally narrow focus constructions in which the clefted constituent rests in the precopular actual focus domain in order to enable the addressee to interpret exhaustively the value element as specific referent holding a focus relation to a pragmatically presupposed proposition in the cleft clause.

Keep in mind that Persian clefts are semantically specificational constructions that provide a value for an underspecified element in the variable. It is noteworthy that focus of proposition is acknowledged not as a referential property of a denotatum in the discourse model; rather, as a relation established between the denotatum and the proposition.

This means that a focal denotatum may in principle have the same referent as a topical denotatum but what makes it focal is its new relation to the presupposition. In other words, a denotatum can be referentially given but relationally new. More strictly speaking, a cleft sentence is from a constructional viewpoint a disambiguative, discourse-pragmatic strategy on the side of the speaker to instruct the hearer to establish a pragmatic relation between a denotatum and a proposition. RRG provides the Persian speakers with two syntactic templates including the focus structure projection, given in figures 10 and 11.

The cleft clause is not placed in the focus domain because it is pragmatically and grammatically presupposed. As reflection of this, the units in the cleft clause cannot be interrogated, as shown in (43).

- (43) Q: mahdi bud ke farhād diruz bord=eš pārk?

Mahdi be.PAST.3SG that Farhad yesterday take.PAST.3SG=PC.3SG park
 ‘Was it Madi that Farhad took to the park?’
 A: na, māni (bud)/ * na, sinamā/ * na, dišab [ke farhād diruz bord=eš park].
 no Mani (be) no cinema no last night
 ‘No, it was Mani.’

Let’s have a look at the information distribution in the example in (44), taken from *Bufe kur* ‘the blind owl’ [Hedayat 1936].

(44) tanhā marg ast ke doruq ne-mi-gu-(y)ad! hozur=e
 only death be.PRES.3SG that lie NEG-IMPf-tell.PRES-3SG presence=EZ
 marg hame=(y)e mouhumāt=rā nist-o nābud mi-kon-ad.
 death all=EZ hallucinations=OM destroy-CONJ ruin IMPF-do.PRES-3SG
 mā bačče=(y)e marg hast-im va marg ast ke mā=rā
 PN.1PL child=EZ death be.PRES-1PL and death be.PRES.3SG that PN.1PL=OM
az faribkāri-hā=(y)e zendegi nejāt mi-dah-ad.
 from deceit-PL=EZ life save IMPF-give.PRES-3SG

‘It is only death that does not lie. Death existence annihilates all hallucinations.
 We are the children of death and it is death that rescues us from the deceptions of
 life.’ P.69

I would like to turn to the relational and referential givenness/newness and relational givenness/newness distinction (Gundel 2004, 2008) where the former is defined in terms of a semantic/conceptual partition of a sentence into two complementary parts, x and y; x is what the sentence is about and y is what is predicated about x, and the latter is defined in terms of the relation between a linguistic expression and a corresponding entity in the discourse model that is based on the referential Givenness Hierarchy (Gundel et al 1993). In (44), the cognitive status of the clefted constituent *marg* is referentially presupposed/ given because it is ‘in-focus’ of the preceding discourse model. Likewise, the cleft clause material is referentially presupposed because it at least entails ‘uniquely identifiable’ in the proposition ‘x mā=rā az faribkārihā=(y)e zendegi nejāt midahad’.

Interestingly, being directly evoked in the discourse, the clefted constituent bears a focus relation to the propositional content of the cleft clause (as it is projected in the PRED node of the syntactic template in figure 4.10) on the grounds that it establishes a ‘new’ relation to an indirectly-evoked mistaken belief that death could be the endpoint of life. The author would be inclined to convey to his addressee (probably afraid of death) that death is not the end, rather a rebirth by the stating *mā bačče=ye marg hast-im* ‘we are the children of death’. Accordingly, *marg* is considered relationally new.

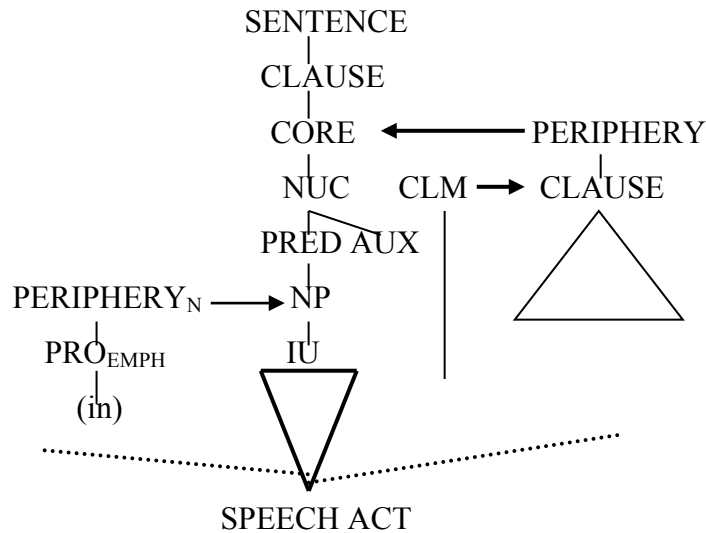


Figure 10: Persian NP-clefted syntactic template with focus structure projection

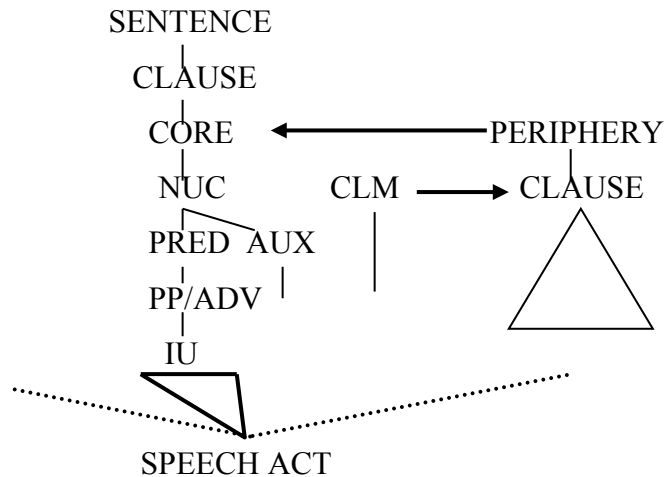


Figure 11: Persian PP- or ADV-clefted syntactic template with focus structure projection

To elaborate on the relational status of the relative clause [RC] proposition, I employ the notions of Knowledge-presupposition [k-presupposition] and Topicality-presupposition [T-presupposed] in Lambrecht (2001). The RC-proposition in the cleft clause is known to the hearer as it is a part of pragmatic presupposition, i.e. K-presupposed (the hearer is ready to take for granted at utterance time that death will rescue us from life deceits)); yet it is not of hearer's current interest; hence not T-presupposed (the topicality of the RC-proposition is not sufficiently salient to be 'ratified'/ pragmatically accommodated, that is, the hearer is not expected to be given information about death's capability to rescue humans). This leads us to consider the RC-proposition of (44) as relationally new. To summarize, the cleft sentence above is a sample of informative-presupposition, evidenced by the primary stress falling on an element inside the cleft clause, namely *nejāt*. Khormai and Shahbaz (2010) argue that in case of informative-presupposition clefts, the hearer is cognitively invited to evaluate the proposition in the cleft clause as given. This is what Lambrecht (1994) calls 'pragmatic accommodation', a discourse strategy that enables the interlocutors to push forward the discourse model.

Clefted constituent	Cleft clause
marg	X ke mārā az faribkārihāye zendegi nejāt midahad
Referentially given	Referentially given
Relationally new	Relationally new

Table 1: Referential and relational givenness in (44)

Now consider the informational pattern in (45), excerpted from *ruzegār-e separi šode-ye mardom-e sālخورde* ‘the bygone era of the senile people’ [Dowlatabadi 1998].

- (45) har do tā=šān barādar-hā=(y)am bud-and, ham abdus=rā
 each two CL=PC.3PL brother-PL=PC.1SG be.PAST-3PL also Abdus=OM
 dust dāšt-am va ham yadegār=rā ke bad az ān nāxuši ham
 love have.PAST-1SG and also Yadegar=OM that after from that sickness also
 nākār shod ke shod. bad az marg=e
 inefficient become.PAST.3SG that become.PAST.3SG after from death=EZ
 pedar=am, **in barādar-hā=(y)am bud-and ke man=rā**
 father=PC.1SG this bother-PL=PC.1SG be.PAST-3PL that PN.1SG=OM
be yād=e u mi-andāxt-and. (p.31)
 to memory=e PN.3SG IMPF-cast.PAST-3PL
 ‘Both of them were my brothers; I loved both Abdus and Yadegar, who became
 inefficient after that sickness. After my father’s death, it was my brothers who
 reminded me of his memory.’

The cognitive status of the cleft clause is always referentially given. The cognitive status of the clefted constituent is referentially given too, as there are direct mentions of it in the previous sentences. The cleft clause material is relationally given because it is inferrable from the expression *bad az marg=e pedar-am* ‘after my father’s death’ that when a person passes away (specially a family member), his relative think of him after his death. Therefore, the proposition ‘x ke man=rā be yād=e u mi-andāxt-and’ is relationally given. In other words, the RC-proposition topicality is construed as pragmatically ratified/ accommodated. Arguably, the clefted constituent still holds a focus relation to the presupposed RC-proposition, hence relationally new. This type of sentence is the prototypical case of clefting (stressed focus *it*-clefts), for the cleft clause is both referentially and relationally given and the clefted constituent is relationally new. The primary stress falls on the clefted constituent.

Last but not the least, it is evident that RRG can explicitly formalize the expression of information structure with the help of actual focus domain, that is, the clefted constituent, no matter its referential coding, bears a new/focus relation to the RC-proposition, regardless of the mental or relational representation of the cleft clause.

Clefted constituent	Cleft clause
barādar-hā=yam	x ke man=rā be yād=e u mi-andāxt-and
Referentially given	Referentially given
Relationally new	Relationally given

Table 2: Referential and relational givenness in (45)

6. Information Structure-Syntax Interface in Cleft-like Constructions in Persian

In this part, an argument will be developed regarding the existence of two other constructions prevalent in Persian discourse which bears remarkable resemblance to Persian cleft constructions.

Extrapositional sentences are the hallmark of such affinity. This section argues that these two types of information packaging devices in Persian discourse can indeed be differentiated by the interaction of constituent projection and focus structure projection in the RRG theory. Both extraposition and clefting are thematically marked grammatical constructions with which the natural language users are provided the possibility to depart from the unmarked expression of sentences, e.g. clefting in Persian represents a markedly structuring of a non-focal argument as focal by placing it in the precopular position of a matrix clause. On the other hand, extraposition is moving a clause out of the subject domain and placing it sentence-finally. The structural similarity of these two can be represented in the following way, proposed by Calude (2008).

(46)

- a. Persian cleft sentence: (in) + clefted constituent + copula + cleft clause
- b. Persian extraposed sentence: (in) + remainder predicate + copula + extraposed clause

Here I present an example of extraposition in Persian, taken from *čerāqhā rā man xāmuš mikonam* ‘the lights, I’ll turn off’ [Pirzad 2001].

- (47) in mohem nabud ke ninā šelaxte ast va be qoul=e
 this important NEG-be.PAST.3SG that Nina untidy be.PRES.3SG and to word=EZ
 madar tu=(y)e xāne=aš šotor bā bār=aš gom
 mother in=EZ house=PC.3SG camel with burden=PC.3SG lost
 mi-sha-(v)ad. in mohem bud ke ninā va gārnīk bā
 IMPF-beome.PRES-3SG this important be.PAST.3SG that Nina and Garnik with
ham xub va xoš bud-and. (P. 22)
 together good and happy be.PAST-3PL
 ‘It was not important that Nina is untidy and as her mother says, a camel with its
 burden is lost in her house. It was important that Nina and Garnik are happy and
 prosperous together.’

The ambiguity between clefting and extraposition can be solved in the first place via the information structure which is the reflection of their discourse functions. As already mentioned, clefts are focus marking devices, highlighting or contrasting bits of information, that is, they are in fact attention markers (Miller and Weinert 1998: 301). Extraposition, on the other hand, is associated with the avoidance of having complex subjects at the beginning of the sentence serving the two principles of end-focus and end-weight (Quirk et al. 1985: 863). Extraposition in principle patterns with the Given-Before-New principle (Gundel 1985; 1988) and also with the Communicative Dynamism proposed by the Prague School. For instance, in (47), the hearer’s mind has been previously impregnated with the presupposition that something is important and the speaker, because of the syntactic heaviness and a high degree of informativeness in the new element, finds it expedient to lighten the load of the element by ‘demoting’ it from the subject position to the end of the sentence. To follow up the above-mentioned

comment, I represent how the information is organized in (47) in figure 12 by using the syntactic and focus structure representations in RRG. The nexus-juncture relation in extraposition is daughter clausal subordination because the extraposed clause is both informationally and structurally dependent on the matrix clause whereas this relationship in clefts is of ad-core subordination alongside the cleft clause is placed in the periphery of the matrix clause.

It was previously pointed out in (9) that the focus domain in complex sentences can extend over the subordinate clause if and only if the subordinate clause is the direct daughter of the clause node which is modified immediately by the IF operator. Figure 12 shows that the subordinate clause meets the condition and consequently, the focus domain encompasses the extraposed clause. More specifically, the actual focus domain falls upon it because it contains new information.

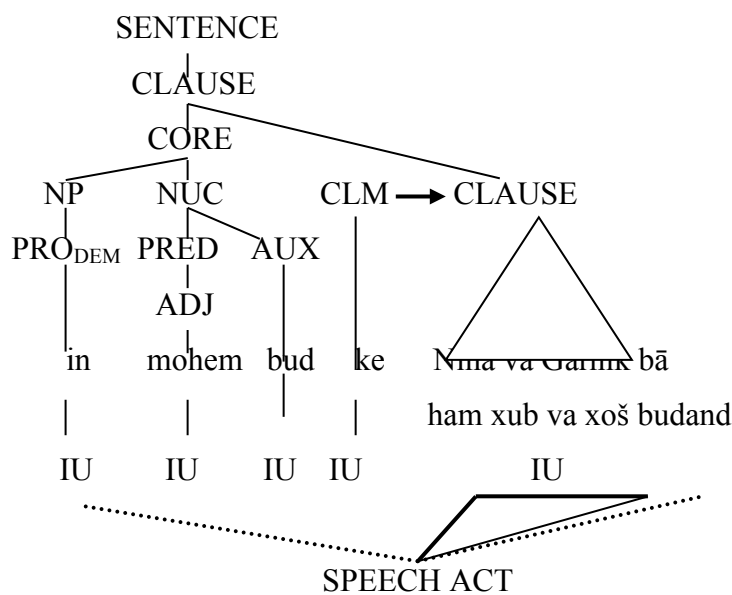


Figure 12: Syntactic representation of Persian extraposed sentences along with the focus structure projection

Extraposition accords with the Persian speakers' communicative competence in the placement of the heavy complex NP to the end part of the sentence because processing a sentence starting off with a complex NP of strong informativeness would be high-cost for them communicatively.

This discourse strategy of Persian speaker can be stored in a syntactic template in which the extraposed clause lies in the actual focus domain. It is worth noting that 'in' has been treated as demonstrative in the syntactic template of extraposition in figure 13, while 'in' in clefting as emphatic in the syntactic template of clefting in figure 10.

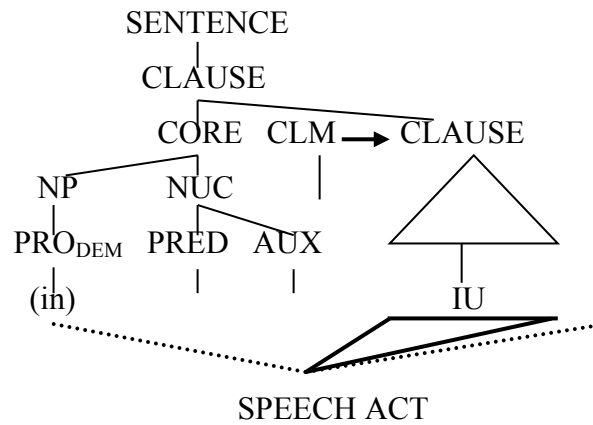


Figure 13: Syntactic template for Persian extraposed sentences along with the focus structure projection

The point here is that the demonstrative in extraposed constructions functions as core argument, due to its agreement with the copula, but the emphatic element in the cleft constructions functions as a nominal adjunct in the NP periphery because of its agreement failure with the copula. The optional presence of demonstrative in extraposition is justified with the pro-drop parameter of Persian as a null subject language, while the optional presence of ‘*in*’ in the cleft sentences needs to be justified by the Persian speakers’ communicative competence to intensify the focus marking function of clefts. In other words, Persian syntax on one hand, prepares the grounds for the deictic ‘*in*’ in the extraposition to be interpreted anaphorically (i.e. the subject position of the demonstrative) and Persian discourse stylistics takes the responsibility to interpret ‘*in*’ in the clefting emphatically when it comes to the incapability of syntactic features (i.e. agreement failure of the emphatic).

The treatment of ‘*in*’ as demonstrative is also confirmed by Karimi (2005: 92). She suggests that subordinate extraposed clauses are indeed headed by an NP viz. the demonstrative *in*, as in (48). The obligatory presence of ‘*in*’ in (48b) and the possibility that the demonstrative in Persian can replace the whole DP, as demonstrated in (49), give evidence that *in* is an anaphoric expression in the subject position. From an RRG perspective, the sentence in (48a) is an example of daughter clausal subordination as it has been indicated in figure 12. The sentence in (48b), on the other hand, represents an example of ad-core NP subordination (Van Valin and Lapolla 1997:509) where the demonstrative is placed in the NUC_N and the relative clause is adjoined to the CORE_N. The layered structure of the clause in (48) is given in figures 14 and 15.

- (48) a. (in) vāzeh-e [CPke kimiya doxtar=e xubi-(y)e]. (Extraposition)
 (this) clear-be.PRES.3SG that Kimiya girl=EZ good-be.PRES.3SG
 ‘It is clear that Kimiya is a good girl.’
 b. [DPin [CPke kimiya doxtar=e xubi-(y)e]] vāzeh-e. (Non-extraposition)
 b’. *[CPke kimiya doxtar=e xubi-(y)e] vāzeh-e

- (49) in vāzeh-e.
 this clear-be.PRES.3SG
 ‘It is clear.’

Van Valin and Lapolla (1997: 527) assert that since the expletive pronoun contributes to the semantic interpretation of the sentence in the way that it refers to a *that*-clause outside the core, it must be a part of semantic representation. This is the case in the Persian extraposed construction where ‘*in*’ refers to the subordinate *ke*-clause; thus participates in the semantic representation whereas in Persian cleft construction, ‘*in*’ is not a part of semantic representation because of its very syntactically as well as semantically dummy nature, as discussed earlier. Further, the demonstrative indicates the function of the *ke*-clause as actor or undergoer. Logical structures of (48a) and (b) are given in (50) and (51) respectively.

(50) **be’** ([3SG DEM_i, [**be’** (Kimiya, [**good girl’**])]_i], [**clear’**])

(51) **be’** ([**be’** (3SG DEM, [**be’** (Kimiya, [**good girl’**]))], [**clear’**])

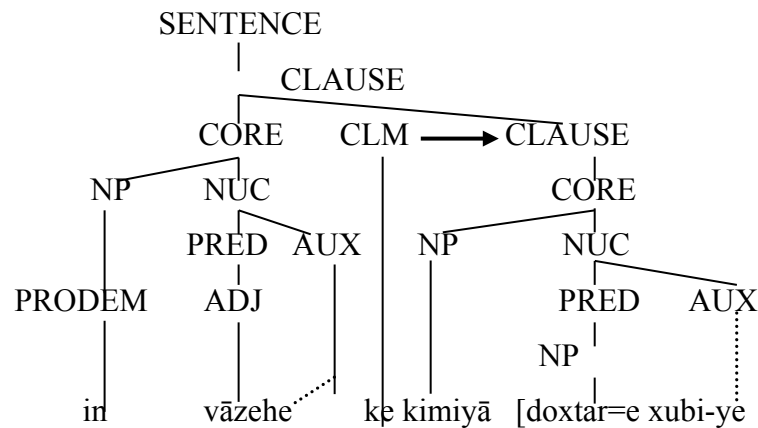


Figure 14: Daughter clausal subordination in extraposed sentences in Persian

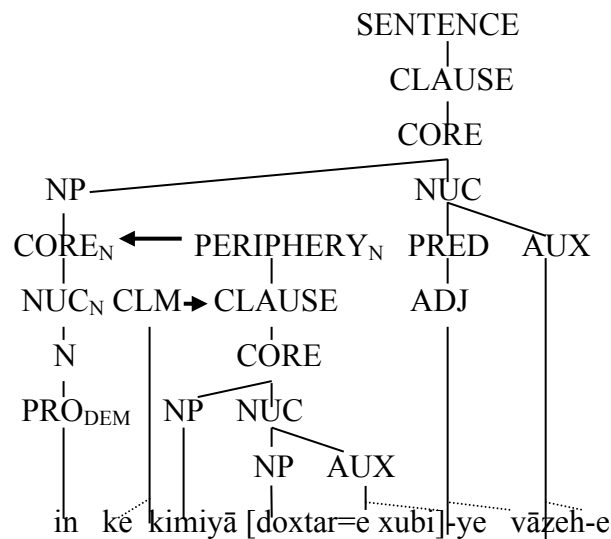


Figure 15: Ad-core NP subordination in Persian

To provide further proof in support of ‘*in*’ differentiation in the Persian cleft and extraposed constructions, I employ a transformational test, partly similar to the one proposed by Calude (2008), according to which the process of reinstating the extraposed clauses to its original position will result in grammaticality, while doing the same to the cleft clause will bring about ungrammaticality. Consider the reinstatement process in (48a), repeated below as (52), and in (11), repeated as (53).

(52) Reinstatement test:

↓
in vāzeh-e ke kimiyā doxtar=e xubi-(y)e.

in ke kimiyā doxtar=e xubi-(y)e vāzeh-e. = grammatical result \implies Extraposition

(53) Reinstatement test:

↓
in farhād bud ke širin=rā dust dāšt.

↓
?? in ke širin=rā dust dāšt farhād bud. = ungrammatical result \implies Clefting

One might claim that the result of the reinstatement test on (53) is acceptable, but a far closer look reveals that its oddity will be removed if we take the sentence in (54) into consideration. In other words, the grammatical form is a pseudocleft sentence.

(54) un ke širin=rā dust dāšt farhād bud.
that that Shirin=OM love have.PAST.3SG Farhad be.PAST.3SG
‘The one who loved Shirin was Farhad.’

Aside from the extrapositional sentences, other sentences can be found bearing structural similarity to the cleft sentences. Again, this is information structure that can help us distinguish between them although syntactic features sometimes prove helpful. Consider the examples in (55) and (56).

(55) a. vasat=e rāhrou bud-Ø ke nedā zang zad.
middle=EZ doorway be.PAST-3SG that Neda ring hit.PAST.3SG
‘It was in the middle of the doorway that Neda Rang.’

(56) vasat=e rāhrou bud-am ke nedā zang zad
Middle=EZ doorway be.PAST-1SG that Neda rang.
‘When I was in the middle of the doorway, Neda Rang’

The only criterion which enables us to distinguish between the two sentences is the bound morpheme marked on the copula. In (55), the agreement marker is a 3rd person zero morpheme, indicated here for the clarity sake, while it is overt 1st person morpheme. According to the formulization of cleft constructions, the 3rd person agreement morphology signals that a PP or an ADV has been clefted. As for (56), I consider it to be a kind of fronted adverbial construction, representing a sentential subordination which involves sentences or clauses occurring in the right- or left-detached position (Van Valin 2005: 192). The relation between of the adverbial subordinate clause to the core it modifies is the same as that of a peripheral PP modifying a core. Therefore, since a fronted peripheral PP occurs in the LDP, a fronted adverbial clause can appear, by comparison, in the same position. Van Valin and Lapolla (1997: 228) argue that the elements in the LDP are always topical; hence

outside of the actual focus domain. Regarding all this, I represent the syntactic and focus structure of (55) in figure 16 together with the semantic representations of the two sentences in (57) and (58).

(57)

be' ([**be-LOC'** (x_i , [**do'** (Neda, [**ring'** (Neda))])])_j], [**be-in middle of'** (rāhrou, y_j)]_i)

(58)

be-in middle of' ([rāhrou, 1SG]), [**do'** (Neda, [**ring'** (Neda))])

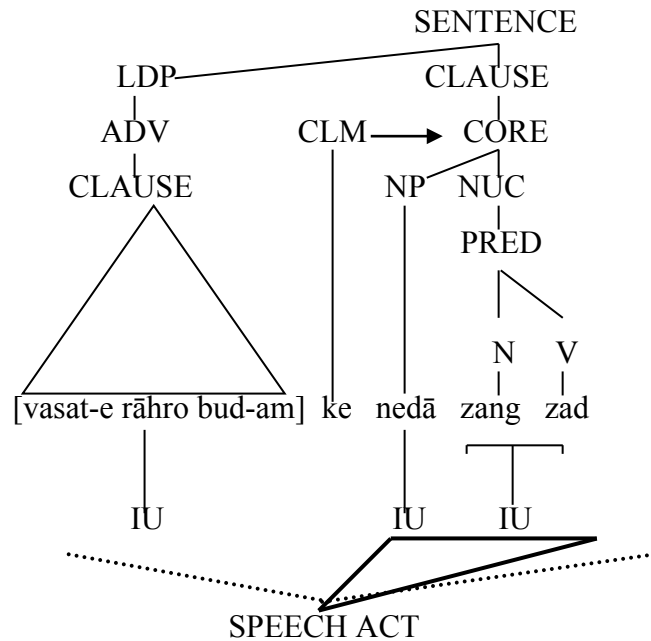


Figure 16: Information structure-syntax interface in Persian fronted adverbial

The potential focus domain in figure 16 does not extend over the fronted adverbial clause because it is not the direct daughter of the clause immediately dominated by IF operator. The actual focus domain falls on the whole clause, that is, any item in it can be actually brought into focus. Crucially, *ke* appears to be able to emphasize any NP or the entire clause in Persian as an emphatic (Windfuhr 1979: 71).

7. Grammatical Relations and Constructional Schemas in Persian clefts

RRG takes a somewhat different view of grammatical relations, which are defined in terms of the neutralization of semantic macroroles for syntactic reasons in specific constructions. To begin with, I get into the determination of the PSA in sentences in which NPs are clefted. Since clefts consist of two clauses, it seems that each has its own PSA.

In Persian cleft constructions, there is a neutralization with respect to the omitted argument in the subordinate cleft clause, i.e. both actor and undergoer can be regarded as PSA, for either can function as clefted constituent. This means the PSA in the cleft constructions is a syntactic pivot. Given that *in* cannot occur when the clefted constituent is not an NP, and it is optional with clefted NPs, it would be best to take the form without *in* as basic.

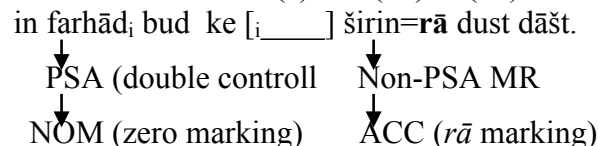
- (59) a. farzād_i bud ke [i____] xaste šod. (Undergoer of an intransitive verb)
 Farzad be.PAST.3SG that tired become.PAST.3SG
 ‘It was Farzad who became tired.’
- b. mehrdād_i bud ke [i____] dar raft. (Actor of an intransitive verb)
 Mehrdad be.PAST.3SG that PREV go.PAST.3SG
 ‘It was Mehrdad who ran away.’
- c. farhād_i bud ke [i____] sar=eš=o šekast. (Actor of a transitive verb)
 Farhad be.PAST.3SG that head=PC.3SG=OM break.PAST.3SG
 ‘It was Farhad who broke his head.’
- d. nedā_i bud ke bačče-hā [i____] mi-zad-an=eš
 (Undergoer of a transitive verb)
 Neda be.PAST.3SG that kid-PL IMPF-hit.PAST-3PL=PC.3SG
 ‘It was Neda that the kids hit.’

The clefted constituent, however, is a double controller because it controls both the core-internal phenomenon viz. verb agreement in the matrix clause, and it controls the interpretation of the missing argument in the linked core. As for the PSA when the clefted constituent is a prepositional phrase or an adverbial, I claim that there is no PSA in the matrix clause because PSAs must be core-level phenomena, and also because the agreement is not marked on the copula (unless the clefted constituent is an argument adjunct prepositional phrase). The cleft clause yet has a PSA which controls the verb agreement in it. I discussed earlier that ‘*in*’ in NP-clefted constructions performs emphatically as the copula fails to agree with it; thus I can lay down the following rules with respect to case assignment in Persian cleft constructions.

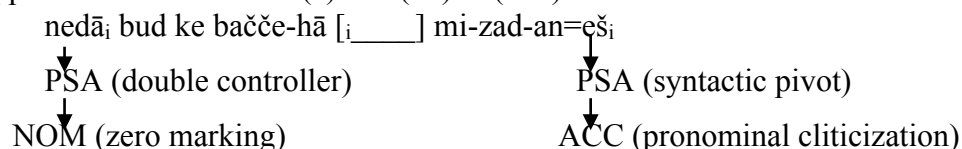
(60) Case marking rules for Persian NP-clefted constituent constructions:

- PSA: double syntactic controller in the matrix core and syntactic pivot (the missing argument)
- a. Matrix core
 Assign nominative case to the PSA, which is zero marked (even if the emphatic *in* is present).
- b. Linked core
1. Assign accusative case (=rā) to the non-PSA macrorole in the linked core when it is not identical with the PSA in the matrix core, or
 2. assign accusative case (pronominal cliticization) to the PSA in the linked core (syntactic pivot) when it is identical with the PSA in the matrix core (a pronominal clitic appears on the subordinate predicator, coindexed with the PSA in the matrix core).

(61) Application of the rules in (a) and (b1) to (11):



(62) Application of the rule in (a) and (b2) to (59d)



Interestingly, the PSA in the matrix core turns out to be a ‘triple controller’: it controls the verb agreement in the matrix core, it controls the syntactic pivot in the linked core, and finally it controls the cross-reference with the pronominal clitic on the linked verbal core. To summarize the representation of the syntactic, morphological, semantic, and pragmatic features along with the nexus-juncture linkage type of the cleft types, a constructional schema is presented below for each of Persian cleft constructions.

Construction: Persian cleft construction with an NP as the clefted constituent
Syntax:
Juncture: core
Nexus: subordination
Construction type: Specificational
Unit template(s): Optional emphatic ‘ <i>in</i> ’, pragmatic predicate, copula, cleft clause
PSA: double controller in the matrix core and syntactic pivot in the linked core
Morphology:
<i>Ke</i> : optional in informal register
Copula: agrees with the clefted constituent both in number and person
<i>in</i> : a discourse strategy highlighting the focus marking function of the construction
Semantics:
Specifying a value for a variable with respect to the logical structure
be’ ([pred’ (...x _i ...)], y _i);
y is the pragmatic predicate coindexed with the unspecified value in the variable
Pragmatics:
Illocutionary force: unspecified
Focus structure: narrow focus on the clefted constituent (NUC of matrix core) or element(s) within it

Table 3: Constructional template for Persian NP-clefted constituent construction

Construction: Persian cleft construction with a PP or an ADV as the clefted constituent
Syntax:
Juncture: core
Nexus: subordination
Construction type: Specificational
Unit template(s): pragmatic predicate, copula, cleft clause,
PSA: syntactic controller in the linked core
Morphology:
<i>Ke</i> : optional in informal register
Copula: default 3 rd singular morphology
Semantics:
Specifying a value for a variable with respect to the logical structure
be’ ([pred’ (...x _i ...)], y _i);
y is the pragmatic predicate coindexed with the unspecified value in the variable
Pragmatics:
Illocutionary force: unspecified
Focus structure: narrow focus on the clefted constituent (NUC of matrix core) or element(s) within it

Table 4: Constructional template for Persian PP- or ADV-clefted constituent construction

8. Conclusion

This paper was devoted to the analysis of Persian cleft constructions which had not received much attention in the literature. It was delineated that that RRG can clear up unambiguously the complexity of Persian clefts as asymmetrical grammatical constructions the semantic and syntactic properties of which are not compositionally iconic.

Firstly, I went through the syntactic structure of Persian clefts and illustrated that the copula and the cleft emphatic pronoun are in fact syntactic devices that bring into focus a semantic argument of the cleft clause. ‘in’ in the structure of clefts is an emphatic marker which does not modify the syntactic structure of the sentence because of its disagreement with the copula, but it contributes to the informational account of the construction. Therefore, I ended up with the appreciation that emphatic and anaphoric ‘in’ in Persian discourse should be distinguished, as Dabir Moghddam (1992) speaks of the necessity to differentiate between the syntactic behaviour of the postposition *rā* as the marker of definite direct objects and its discourse function as the marker of secondary topicalization.

I also mentioned that the clefted constituent can be NPs, PPs, and ADVs, although the emphatic marker is omitted if the clefted constituent is a PP or an ADV and the agreement default morphology appears as 3rd singular. The logical structure of Persian clefts represented explicitly the specificational function in the semantic structure through the coindexation of the second argument of the specificational predicate with an element in the logical structure of the embedded predicate. Despite that the clefted constituent is a semantic argument, interpreted referentially in the logical structure of the cleft clause; it has a predicative function playing as pragmatic predicate in the information structure of the cleft sentence. This absolutely originates from the non-isomorphic nature of the cleft constructions. Persian clefts align with the communicative competence of the speakers in the markedly expressing of the propositions that otherwise can be understood as the unmarked subject-predicate ordering; consequently, the clefted constituent bears a narrow focus relation to the proposition contained in the cleft clause. It was also discussed that the taking a constructional account towards the extraposed and fronted-adverbial sentences which are structurally akin to Persian clefts can shed light on the different patterns of information packaging in these sentences.

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Three-place predicates in English: Towards a unification-based computationally adequate approach to Role and Reference Grammar

Judith Gottschalk
 BBDO Services GmbH
gottschalk.judith@googlemail.com

Abstract²⁵

This paper is concerned with a computational linguistics analysis of Role and Reference Grammar [RRG] (cf. Van Valin and LaPolla 1997; Van Valin (2005) and introduces research work in progress aiming to analyze the computability of RRG. The concept of computational adequacy is introduced as an important external principle from a philosophy of science perspective to sharpen the scientific principles of the area of functional computational linguistics. In addition, a pseudo-code-based meta-language is developed in order to semi-formalize the linking algorithm from semantics to syntax. This paper will show that RRG in its current fashion is not executable on an abstract machine model - called Random Access Machine - and is therefore not computationally adequate. It is highlighted that the semantics to syntax linking algorithm as proposed in Van Valin (2005) is in fact too coarsely grained to account for the variable undergoer linking in English three-place predicates. Also, the concept of intelligent software agents is introduced in order to account for the functional linguistic approach used in RRG. It will be shown that it is possible to account for variable undergoer linking in three-place predicates using constructional schemas as developed in Nolan (2011).

Based on the development of typed feature structures of thematic relations it is possible to show that semantic macroroles as developed in Van Valin (2005) are epiphenomenal. They are an unnecessary concept set on top of thematic relations, which is in conflict with the principle of economy as discussed in Van Valin and LaPolla (1997). It is shown that thematic relations are stored in inheritance networks in the mental lexicon and that they interact with constructional schemas for transfer verbs as they are developed in this paper. The concept of discourse representation structures is also of crucial importance in this paper. It will be shown that variable undergoer linking in English is based on information structure considerations. In order to develop a computationally adequate version of RRG, a revised version of the semantics to syntax linking algorithm is developed.

1. Introduction

From a computational linguistics point of view, Role and Reference Grammar [RRG] (cf. Van Valin and LaPolla 1997; Van Valin 2005) is a rather informally described linguistic theory. For the purpose of computational processing of RRG in diverse computational linguistic applications it would be necessary to specify the formal meaning of the theoretical framework of RRG. If this was the case it would be possible for RRG to be interpreted by an ordinary computer program (cf. Richter 2000: 5).

The present study introduces research work in progress which aims to formalize RRG and to analyze the computational complexity of RRG. It asks whether RRG is computationally tractable and thereby analyzes RRG's generative capacity. As a

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starting point I will introduce a semi-formalization of the RRG linking algorithm from semantics to syntax in terms of a pseudo-code meta-language with which it will be possible to pinpoint problems occurring in the semantics to syntax linking algorithm. These give evidence that the linking algorithm in RRG should mainly be understood as a coarsely grained guidance principle rather than a formal linguistic theory which is applicable for computational linguistic applications.

In fact, RRG has already been used in some computational linguistic applications. Guest (2008) developed an RRG-based parser, which uses extensions of a chart parser to parse languages with different degrees of word order. In this approach, parsing is executed via syntactic templates as used in RRG instead of rules. Winther-Nielsen (2009) and Wilson (2009) describe a software tool called Role-Lexicon Module which is database driven and can be used for parsing of Biblical Hebrew. This system uses an EMDROS database and contains active chart parser which generates the layered structure of the clause. Nolan and Salem (2009) and Salem (2009) on the other hand have developed a machine translation program called *UniArab*, which uses a rule-based lexical framework to process Arabic based on RRG. In Murtagh (2011), a linguistically motivated Irish Sign Language conversational agent is introduced which uses RRG as the linguistic engine in the development of a conversational agent for sign languages. Also, within FunGramKB aspects of RRG, especially the semantic representation of RRG, are used to create a knowledge base for natural language processing. All these implementations focus on the software developed, but they do not focus on the specific computational problems caused by the architecture of RRG.

As Langer points out in personal communication, the principle with respect to the application of RRG within computational devices as described above is mainly the same as with programming languages: It is possible to write programs which terminate, however it is also possible to write programs which do not terminate. The previous applications of RRG in software implementations have shown that applicable RRG-fragments do exist. Otherwise RRG would not have any justification. However, the important question with respect to the computability of RRG is to test whether RRG allows the formulation of fragments for which it is not possible to develop an algorithm answering the fundamental question in a finite number of steps. This in turn leads to the question whether a string XY belongs to a fragment of a defined language or not. In fact programming languages are tools. However, they are not theories and therefore it is reasonable to give them maximal expressiveness. With respect to grammar formalisms such as RRG the situation is rather different: these formalisms ideally should be as expressive as necessary for the computation of natural languages. In this regard questions like ‘Is the natural language XY context-free?’ or ‘Are all natural languages maximally mildly-context-sensitive?’ are of high importance. The long term aim of my research will focus on this question based on a formalized version of RRG. However, the crucial point is: Grammar formalisms can only contribute relevant insights to this question if they are not able to generate a specific string of signs. The question which should be answered in the course of my research, for which this paper is the initial starting point, is whether RRG is Turing complete, hence, whether it is computationally adequate or not.

These questions also result in a revision of the levels of linguistic adequacy as mentioned in Van Valin and LaPolla (1997) since, as pointed out above, a linguistic theory can only contribute to the analysis of natural languages if it has computational

adequacy and thus reasonable explanatory power. In Van Valin and LaPolla (1997), the general goals of a linguistic theory are described as well as a number of levels of adequacy a linguistic theory should meet. As Van Valin and LaPolla (1997: 2) point out, the majority of linguists would agree that the first goal of a linguistic theory is to describe linguistic phenomena, while the second is to explain these phenomena and the third is to understand the cognitive basis of language. As pointed out in Van Valin and LaPolla (1997: 3), describing linguistic phenomena is one of the central goals in linguistics. For many linguists it is the primary goal of linguistics. This goal may include the description of individual languages, describing what is common to all languages - seeking for language universals - or, in how far languages differ from each other, which is the endeavor of language typology (cf. Van Valin and LaPolla 1997: 3). With respect to explanatory linguistics theories, Van Valin and LaPolla (1997: 3) explain the following:

The main impetus to the postulation of explanatory theories of linguistic phenomena came from Chomsky's early work in generative grammar. Chomsky (1957) argued that the proper role of linguistic theory is to provide criteria for selecting the most explanatory grammar from among a group of competing grammars.

The important question is: what should a linguistic theory explain? Van Valin and LaPolla (1997: 3) list a number of candidates for what a linguistic theory should explain. These candidates are given in (1):

- (1) Candidates for what a linguistic theory should explain
 - a. how speakers use language in different social situations;
 - b. why human languages have the structure they do;
 - c. what is common to all human languages;
 - d. why human languages vary structurally the way they do;
 - e. how human languages change over time;
 - f. how speakers produce and understand language in real time;
 - g. the nature of native speakers' knowledge of their language;
 - h. how children learn language.

(Van Valin and LaPolla 1997: 4)

As pointed out in Van Valin and LaPolla (1997: 15), RRG is directly concerned with all these goals except (a) and (e). The last three topics in (1) explicitly deal with psychological questions about language. Many linguists, following Chomsky, maintain that cognitive issues are in fact the most important issues for a linguistic theory to deal with (cf. Van Valin and LaPolla 1997: 4). However, as pointed out by Van Valin and LaPolla (1997: 4), not all linguistic theories agree on which questions regarding psychology are the most important. Van Valin and LaPolla (1997: 4) list a number of three major facets of the psychology of language:

- (2) *Processing*: Which cognitive processes are involved when human beings produce and understand language on line in real time? How specialized to language are these processes?
Knowledge: What constitutes knowledge of language? How is it organized? How is it represented? How is it employed in language processing? How does knowledge of language relate to knowledge in other cognitive domains?
Acquisition: How do human beings come to have knowledge of language? What is the nature of the acquisition process? Is coming to know language similar to or different from acquiring knowledge in other cognitive domains? Does it involve knowledge from other cognitive domains?

(Van Valin and LaPolla 1997: 4)

In this paper I will focus on language processing and knowledge of language from a computational linguistics perspective. Here the basic idea is that computational linguistics is used as a means and a test bed to testify assumptions made in theoretical linguistics focusing on the facets of the psychology of language. Van Valin and LaPolla (1997: 5) point out that philosophers of science typically divide theories into two basic types: The first type is inductive while the second type is deductive. In inductive theories, generalizations are derived from the observation of many examples of the phenomenon under investigation. Van Valin and LaPolla (1997: 5) explain this idea as follows:

If one for example, examined a large number of birds of various species and concluded ‘all birds have wings’, this would be an inductive generalization describing as property of birds. The generalizations of structural linguistics are inductive in nature, as are the language universal proposed in the work of Greenberg (e.g. Greenberg 1966). The relationship between data and theory with respect to inductive theories is **data hypothesis**.

(Van Valin and LaPolla 1997: 5)

Deductive theories however work in a different way. Here, hypotheses are formulated and then tested against data in order to ascertain their validity. In this case, the hypotheses typically grow out of observations of phenomena but not directly as in inductive theories. In a deductive theory, hypotheses are formulated which are intended to explain the observed facts and to predict what has been observed before. This means deductive theories are explanatory theories, and the relationship between data and theory is **hypothesis data** (Van Valin and LaPolla 1997: 5). In this context Van Valin and LaPolla (1997: 5) note that often one set of hypotheses is proposed to account for a given observation or set of observations. However, the important question is how it is possible to chose the best one among a number of alternatives. In fact there are two types of criteria, empirical and theory-internal criteria. The empirical criteria ask whether a theory is in accordance with the known facts or experimental results. If this is not the case, it should be eliminated from consideration. If however two or more theories are empirically adequate, theory internal criteria come into play (cf. Van Valin and LaPolla 1997: 5). These theory internal criteria are given in (3):

(3) *Theory-internal explanatory criteria*

a. *Economy (Occam's Razor)*: Is it the simplest theory?

b. *Motivation*: Are crucial explanatory constructs independently motivated or are they *ad hoc*?

c. *Predictiveness*: Do the hypotheses predict phenomena beyond those for which they were formulated?

(Van Valin and LaPolla 1997: 5)

It is not always easy to come up with explicit criteria for simplicity in a particular theoretical domain. However, the intuition behind the criteria in (3a) is straightforward: all other criteria being equal, the simplest theory is to be the preferred one (cf. Van Valin and LaPolla 1997: 5). Van Valin and LaPolla (1997: 5) describe the other two criteria as follows:

The second criterion, motivation, refers to the extent to which the hypotheses follow in a natural way from the preexisting theory and the extent to which the constructs invoked in the explanation are also required elsewhere in the theory. An account in which the explanatory constructs have no other function beyond dealing with the problem at hand is less highly valued than one in which they play a role in the explanation of other phenomena; in this case the constructs are said to be *independently motivated*, because they are required by the theory for phenomena other than the problem at hand.

(Van Valin and LaPolla 1997: 6)

The basic idea with respect to the third criterion is that hypotheses which make empirically testable predictions about other observed phenomena or phenomena which have not yet been observed are more highly valued than those which do not (cf. Van Valin and LaPolla 1997: 6). With respect to theory-internal criteria Van Valin and LaPolla (1997: 7) explain the following:

[...] the theory-internal criteria [...] play a central role in theoretical argumentation in linguistics. By referring to these criteria as ‘theory-internal’, we do not mean to imply that they are internal to any specific theory; rather, they are assumed by all linguistic theories. It is also possible to appeal to external phenomena in explanation, and this is a point of controversy among linguistic theories. An example of an external explanation would be an account of some syntactic pattern which makes crucial reference to semantics (i.e. the meaning of the pattern) and/or pragmatics (i.e. the context in which it occurs or the communicative function which it serves). A semantic explanation for a syntactic pattern would be an external explanation, on the standard (but not universally held) assumption that syntax and semantics are distinct from each other. In this instance we are dealing with external but language-internal explanations. It is also logically possible to appeal to language-external facts or principles in an explanation. For example, one could argue that some syntactic pattern holds in human languages because of the nature of human cognition or perception; such an appeal to non-linguistic aspects of cognition or perception would be an external explanation as well.

(Van Valin and LaPolla 1997: 7)

As a functional linguistic theory RRG accepts external criteria in explanation which are given in table 1 below:

Table 1: Types of explanatory criteria

<i>Domain to be explained</i>	<i>Theory-internal criteria</i>	<i>External criteria</i>	
		<i>Language-internal</i>	<i>Language-external</i>
SYNTAX	Economy	Phonology	Reasoning
	Motivation	Semantics	Categorization
	Predictiveness	Pragmatics	Perception
		Processing	...

(Van Valin and LaPolla 1997: 7)

The fact that RRG as a functionalist linguistic theory accepts external criteria as given in table 1 is of great importance with respect to a computational linguistics approach to RRG in the vein of what is accounted for as functional computational linguistics by Nolan (2011). A functional computational linguistics account accepts both language-internal and language-external explanatory criteria. This fact will become obvious if the concept of a learning software agent is employed in order to account for a semi-formalization of RRG.

With respect to the level of adequacy in a linguistic theory, Van Valin and LaPolla (1997: 7) explain the following:

One of the most important arguments Chomsky made in *Syntactic structures* (1957), the monograph which introduced generative grammar to the field, was that linguistics should be considered a deductive, rather than an inductive, enterprise. Bloomfield had stated explicitly in his 1933 book, *Language*, that ‘the only valid linguistic generalizations are inductive generalizations’ (21) and one of Chomsky’s main goals was to make linguistic theory explanatory and not solely descriptive.

(Van Valin and LaPolla 1997: 7)

In Chomsky (1965), levels of adequacy which grammar must meet are proposed. These levels of adequacy are listed in Van Valin and LaPolla (1997: 7f) and given in (4)

(4)

- (a) **observational adequacy** which means the grammar correctly predicts which sentences are well formed in a language and therefore grammatical and which are not;
- (b) **descriptive adequacy** which means the grammar is observationally adequate and assigns structural descriptions to the sentences in the language that captures native speaker intuitions about the structure and meaning of the sentences;
- (c) **explanatory adequacy** which means the grammar is both descriptively adequate and is part of a theory which provides an account of 'how these facts arise in the mind of the speaker-hearer' as pointed out in Chomsky (1994: 386)

(cf. Van Valin 1997: 7f)

With respect to these three levels of adequacy proposed in Chomsky (1965), Van Valin and LaPolla (1997: 8) note the following:

For Chomsky, 'the fundamental empirical problem of linguistics is to explain how a person can acquire knowledge of language' (1977: 81). The last two levels of adequacy are explicitly cognitive in nature, as they refer to native speaker intuitions and to language acquisition.

(Van Valin and LaPolla 1997: 8)

If one takes the criteria introduced in the paragraphs above into consideration, observational adequacy is the criterion of empirical adequacy, which applies to the sentences of a language, while descriptive adequacy is also based on empirical accuracy. In this case it applies to native speaker intuitions about sentences (cf. Van Valin and LaPolla 1997: 8). The theory-internal criteria given in table 1 come into play with respect to explanatory adequacy. This is an important point of disagreement among linguistic theories with respect to the application of external criteria in linguistic theories, since functional linguistic theories like RRG accept external criteria for explanatory adequacy, while formalist theories in the Chomskian tradition only accept theory-internal criteria (cf. Van Valin and LaPolla 1997: 8).

However, additional types of adequacy have been proposed, too (cf. Van Valin and LaPolla 1997: 8). These are described by Van Valin and LaPolla (1997: 8) as follows:

Dik (1978, 1991) proposes a broad notion of **psychological adequacy**, which states that a theory should be 'compatible with the results of psycholinguistic research on the acquisition, processing, production, interpretation and memorization of linguistic expressions' (1991: 248). This subsumes the criterion put forth in Kaplan and Bresnan (1982) that theories linguistic structure should be directly relatable to testable theories of language production and comprehension. Dik also proposes two additional types of adequacy: **pragmatic adequacy**, i.e. 'the theory and the language descriptions based on it should be interpretable within a wider pragmatic theory of verbal communication' (1991: 247), and **typological adequacy**, i.e. the theory should 'formulate such rules and principles as can be applied to any type of language without 'forcing', i.e. without adapting the language described to the theory already developed' (248).

(Van Valin and LaPolla 1997: 8)

RRG is a functional linguistic theory which is both monostratal and lexicalist (cf. Van Valin 1991, cf. Van Valin and LaPolla 1997). It was developed to answer the following questions, as described in Van Valin (2005: 1):

[...] (1) what would a linguistic theory look like if it were based on the analysis of languages with diverse structures such as Lakhota, Tagalog and Dyirbal, rather than on the analysis of English?,

and (2) how can the interaction of syntax, semantics and pragmatics in different grammatical systems be captured and explained?

(Van Valin 2005: 1)

This means the main focus of RRG is to be typologically adequate, as pointed out in Van Valin and LaPolla (1997). However in this paper I will show that a functional linguistic theory which also accepts the external criteria described in table 1 should also meet a level of adequacy which I will refer to as *computational adequacy*.

By computational adequacy I mean the fact that a theory should refer to formal systems which are computationally tractable in order to support the level of explanatory adequacy within a Chomskyan framework. This is because a theory which is not tractable and has a Turing complete generative power, as pointed out in Carpenter (1991) with respect to HPSG, is less explanatory than a theory which is tractable and has less generative power in the sense of being not Turing complete (Langer personal communication). As can be inferred from Van Valin (2006), RRG is mainly concerned with psycholinguistic adequacy rather than computational adequacy. As pointed out by Langer (personal communication), psycholinguistic adequacy, with which RRG is concerned, can be described as follows: Humans usually make specific linguistic errors. A psycholinguistically adequate model should account for the same mistakes. This means a psycholinguistically adequate model of language should have the same limitations, such as humans being able to accept only one single linguistic input. This means one is not able to read three books simultaneously or listen to five radio shows. Also, garden-path effects occur. This means psycholinguistic adequacy regards adequacy on the performance level rather than on the competence level linguistic theories are usually concerned with. Computational adequacy on the other hand means to process language with low storage demands without mistakes. This means in a Jeopardy competition the psycholinguistically adequate model would try to be as close as possible to the human competitors while a computational adequate model wants to win (Langer personal communication).

One crucial assumption with respect to computational adequacy is that it is based on the Church-Turing-thesis which assumes that everything which is computable on a machine is intuitively computable. The Church-Turing thesis is bidirectional. This means since natural language is intuitively computable, based on the Church-Turing-thesis it should also be computable on a machine (cf. Blass and Gorevitch 2001). This way a computer can be used as a test bed for linguistic theories in order to show that a linguistic theory actually works. Based on my definition of computational adequacy and on the Church-Turing thesis, my research aim is to test whether RRG, which until now has only been rather informally described is computable on a machine and by this intuitively computable. This way computational adequacy is in fact more basic than psycholinguistic adequacy and is necessary if a linguistic theory should be psycholinguistically adequate. This means computational adequacy has a different quality from psycholinguistic adequacy, since psycholinguistic adequacy operates on the performance level and presupposes psycholinguistic adequacy. Kaplan and Bresnan (1982) explain that a linguistic theory which should be a psycholinguistically real model of competence should be tied to a testable theory of performance in the sense of being psycholinguistically or computationally implementable. However, the concept of computational adequacy proposed in this paper differs strikingly from Kaplan and Bresnan's (1982) idea, since it operates on the competence level as laid out above. The aim of this paper is to support the level of computational adequacy in more detail by the

attempt to semi-formalize RRG in terms of a while-program which can be executed on a Random Access Machine.

In RRG, a single syntactic description which is semantically motivated is used to describe the constituent structure of natural languages. RRG does not assume any abstract underlying levels of syntactic representation as used in Government and Binding theory or Relational Grammar (cf. Gottschalk 2011: 31; cf. Van Valin 1991: 154; Van Valin 2005: 1). RRG employs a semantic representation based on Aktionsarten as developed by Vendler (1969). The formal representation of the RRG semantic structure is based on Dowty (1979). For the correspondence of the syntactic and semantic representation RRG employs a linking algorithm which is strictly procedural and uses a set of instructions to link the two representations to each other. This procedural algorithm is called the linking algorithm.

Van Valin (2005: 129) describes the basic idea of this algorithm as follows:

A distinctive feature of the RRG linking algorithm is that it is bidirectional; this is, it links the semantic representation to the semantic representation. Viewed in terms of a language processing model, the semantics-to-syntax linking is an aspect of the production process. In the comprehension process, the parser would take the input and produce a structured syntactic representation of adpositions and other grammatically relevant elements in the sentence. It is then the task of the grammar to map this structure into a semantic representation, as the first step in interpreting it, and this is where the syntax-to-semantics linking algorithm is required. The same syntactic representations are used in both the linking algorithms.

The use of macroroles will be of interest in this paper since I will show that they are, in fact, epiphenomenal and are mainly used as attributes in typed feature structures. Following Langer (personal communication) with respect to the computational adequacy of RRG the important questions to be asked are: (1) If RRG was more formal would it be tractable and computable? (2) Is RRG implementable? (3) Can RRG be used for the most important computational processes like parsing, generation, translation, learning etc.? (4) How much reservoir demands does RRG have and which runtime would RRG have (theoretical worst case, practical average case)? (5) What does the anytime capacity of an implementation of RRG look like? (6) Is a formalized and implemented RRG-linking algorithm robust? Questions (2) and (3) have been answered in the computational implementations of RRG mentioned above. In my research project I aim to find answers to questions (1), (4), (5) and (6).

This paper seeks to semi-formalize the semantics-to-syntax linking algorithm in terms of a pseudo-code meta-language in order to be able to base a formal analysis on these findings. Since RRG models cognitive processes, it will be necessary to somehow model these concepts in a computational framework. I will use the notion of an intelligent software agent for this purpose. A software agent can be executed on an abstract machine model, in this case a random access machine [RAM]. In this study it will be shown that a semi-formalized version of RRG is not executable if no revision of the linking algorithm takes place. In computer science it is a common technique to test whether an algorithm is computable in the sense of being executable by the attempt to execute them on an abstract machine model. Therefore the aim of this paper is twofold: The linking algorithm in the semantics to syntax linking will be semi-formalized in pseudo-code and the linking algorithm will be revised. Special attention will be put on the assignment of actors and undergoers in the place predicate constructions in English, since here specific problems in the linking process from semantics to syntax occur

which need to be solved in order to be able to have an algorithm which can be executed on a RAM.

The paper is organized as follows: In section 2 I will introduce the RAM as abstract machine model and describe the pseudo-code based meta-language which will be used to semi-formalize the linking from semantics to syntax. Also in this section I will introduce the idea of intelligent software agents as a reasonable tool to implement cognitive processes in software implementations. In Section 3 I will introduce Van Valin's (2007) approach to the analysis of three-place predicates and will show some weak points in Van Valin's solution which is mainly based on macroroles as proposed in Van Valin (2005). I will also discuss Van Valin's arguments against the assumption of a third macrorole. In section 4 Van Valin's (2007) analysis of three-place predicates is introduced and is critically discussed. Section 5 is concerned with pinpointing the shortcomings in the linking from semantics to syntax. This will be achieved by the development of a pseudo-code-based semi-formalization of the linking algorithm from semantics to syntax with special focus on variable undergoer linking in three-place predicate constructions. It will be shown that the linking algorithm in its current state cannot account for these constructions from a computational linguistics perspective. In section 6 I will introduce the concept of constructional schemas as developed in Nolan (2011). Section 7 is concerned with a revision of the theory of the mental lexicon as proposed in Gottschalk (2010a, 2011b). Typed feature structures for lexical semantic relations are developed which are stored in inheritance networks in order to store the argument structure of verbs. Also, an inheritance network of thematic relations will be developed and it will be shown that based in this unification based approach the assumption of semantic macroroles as developed in Van Valin (2005) are epiphenomenal. Also lexical entries for verbs of transfer with which this paper is concerned are introduced.

The paper closes with section 8 in which an information structure-based analysis of three-place predicates in English based on discourse representation structures follows which shows that information structure governs variable undergoer linking in English. Also in this section a constructional schema for the give-relation in English is developed and the linking algorithm from semantics to syntax is revised to show what a computationally adequate version of RRG should look like. This is also done in terms of the pseudo-code meta-language developed in section 2.

2. Random Access Machines and the pseudo-code meta-language

A RAM is an abstract mathematical machine model (cf. Güting and Dieker 2004: 6) which has two memories, a program memory and a data memory. The program memory is able to hold a sequence of commands which are stored in a small set of instructions. The data memory on the other hand is an infinite sequence of memory cells or registers of the kind r_0, r_1, r_2, \dots , which are able to collect a natural number. In this case register r_0 is an accumulator. This means that it represents an implicitly used operator used for arithmetic operations, comparisons, etc. (cf. Güting and Dieker 2004: 7). There is also a program counter. This program counter points to the first command at the beginning of an operation and later it points to the command which is executed presently (cf. Güting and Dieker 2004: 7).

follows until ' $x < 10$ ' is false. Also, this meta-language uses assignments of the form ' $\text{Actor} = x$ ' which means that x is assigned Actor. Equations are formulated with the use of $=$ and the Boolean data types true and false are used to evaluate the Boolean content of an expression.

The aim of the employment of this meta-language is to semi-formalize the two RRG-linking algorithms in order to be able to pinpoint some problems within the procedural approach for the linking as described in Van Valin (2005), Van Valin and LaPolla (1997) and other works in RRG. However, since RRG is a linguistic framework which models cognitive processes, the attempt to use a classical approach to formalize and later to implement it would fail, since in a standard model no account is made for the fact that cognitive processes beyond the scope of an ordinary computer program are at work. Therefore it is necessary to introduce the concept of an intelligent software agent at this point of the discussion in order to account for the cognitive processes RRG attempts to model. The idea of an agent in the broad sense refers to anything that can be viewed as perceiving its environment through sensors and to act on the environment through actuators (cf. Russell and Norvig 2003: 32). Russell and Norvig explain the idea of an agent as follows:

A human agent has eyes, ears, and other organs for sensors and hand, legs, mouth, and other body parts for actuators. A robotic agent might have cameras and infrared range finders for sensors and various motors for actuators. A software agent receives keystrokes, file contents, and network packets as sensory inputs and acts on the environment by displaying on the screen, writing files, and sending network packets. We will make the general assumption that every agent can perceive its own actions (but not always the effects).

The term percept is used to refer to the perceptual inputs an agent has at any given instant while the term percept sequence is used to refer to the complete history of everything the agent has ever perceived (cf. Russell and Norvig 2003: 32). This means the choice an agent has at any given instant can depend on the entire percept sequence which it has observed to date (cf. Russell and Norvig 2003: 32). In mathematical terms, the agent's behavior is described by the agent function mapping of any given percept sequence to an action. The idea behind this function is described by tabulating the agent function that constitutes any given agent. Such a table is in fact an external characterization of the agent. Internally however the agent function is implemented by the use of an agent program (cf. Russell and Norvig 2003: 33). As Russell and Norvig (2003: 33) note it is important to keep these ideas separated since the agent function is an abstract mathematical description while the agent program is a concrete implementation running on the agent architecture. In the long term for the formalization of RRG in terms of its complexity and generative power it will be an important task to specify the mathematical function of the agent. However, for the purpose of this paper, which seeks to be a semi-formalized starting point, in order to have a basis for the later formalization of RRG it is sufficient to use a pseudo-code agent program. The basic idea of such an agent program is that it is executed on some sort of computing device, in the case of this paper on a RAM, which will be called *architecture* (cf. Russell and Norvig 2003: 44). What constitutes the agent is given in (6)

$$(6) \quad \text{agent} = \text{architecture} + \text{program}$$

(Russell and Norvig 2003: 44)

The agent program I will use in this paper has the following skeleton: It takes the current percepts as input from the sensors and returns an action to the actuators. In this context it is important to take into account that the agent program takes the current percept as input while the agent function takes the entire percept history as input (cf. Russell and Norvig 2003: 44). In fact the agent program just takes the current percept as input. This is because nothing more is available from the environment. In cases where the agent's actions depend on the percept sequence, the agent will have to remember the percepts (cf. Russell and Norvig 2003: 45).

With respect to the table-driven approach for software agents Russell and Norvig (2003: 45) note the following:

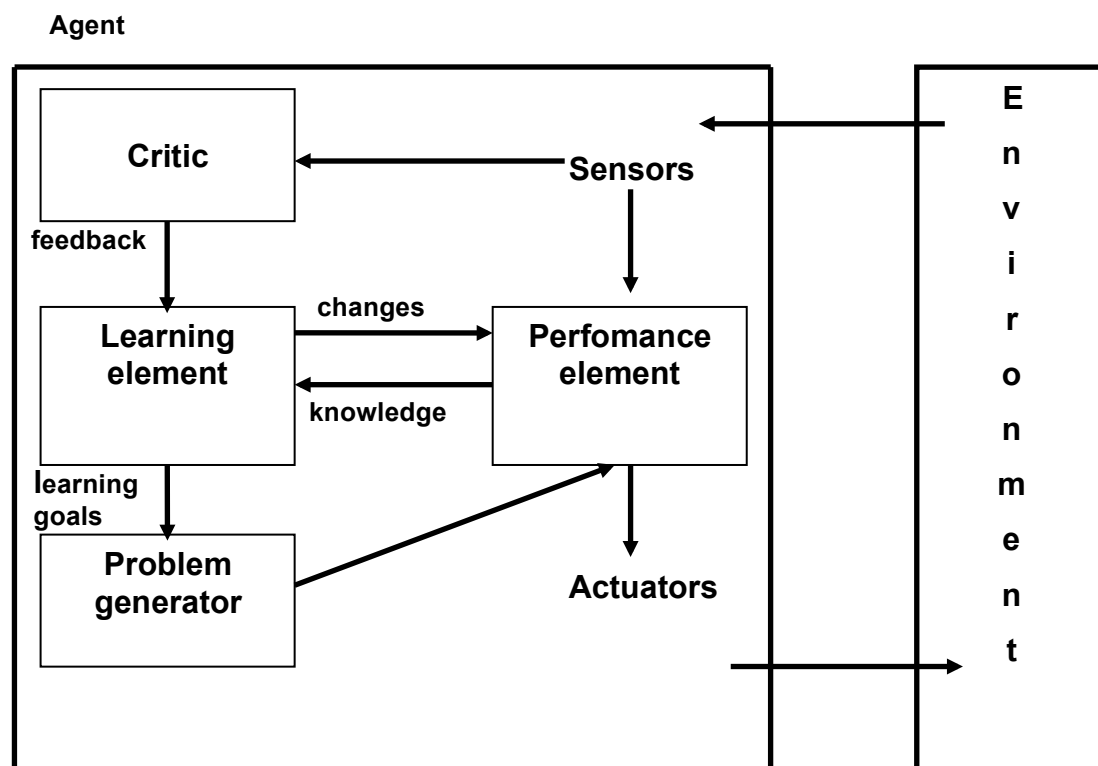
It is instructive to consider why the table-driven approach to agent construction is doomed to failure. Let P be the set of possible percepts and let t be the lifetime of the agent (the total number of percepts it will receive). The lookup table will contain $|P|^t$ entries. Consider the automated taxi: the visual input from a single camera comes in at the rate of roughly 27 megabytes per second (30 frames per second 640×480 pixels with 24 bits color information). This gives a lookup table with over $10^{250,000,000,000}$ entries for an hour driving. Even the lookup table for chess, a tiny, well-behaved fragment of the real world – would have at least 10^{150} entries. The daunting size of these tables (the number of atoms in the observable universe is less than 10^{80}) means that (a) no physical agent in this universe will have the space to store the table, (b) the designer would have no time to create the table, (c) no agent could ever learn all the right table entries from its experience, and (d) even if the environment is simple enough to yield a feasible table size, the designer still has no guidance about how to fill in the table entries.

Despite all this, table-driven-agent does what we want: it implements the desired function. The key challenge for AI is to find out how to write programs that, to the extent possible, produce rational behavior from a small amount of code rather than from a large number of table entries. We have many examples showing that this can be done successfully in other areas: for example, the huge tables of square roots used by engineers and schoolchildren prior to 1970s have now been replaced by a five-line program for Newton's method running on electronic calculators.

If an agent acts in an environment and interacts with other agents it needs to know both how the world evolves in the sense of having knowledge about the world and it needs to know what its actions with respect to other agents, too. For example, the agent needs to know what the result of questions understood as an action accomplishes. However, the agent also needs to learn. Learning affects the agent to operate in an initially unknown environment, becoming more competent than its initial knowledge alone might allow (cf. Russell and Norvig 2003: 51f). With respect to language and communication, the agent needs to learn more about communicative processes. However, in an interaction where information is transferred, the agent also needs to learn about circumstances in the environment and it needs to be able to construct and revise presuppositions which are crucial in communication. Also, an important part of learning with respect to language is learning new words and adding them to the lexicon and to understand constructions in which for example intransitive words, are used transitively or vice versa. Therefore, an agent program is needed which constitutes a learning agent. Also, language acquisition can be modeled on an intelligent agent. Thereby it can be used as a test bed for the application of a linguistic theory.

A learning agent can be divided into four conceptual components. The most important component is the distinction between the learning element, which is responsible for making improvements, and the performance element, which is responsible for selecting

actions. In this case the performance element contains a model-based agent which has static knowledge about the world, a set of rules according to which it acts, and actions it can perform. The state the agent holds can be updated, and it can have access to the rules (cf. Russell and Norvig 2003). In the case of a communication agent these rules would contain knowledge about the language in questions and by this it contains the grammar. The performance element of the agent uses feedback from the critic on how the agent is doing and determines how the performance element should be modified to be better in the future (cf. Russell and Norvig: 2003: 52). The last component of the learning agent is the problem generator, which is responsible for suggesting actions that will lead to new informative experiences. Here, the point is that if the performance element had its way, it would keep doing the actions that are best, given what the agent knows (cf. Russell and Norvig 2003: 52). What is important here is that the learning element can make changes to any of the knowledge components of the agent. The design of an intelligent software agent as used in this paper is described in figure 1:



(Russel and Norvig 2001: 53)

Figure 1: Architecture of Learning Agent

3. Macroroles in RRG

The application of semantic roles in the RRG framework is of importance for the analysis of three-place predicates in RRG. In this section I will describe the RRG account of semantics. Later in this section I will introduce a new account of the treatment of semantic roles in the RRG framework in order to account for a computational analysis of three-place predicates in RRG. RRG uses seven Aktionsarten which additionally all have causative counterparts (cf. Gottschalk 2010). Aktionsarten are assigned on the basis of tests which are language specific. Following Van Valin, these tests are the basis of the RRG approach to argument realization and syntactic

organizations (cf. Diedrichsen 2012: 2). The Aktionsarten are represented in terms of logical structures. They are given in 7.

(7)	State	predicate '(x) or (x, y)
	Activity	do '(x, [predicate '(x) or (x, y)])
	Achievement	INGR predicate '(x) or (x, y) or INGR do '(x, [predicate '(x) or (x, y)])
	Semelfactive	SEML predicate '(x) or (x, y) or SEML do '(x, [predicate '(x) or (x, y)])
	Process	PROC predicate '(x) or (x, y)])
	Accomplishment	PROC predicate '(x, (y)) & INGR predicate '((z), y)
	Causative	α CAUSE β where α and β are LSs of any type

There are three distinct levels of generality which apply to semantic roles: the first level is 'verb-specific' semantic roles like *killer*, *hearer*, *broken* etc. The second level in which semantic roles can apply are thematic relations. These are generalizations across verb-specific roles like *agent*, *instrument*, *experience*, *theme* or *patient*. The third level is generalized semantic macroroles which are a generalization across thematic relations (cf. Van Valin 2005: 53). These semantic macroroles are actor and undergoer. Actor is a generalization across agent, experience, instrument and other roles. Undergoer on the other hand is a generalization across agent, experience, instrument and other roles (cf. Van Valin 2005: 53). In RRG, two types of semantic roles are posited: thematic relations and semantic macroroles (cf. Van Valin 2005: 53). RRG uses a configurational approach to the assignment of semantic roles. The idea is that logical structures form the heart of a verb's lexical entry and correspond to thematic relations or θ -role lists assumed in other theories associated with a verb in its lexical entry (cf. Van Valin 2005: 53). In this context Van Valin (2005: 53) points out the following:

There is, however, no listing of thematic relations in a verb's lexical entry in RRG; rather, thematic relations are defined in terms of the argument positions in the decompositional logical structure representations, following Jackendoff (1976)

The continuum from verb-specific semantic roles to grammatical relations are given in figure 2. Definitions of thematic relation in terms of logical structures argument positions are given in table 2.

This table shows that RRG uses a configurational approach to the assignment and definition of thematic relations. However what is crucial is that only logical structures are associated with a verb's lexical entry rather than thematic relations. With respect to a new account to three-place predicates in RRG I will however show that it is reasonable to associate lexical entries of verbs directly with thematic relations in terms of typed feature structures stored in a lexical semantics relation hierarchy in the mental lexicon.

With respect to activity verbs, there are at least ten subclasses in RRG. The first argument of a non-motion activity verb is an effector. This is the participant which does some action which is not marked for volition and control. All other thematic relations which are associated with the first argument of activity verbs are in fact subtypes of effector (cf. Van Valin 2005: 56). What is important about activity verbs is they usually are single-argument verbs, but there are also some which have two arguments. This is the case with verbs like *eat*, *drink* and *play* (cf. Van Valin 2005: 56).

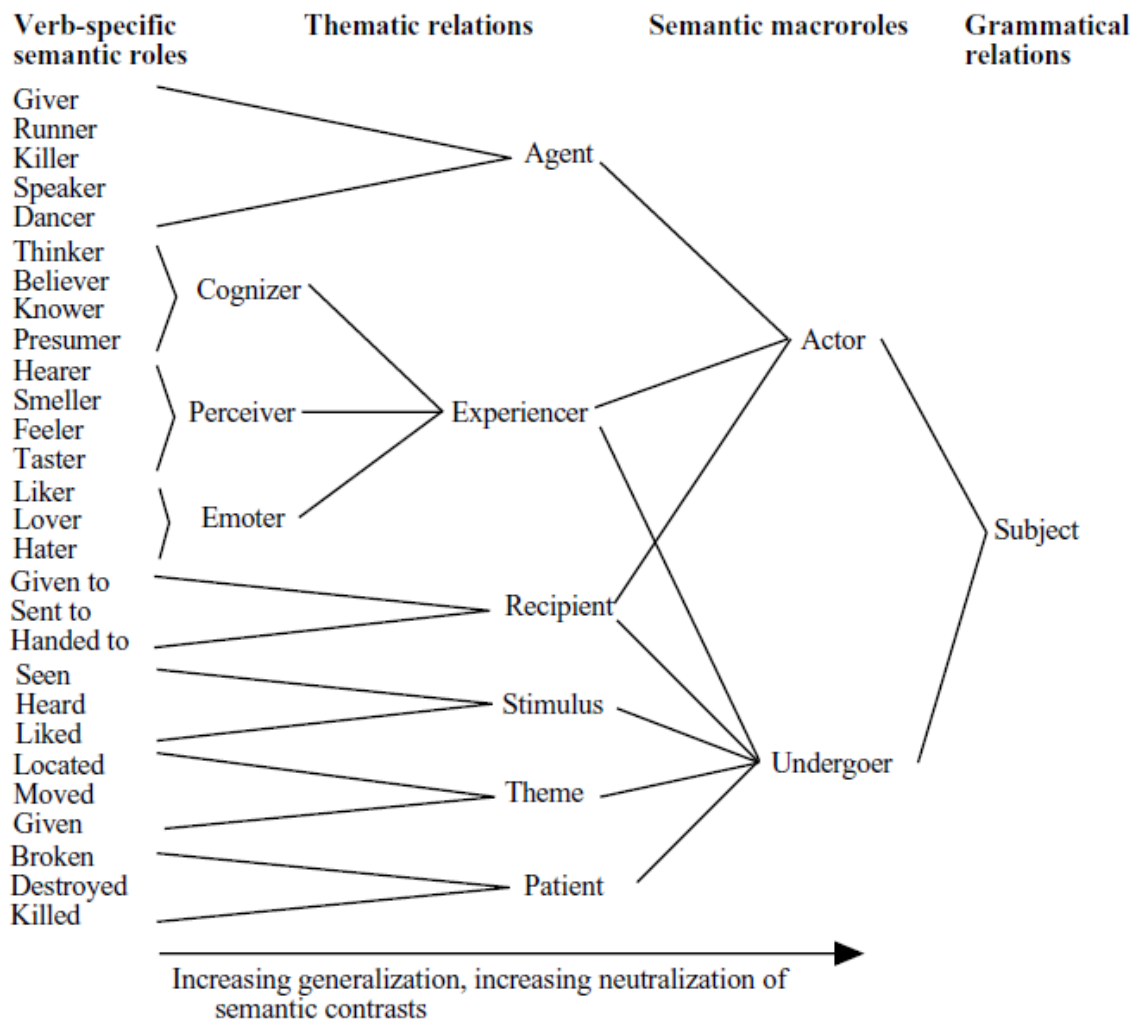


Figure 2: Continuum from verb-specific semantic roles to grammatical relations (Van Valin 2005: 54)

In table 2 one thematic relation is missing: that of agent. In comparison with many other approaches, RRG does not take agent to be a basic relation. The reason is that if agent is taken to be the intentional, volitional and controlling participant in an event, many verbs would appear which take agents in some sentences but not in others (cf. Van Valin 2005: 56). Rather, agentive thematic relations in table 2 are decomposed in terms of more finely grained thematic relations like effector, mover etc. which are more verb specific. In cases where agent applies, it requires an agentive DO-predicate in its logical structure, not even in a complex active accomplishment structure (cf. Diedrichsen 2012). As pointed out by Diedrichsen neither agent nor patient appear naturally without stipulation as parts of a simple logical structure. For Diedrichsen, the important question is why they are listed among the ‘relevant distinctions’ with thematic relations, while recipient does not occur. All arguments which are contained in the logical structure are realized. In the default situation all arguments in the logical structure of the predicate must appear in the core of the clause (cf. Van Valin 2005: 57). In passive constructions the situation is different, since the effector, if overtly expressed, occurs as oblique constituent in the periphery. (cf. Van Valin 2005: 57). RRG seems to posit a great many of thematic relations since they appear in table 2. However, as pointed out in Van Valin (2005: 57) only five distinctions are relevant which are shown in figure 3 (cf. Van Valin 2005: 57).

Table 2: Definitions of thematic relations in terms of logical structure argument positions (Van Valin 2005: 55)

I. STATE VERBS

A. Single argument

- | | | |
|-----------------------|--------------------|-------------|
| 1. State or condition | broken' (x) | x = PATIENT |
| 2. Existence | exist' (x) | x = ENTITY |

B. Two arguments

- | | | |
|---------------------------|-------------------------|-----------------------------------|
| 1. Pure location | be-LOC' (x, y) | x = LOCATION,
y = THEME |
| 2. Perception | hear' (x, y) | x = PERCEIVER,
y = STIMULUS |
| 3. Cognition | know' (x, y) | x = COGNIZER,
y = CONTENT |
| 4. Desire | want' (x, y) | x = WANTER,
y = DESIRE |
| 5. Propositional Attitude | consider' (x, y) | x = JUDGER,
y = JUDGMENT |
| 6. Possession | have' (x, y) | x = POSSESSOR,
y = POSSESSED |
| 7. Internal Experience | feel' (x, y) | x = EXPERIENCER,
y = SENSATION |
| 8. Emotion | love' (x, y) | x = EMOTER,
y = TARGET |
| 9. Attributive | be' (x, [pred']) | x = ATTRIBUTANT,
y = ATTRIBUTE |
| 10. Identificational | be' (x, [pred']) | x = IDENTIFIED,
y = IDENTITY |
| 11. Specificational | be' (x, y) | x = VARIABLE,
y = VALUE |
| 12. Equational | equate' (x, y) | x, y = REFERENT |

II. ACTIVITY VERBS

A. Single argument

- | | | |
|-----------------------|-------------------------------|---------------|
| 1. Unspecified action | do' (x, Ø) | x = EFFECTOR |
| 2. Motion | do' (x, [walk' (x)]) | x = MOVER |
| 3. Static motion | do' (x, [spin' (x)]) | x = ST-MOVER |
| 4. Light emission | do' (x, [shine' (x)]) | x = L-EMITTER |
| 5. Sound emission | do' (x, [gurgle' (x)]) | x = S-EMITTER |

B. One or two arguments

- | | | |
|------------------------|-----------------------------------|-----------------------------------|
| 1. Performance | do' (x, [sing' (x, (y))]) | x = PERFORMER,
y = PERFORMANCE |
| 2. Consumption | do' (x, [eat' (x, (y))]) | x = CONSUMER,
y = CONSUMED |
| 3. Creation | do' (x, [write' (x, (y))]) | x = CREATOR,
y = CREATION |
| 4. Directed perception | do' (x, [hear' (x, (y))]) | x = OBSERVER,
y = STIMULUS |
| 5. Use | do' (x, [use' (x, y)]) | x = USER,
y = IMPLEMENT |

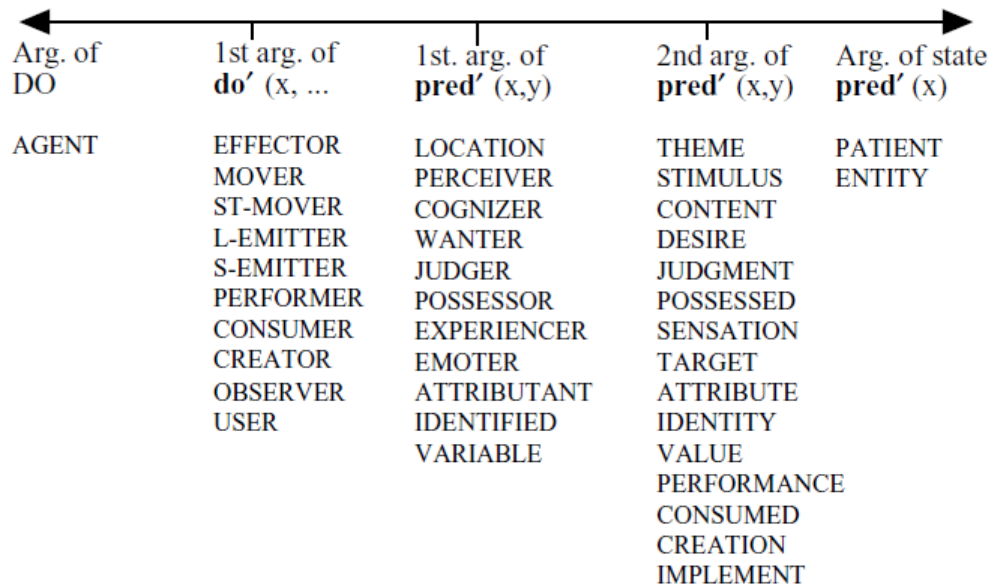


Figure 3: Thematic relations continuum in terms of logical structure argument positions (Van Valin 2005: 58)

Following Van Valin (2005: 57), agents are willful, controlling, instigating participants in states of affairs. Patients on the other hand are strongly affected participants (cf. Van Valin 2005: 57). Van Valin (2005: 57) explains the idea of the continuum of thematic relations used in RRG as follows:

Taking these as endpoints on the continuum makes it possible to place the other role-types with respect to them. The DO of lexicalized agency always co-occurs with the **do'**(x, ... which defines effector and its subtypes, and accordingly the first two columns are closely related to each other; all of them express participants which do something. At the other end of the continuum fall patient and theme, etc. The single argument of state **predicate'**(x) includes those participants which are crushed, killed, smashed, shattered, broken, destroyed, etc., while the second argument of **predicate'**(x,y) includes those participants which are placed, moved, thrown, given, possessed, transferred, seen, heard, loved etc. In terms of affectedness, the former type of participant is much more affected than the latter, hence the placement of the single argument of state **predicate'**(x) at the end of the hierarchy.

There is also a middle continuum in which the first element of **predicate'**(x, y) falls. If this is contrasted with the first argument of **do'**, what becomes obvious is that seeing, thinking, believing, possessing, etc. are less agent-like than speaking, doing, moving, performing and consuming are. This means their placement is to the right of effector, etc. In cases where the contrast is on the second argument of **predicate'**(x, y), then the reverse conclusion follows (cf. Van Valin 2005: 58). Van Valin (2005: 58) explains the following with respect to the continuum of thematic relations:

Seeing, thinking, liking, believing, etc. involve some kind of internal activity (mental, emotional or perceptual) on the part of the participant, whereas being seen, being thought about, being liked or being believed does not require any action or effort of any kind on the part of the participant. Hence the participant denoted by the first argument is more active and hence more agent-like than the participant referred to by the second argument, and, accordingly, the first argument is closer to the agent end of the hierarchy than the second argument. (Van Valin 2005: 58)

From this, Van Valin (2005: 58) concludes that positioning of the different argument positions in the continuum in figure 3 is able to reflect the semantic contrasts among them. Van Valin (2005: 59) points out the following:

The theoretical implications of this system for deriving thematic relations from logical structures are very important. If it is the case that the thematic relations which a verb takes are a function of the argument positions in its logical structure, and there is a system of lexical representation in which there are independent criteria for assigning logical structures to verbs, then there are independent criteria for assigning thematic relations to verbs. This is the case because the thematic relations are a function of the logical structure of a verb, and there are independent criteria for attributing a logical structure to a verb. Thematic relations cannot be assigned arbitrarily. (Van Valin 2005: 59)

Logical structures in RRG are determined on the basis of tests given in Van Valin (2005: 59). As pointed out by Van Valin (2005: 59), the great advantage of this system of lexical representation is that there are tests providing independent criteria for the assignment of a particular logical structure. Hence a particular argument structure is assigned to a given verb (cf. Van Valin 2005: 59).

It is important to emphasize that in the system presented here, thematic relations play no direct role in the lexical representation; the relevant semantic properties of the verbs are expressed by the decompositional logical structure representations, not by thematic relations. Thus even though a large number of role labels like agent, cognizer, theme and patient have been used in this discussion, they are merely mnemonics for argument positions in logical structure. They have no independent status. Since there is as yet no adequate decompositional representation for the primitive state and activity predicates which are the argument-bearing components of the system and which carry the substantive semantic load, these labels are useful in that they indicate the subclass of the predicate; hence cognizer means 'second argument of a two-place state predicate of cognition', judgment means 'second argument of a two-place predicate of propositional attitude' and theme means 'second argument of a two-place predicate of location', for example. These labels will be used in this way, and it must be kept clearly in mind that these labels do not refer to independently meaningful relations but rather to argument positions in the logical structure or predicates of a certain type. (Van Valin 2005: 60).

In the model I will develop in this paper, the treatment of thematic relations will be rather different from the account proposed in Van Valin (2005). Instead of the thematic relations playing an underpart I will show that thematic relations are an essential part of the construction's signatures for three-place predicate constructions, which are specified in the lexical entry of the verb. I will also show that macroroles need not occur in the framework proposed in this paper. Macroroles are the second type of semantic roles used in the RRG framework and they are generalized semantic roles (cf. Van Valin 2005: 60). The two arguments are 'actor' and 'undergoer'. They are the primary arguments of transitive predications, either one of which may be the single argument of an intransitive verb. Generally actor is the most agent-like argument and undergoer is the most patient-like argument. The name macroroles refer to the fact that they subsume a number of specific thematic relations and they are motivated by the fact that in grammatical constructions groups of thematic relations are treated alike (cf. Van Valin 2005: 60). In this context, Van Valin (2005: 60) explains the following:

For example, themes and patients function alike for certain purposes in the grammar. It is necessary to distinguish them on semantic and other grounds. But nevertheless, the grammar, for certain purposes, treats these roles as essentially the same, e.g. they can be both the direct object in an active and the subject in a passive. In fact, active and passive in English can be described in terms of lists of thematic relations. Agent, effector, experience, perceiver, possessor, judger, etc. can be the subject of an active verb, while patient, theme, stimulus, possessed, location, etc., can be

direct object. In the English passive, patient, theme, stimulus, possessed, location, etc., can be subject, while agent, effector, experience, perceiver, possessor, judger, etc., can be the object of the preposition *by*. It appears that a significant generalization is being missed here, since there are long disjunctive lists of roles in these statements. But in fact, it is not an accident that they seem to group together the way they do, and the obvious generalization can be captured in terms of semantic macroroles: in an active clause the actor is subject and the undergoer is direct object, while in a passive the undergoer is subject and the actor is a peripheral PP: (Van Valin 2005: 61)

In RRG, the relation between macroroles and logical structure argument positions is captured in the actor-undergoer hierarchy [AUH] given in figure 4:

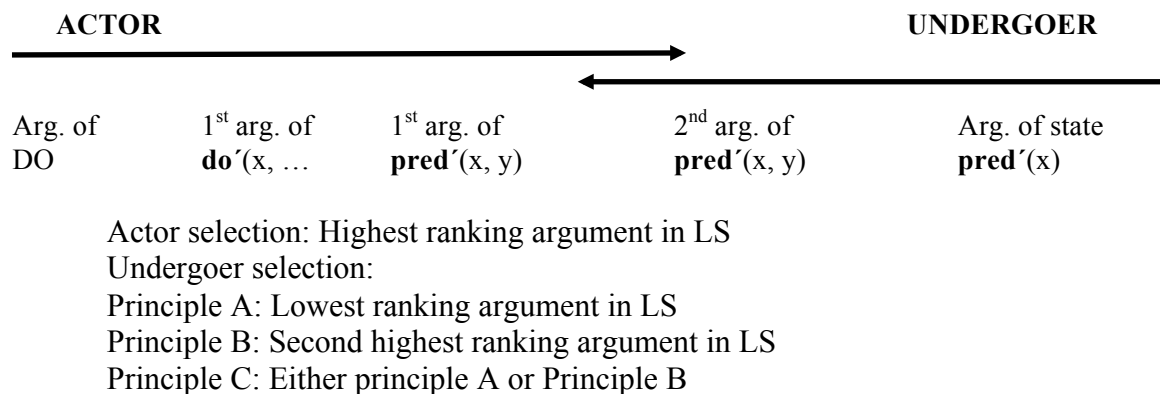


Figure 4: The Actor-Undergoer Hierarchy (Van Valin 2007: 61)

This revised version of the AUH is based on Van Valin (2007) rather than on Van Valin (2005). In the hierarchy, the leftmost argument is the actor and the rightmost argument is the undergoer. This is referred to as Principle A, which applies via default. Cross-linguistically, undergoer assignment is not as stable as actor assignment, since in three-place predicates undergoer assignment may be variable. Examples for variable undergoer linking are found in English dative shift constructions and ditransitives. Also German has variable undergoer linking. These English constructions with variable undergoer linking will be discussed in greater length in sections 4 and 8. Later in this paper a new account to variable undergoer linking in RRG will be developed.

In the AUH in figure 4, thematic relations along the continuum in figure 3 are represented. Prototypically actor is an agent, while the prototypical undergoer is patient. This depends on the logical structure of a particular verb, given in (7) (cf. Van Valin 2005: 61). In this context, Van Valin (2005: 61) explains:

It must be emphasized that the label 'undergoer' should not be taken literally, just as 'actor' should not. The actor of *see* does not do anything but is nevertheless an actor and the sense intended here, i.e. the logical subject; one could say that the actor is the participant which is responsible for the state of affairs, in the sense that it is impossible to have an action without an entity doing the action, a perceptual situation without a perceiving entity, or a cognitive or emotional situation without a participant experiencing the cognitive or emotional state. Similarly, the undergoer of *see* does not undergo anything, unlike the undergoer of e.g. *kill*, but it is still the undergoer of the verb, i.e. the logical object. In general, the undergoer represents the non-insignificant, affected participant in a state of affairs. The specific semantic content of the macrorole with a particular verb is supplied by the position of the argument in the logical structure, not by its macrorole status, although the two are clearly related. (Van Valin 2005: 62)

There is a ranking of argument positions or thematic relations in the AUH with respect to the selection of actor and undergoer selection which is supported by cross-linguistic

evidence. If a verb has an agent argument, it will always be actor and patient will always be undergoer. In cases where a verb has both a potential agent and an inanimate effector (i.e. instrument), the potential agent must be the actor and never the effector (cf. Van Valin 2005: 62).

In fact the AUH always applies to the assignment of actors and undergoers in RRG. It is a configurational approach and the assignment of macroroles takes place based on this approach. In cases where the arguments in the logical structure are not prototypical agents and patients the thematic relations continuum applies. If in a transitive construction the argument is in the leftmost position in the logical structure and it is semantically closer to the agent end of the thematic relations continuum then it is assigned actor. If, however, the argument in the logical structure is in the rightmost position and semantically closer to the patient end of the thematic relations continuum, it is undergoer. However, generally the assignment of actor and undergoer is based on the AUH rather than on the thematic relations continuum this in fact means, as pointed out in Van Valin (2005), the thematic relations continuum is better to be understood as a mnemonic.

Generally, the number of macroroles a verbs takes is predictable from its logical structure. There are only three possibilities: 0, 1, 2. In cases where a verb has two or more arguments in its logical structure as in [**do**'(x,)] CAUSE [PROC & INGR **be-at**'(y, z)] or in **hear**'(x, y), the unmarked situation is for it to have two macroroles. For verbs having only one single argument in their logical structure as in **do**'(x, [**walk**'(x)]) or in PROC & INRG **open**'(y), the unmarked situation is to have only one macrorole. It is also possible for verbs to have no arguments and therefore no macroroles as in **do**'([**snow**']) (cf. Van Valin 2005: 63). In this context, Van Valin (2005: 63) explains:

The nature of macroroles is also a function of the verb's logical structure. If a verb has two, then they must be actor and undergoer. For verbs which have a single macrorole, the default choice follows directly from the logical structure, the macrorole will be actor; otherwise it will be undergoer.

The way to determine the number of macroroles is determined by the macrorole assignment principles given in (8):

(8) Default Macrorole Assignment Principles

- a. Number: the number of macroroles a verb takes is less than or equal to the number or arguments in its logical structure.
 - 1. If a verb has two or more arguments in its logical structure, it will take two macroroles;
 - 2. If a verb has one argument in its logical structure, it will take one macrorole.
- b. Nature: for verbs which take one macrorole,
 - 1. If the verb has an activity predicate in its logical structure, the macrorole is actor.
 - 2. If the verb has no activity predicate in its logical structure, the macrorole is undergoer.

(Van Valin 2005: 63)

If verbs are irregular and have exceptional transitivity, this is indicated in the lexical entry of the verb by '[MR α]. The variable α is replaced by the number of macroroles in the specific lexical entry (cf. Van Valin 2007: 39). In the framework developed in this

paper, I will develop specific lexical entries of verbs different from the approach developed in Van Valin (2005) and Van Valin (2007). One important point discussed in Van Valin (2005: 64f) and Haspelmath (2008) is if it is reasonable to assume more than two macroroles in RRG.

Van Valin (2005: 64) sees two possible justifications for the assumption of a third macrorole: (1) with a third macrorole it is possible to label the third argument of a ditransitive verb, (2) it would be possible to account for dative case assignment (cf. Van Valin 2005: 64). Following Van Valin (2005: 64), these justifications have no force in RRG, since the third argument of a ditransitive verb is a non-macrorole core argument. In German, the third argument would be a non-macrorole direct core argument, since it is not adpositionally marked. In English on the other hand, it would be a non-macrorole oblique core argument in a dative shift construction or a non-macrorole direct core argument in a double object ditransitive construction (cf. Van Valin 2005: 64f). I will discuss Van Valin's specific interpretation of these constructions in section 4. Van Valin (2005: 65) describes his arguments against the assumption of a third macrorole in RRG as follows:

There are strong empirical and theoretical reasons for rejection the postulation of a third macrorole. First and foremost, it is highly likely that it would not be universal like actor and undergoer. While all languages have cores with two core arguments, some languages have strongly disprefer and perhaps even do not permit three core arguments in a single core. Some serializing languages, e.g. Yoruba, Yatye (Stahlke 1970), fall into this category. In such languages, clauses with more than two arguments require complex expressions in which the additional argument is a core argument of a second nucleus in a second core. So, for example, in expressing a transfer verb meaning 'give' would be serialized with the transfer verb in order to express the recipient, or with a verb like 'break' or 'kill' a verb meaning 'take' or 'use' would be serialized in order to express the instrument.

The second argument against the assumption of a third macrorole is that there is no consistent morphosyntactic treatment of the third argument (cf. Van Valin 2005: 65). However, as pointed out in Van Valin (2005: 65), actor and undergoer have consistent coding properties cross-linguistically. In active voice constructions, actor and undergoer are always direct arguments of the verb. However, the concept of 'direct' varies morphosyntactically across languages. In English a direct argument is not marked by a preposition, while in German and Russian it is marked by a direct case rather than by a preposition (cf. Van Valin 2005: 65). In head-marking languages like Crow or Lakhota which are both Siouan languages 'direct' means being coded on the verb. In languages with case marking, actor and undergoer either have nominative and accusative or ergative and absolutive case. However, with respect to the third core argument, the treatment is not consistent since it may be a direct argument in the dative case, as in German, Russian or Dyirbal, or it may be an oblique argument marked by an adposition as in English or Jakaltek. Actor and undergoer on the other hand are never oblique arguments in the core (cf. Van Valin 2005: 65). For Van Valin (2005: 65), the important issue about the third macrorole is the following:

This raises a further issue: what exactly would count as a third macrorole? In a language like German or Russian, for example, it could be restricted to the third direct core argument of ditransitive verbs. But in a language like English, this would imply that only the *to*-PP with certain verbs would count as being the third macrorole. Why should this particular argument be so analyzed and not other oblique core arguments?

What Van Valin (2005: 65) refers to is that in a sentence like *Abby gives the blood test to Ducky* the third macrorole would be *to Ducky*. However, the question is why *on the litter* as in the *Palmer loaded the injured person on the litter* should not be given the same analysis? In fact, both are omissible PPs and both can occur as ‘direct object’ in an alternative clause pattern as in *Abby gives Ducky the blood test* or as in *Palmer loaded the litter with the injured person*. The next question arising is whether, if *on the litter* has this status in the first sentence, then should *with the injured person* also be analyzed the same way in the second example (cf. Van Valin 2005: 65).

From these findings Van Valin (2005: 65) concludes that it is difficult to justify why some oblique arguments should be analyzed as instantiating a third macrorole but not others. If, however, all oblique core arguments are analyzed this way, then whatever function and semantic content, it would be very different from that which is hypothesized in form of a third macrorole in German and Russian (cf. Van Valin 2005: 66). Van Valin’s third argument against the assumption of a third argument is as follows:

Third, a third macrorole would be markedly less important for the syntax than actor and undergoer and hence is difficult to justify on syntactic grounds. It would play little or no role in subject selection with intransitive verbs. The single argument if an intransitive verb is either an actor or an undergoer in the vast majority of cases, and in those cases where the single argument is non-actor or non-undergoer it does not correspond semantically to the third argument of three-argument verbs. It also plays no role in the major typology of syntactic systems: ergative vs. accusative vs. split-intransitive (e.g. Acehnese) [...]. These differences revolve around the treatment of actor and undergoer; the third argument of ditransitive is not a factor.

From the facts given above, Van Valin (2005) concludes that a third macrorole would be a qualitatively different concept from the two semantic macroroles posited in RRG. The point is it would not be universal, it would not receive consistent morphosyntactic treatment, and it would be relatively unimportant to the syntax (cf. Van Valin 2005: 66). What follows from Van Valin’s perspective is that there is no justification for positing a third macrorole (cf. Van Valin 2005: 66). Diedrichsen (2012) notes that in RRG, the concept of macroroles resembles the idea of ‘logical subject’ and ‘logical object’ semantically. In RRG, actor is the semantic counterpart of what is referred to as ‘subject’ in traditional approaches, since subject is the most agent-like argument. Undergoer on the other hand is the most patient-like and the semantic counterpart of the direct object (cf. Diedrichsen 2012). Diedrichsen (2012) explains the following:

While the traditional labels for grammatical relations, subject and object, are not used in RRG, the theory establishes the macroroles, which refer to semantic relations. Note that here with the description of macroroles, the semantic relations list comes back into play, which have been rejected before, in favor of the logical structures. Macroroles are generalizations across thematic relations. Actor is the subject of active transitive constructions, and undergoer is the subject of passive constructions. Thus, the macroroles are not merely semantic; rather they bridge the gap between semantic and grammatical relations. (Diedrichsen 2012).

Van Valin (2005: 60) points out that macroroles are motivated by the fact that in specific grammatical constructions, thematic relations are treated alike. Therefore, macroroles can be considered constituting the link from semantics to syntax within the interface between syntax and semantics (cf. Diedrichsen 2012). The advantage of this is that the approach used in RRG is basically functional, since arguments in a syntactic construction are characterized based on the verb semantics. Also, this approach is cross-linguistically applicable, because in all languages arguments in a transitive predication

can be distinguished in terms of an ‘agent-like’ and a ‘patient-like’ argument. However, Diedrichsen (2012) points out that in the formulation of the mapping between semantics and syntax, some generalizations are carried out which call into question the semantic motivation of syntactic facts, which include argument structure relations. Diedrichsen argues that facts of meaning are extracted from verb meanings and are selected in virtue of their contribution to argument structure properties. From this she concludes that the argument structure is decisive for the classification of verbs rather than the verbs semantics itself. This means the definition of argument structure properties based on verb classes becomes circular. Also Diedrichsen argues that argument structure positions coincide with the semantics of the verb itself. In logical structure representations the positions are argument positions in transitive and intransitive constructions. In fact the logical structures in the AUH are designed to form a continuum, its endpoints being agent and patient. A further important point Diedrichsen (2012) mentions is that the linking from semantics to syntax is based on the requirements of transitive constructions, as pointed out earlier in this section. The basic definition of actor and undergoer does not give any semantic motivation. Rather the construction-based characterization, that they are the two primary arguments in a transitive construction, gives the semantic representation (cf. Diedrichsen 2012). From these findings Diedrichsen (2012) concludes the following:

Thus the definition of the ‘generalized semantic roles’ and also the classification of verbs with respect to ‘grammatically relevant facets of meaning’ are based on the features of argument structure constructions. The positions in the logical structure are argument structure positions. Accordingly, it is questionable whether a theory with an elaborated account of logical structures, that explicitly denies the theoretical importance of thematic relations (see above), would necessarily need the concept of macroroles.

Diedrichsen (2012) argues that argument positions are in fact defined with respect to their role in argument structure constructions. From her perspective, macroroles abstract away from particular verb meanings that makes them applicable for argument structure patterns found in transitive constructions. As pointed out in Van Valin (2005), transitive constructions are the basic construction pattern rather than ditransitive constructions. This is obvious because of the assumption of two instead of three macroroles. However, in this paper I will show that in a computational linguistics approach, which is based on constructional schemas as developed in Nolan (2011) and a revised version of the theory of the mental lexicon as proposed in Gottschalk (2010a, 2011b), the assumption of macroroles as proposed in Van Valin (2005), is not necessary. Diedrichsen (2012) points out that if the construction was considered to be responsible for argument realization, this would yield the abandonment of the highly problematic concept of macroroles.

As will be shown later in this paper, syntactic processes such as argument alternations in three-place predicates can be described without the help of macroroles as used in Van Valin (2005). Rather, macroroles will be treated as attributes in typed feature structures which are part of a lexical semantics relations hierarchy containing the typed feature structures. The lexical semantics relations hierarchy is a hierarchical network of thematic relations used to semantically define them. They are connected with the lexical fingerprints of verbs via unification. Diedrichsen (2012) also explains the following:

The definition of the macroroles is based on argument positions in logical structures and their position with respect to each other. The correlation of argument positions and semantic relations is

1. The constructional schemas are there already, they do not have to be introduced into the theory. They are very important part of RRG (Van Valin 2005: 131 – 135). Bulter (2009: 28) points out that RRG is a ‘constructional model’ to a certain degree. What would be necessary, though, is to formulate constructional schemas for argument structure constructions.
2. With constructions as main contributors of argument structure, it would be possible to describe the PSA, for example, with respect to the construction.
3. The macroroles have been one source for the identification of the PSA. With a constructional account, the macroroles would be dispensable. As the previous discussion has shown, macroroles are in deficit for many reasons. They don’t suffice to describe syntactic processes and phenomena, in particular with respect to ditransitive constructions.
4. It would be possible to treat constructions equally. Emerging constructions or spontaneous formations could be treated as constructions, not as mistakes or irregularities. This is especially important for the description of language change and variation. The fact that some constructions are more frequent than others would not be principally relevant for this description. (cf. Diedrichsen 2012: 9)

Van Valin (2007) accounts for three-place predicates with the use of a modified version of the Actor-Undergoer-Hierarchy [AUH] - developed in Van Valin (2005) - in terms of identifying three different patterns for variable undergoer assignment in verbs with three argument positions. In the following I will discuss patterns of variable undergoer linking occurring in German and English. In Van Valin (2007) it is noted that abstract predicates in the lexical decomposition system employed in RRG can only have zero, one or two arguments. From these findings, Van Valin (2007: 43) concludes that three-place predicates must have complex LSs which are composited of at least two abstract predicates. Examples for the semantic representation of English three-place predicates are given in (9):

- (9) [do'(x,)] CAUSE [PROC & INGR **predicate'**(y, z)]
e.g. *give, present* [do'(x,)] CAUSE [PROC & INGR **have'**(y, z)]
show [do'(x,)] CAUSE [PROC & INGR **see'**(y, z)]
teach [do'(x,)] CAUSE [PROC & INGR **know'**(y, z)]
load [do'(x,)] CAUSE [PROC & INGR **be-on'**(y, z)]
put [do'(x,)] CAUSE [PROC & INGR **be-LOC'**(y, z)]
(cf. Van Valin 2007: 43)

Van Valin (2007: 44) interprets the logical structures in (9) based on Larson (1988) and others that within the embedded predication in sentences involving verbs like *give*, *present*, *show*, *teach*, *load* and *put*. In RRG the rightmost argument in LSs as given in (9) is the default choice for underoer. This means that in principle it is possible for the *y* argument to be selected as underoer. For English this is illustrated in (10) and (11), which may be termed ‘transfer alternation’ (cf. Van Valin 2007: 44).

(10) (cf. Van Valin 2007: 44)

- a. [do'(Abby,)] CAUSE [PROC & INGR **have'**(McGee, bloodtest)]
- b. Abby [Actor] gave the bloodtest [Undergoer] to McGee. Unmarked choice
- c. Abby [Actor] gave McGee [Undergoer] the bloodtest. Marked choice

(11) (cf. Van Valin 2007: 44)

- a. [do'(Abby,)] CAUSE [PROC & INGR **have'**(McGee, computer)]
- b. Abby [Actor] presented the computer [Undergoer] to McGee. Unmarked choice
- c. Abby [Actor] presented McGee [Undergoer] with the computer. Marked choice

In (10b), the leftmost argument in the LS (*Abby*) is selected as actor, while the rightmost argument is selected as undergoer (*the bloodtest*). Because the sentence is in active voice, the actor appears as core-initial PSA, which is similar to ‘subject’ in traditional grammatical theories, while the undergoer occurs in the immediate post-nuclear position, which in traditional grammatical theories is the ‘direct object’. In this sentence, the third argument *McGee* is a non-macrorole and therefore a preposition assignment rule applies, which assigns *to* to it (cf. Van Valin 2007: 44). The same analysis pertains for the default linking with *present* in (11b).

In the English examples (10c) and (11c), the actor selection is the same; however, undergoer selection is different. In these examples, *McGee*, which is the *y* argument (recipient), is assigned undergoer, leaving *the bloodtest* (10c) and *the computer* (11b) as non-macrorole arguments (cf. Van Valin 2007: 45). Both examples are active voice and the actor occupies the core-initial PSA (‘subject’) position. The interesting question in this context is what happens to the non-macrorole arguments *the bloodtest* and *the computer*? Based on the AUH it should be the default choice for undergoer, but it has been ‘passed over’ in favor of a lower ranking argument (cf. Van Valin 2007: 45). In (11c) this is the situation where the following rule applies:

(12) Preposition assignment rules for English

- a. Assign *to* to non-MR *x* argument in LS segment:
PROC & INGR / INGR **pred'**(*x*, *y*)
- b. Assign *from* to non-MR *x* argument in LS segment:
... PROC & INGR / INGR NOT **pred'**(*x*, *y*)
- c. Assign *with* to non-MR *y* argument if, given two arguments, *x* and *y*, in a logical structure, with *x* lower or equal to *y* on the AUH, *y* is not selected a macrorole.
(cf. Van Valin 2007: 42)

In (5c), the rule in (8c) applies and as shown in (5c) *the computer* is marked by the *with* rule, since here the verb is *present*. However, with a small class of verbs the *with* rule does not apply and the result is a sentence as given in (4c) (cf. Van Valin 2007: 45). Examples like these are often referred to as ‘ditransitive’.

What is crucial with respect to the analysis of three-place predicates in Van Valin (2007) is that several problems occur: RRG uses a configurational approach to the assignment of semantic macroroles based on the AUH, as proposed in Van Valin (2007: 61). As pointed out above, the basic idea of the AUH is that the left-most argument in the LS is assigned Actor and the right-most argument is assigned Undergoer. However, as pointed out in Haspelmath (2008), in Van Valin (2005) and Van Valin (2007) it is assumed that the situations (4b) and (5b) are the unmarked choice for undergoer assignment, since this construction is in accordance with the AUH. In fact this 'default' choice of English three-place predicates is not in accordance with native speaker intuitions. Also, with respect to English Van Valin's (2007) analysis runs into difficulties, since, as pointed out in Erteschik-Shir (1979) and Diedrichsen (submitted), the unmarked word order pattern in English is as in (10c) and (11c) rather than in (10b) and (11b). Further evidence for this comes from several interviews with native speakers of English, and from Haspelmath (2008). Since as pointed out in Haspelmath (2008: 85) variable undergoer linking is found in 10% of the languages and as shown in Siewierska (1998) and Haspelmath (2005a) it is not the case that the patterns given in (10b), (11b), are the more frequent patterns.

As pointed out in Haspelmath (2008: 86), this means that the unequal treatment of the patterns given in (10) and (11) in Van Valin's (2007) analysis and in RRG in general seems to be a feature inherited from transformational approaches where one alternating pattern is regarded as the underlying pattern from which the pattern is derived. However, RRG is a monostratal linguistic theory. No intrinsic reason can be found why one alternation pattern has a privileged status over another pattern (cf. Haspelmath 2008: 86). Therefore, in this paper I will provide a different analysis for these patterns based on the inclusion of information structure considerations and a detailed computational linguistics analysis of the linking algorithm from semantics to syntax as developed in Van Valin (2005).

In the next section I will show that Van Valin's (2007) analysis of three-place predicates is not only not in accordance with native speaker's intuitions and cross-linguistic data but is also problematic from a computational linguistics point of view, which renders the linking algorithm developed in Van Valin (2005) as not executable on a RAM.

5. The semantics to syntax linking algorithm in RRG and its short comings

As explained in section 1, the linking algorithm in RRG links the semantic representation of the clause in terms of logical structures [LSs] with the syntactic representation of the clause which is called the layered structure of the clause (cf. Van Valin 2005). The linking between semantic and syntactic representations is governed by the completeness constraint which is a very general constraint (cf. Van Valin 2005: 129). This constraint is stated in (13):

(13) Completeness constraint

All of the arguments explicitly specified in the semantic representation of a sentence must be realized syntactically in the sentence, and all of the referring expressions in the syntactic representation of a sentence must be linked to an argument in the logical structure in the semantic representation of the sentence.

The completeness constraint guarantees that there will be a match between the number of arguments in the clause and in the LS of the verb (cf. Van Valin 2005: 130). A crucial assumption in RRG is that the semantic representation of the sentence is built around the LS of the predicator. This predicator is usually the verb and the LS is put together in the lexicon (cf. Van Valin 2005: 130). As Van Valin (2005: 130) notes, for the semantics-to-syntax linking it is crucial for the selection of the syntactic template(s) which constitute the syntactic representation. In RRG syntactic representations are conceived as ‘syntactic templates’ which are stored in what is called the ‘syntactic inventory’. In Van Valin and LaPolla (1997: 69ff) it is shown that syntactic templates are formally equivalent to immediate dominance [ID] rules. This might raise the question whether the use of syntactic templates from a computational point of view is more complex than using ID rules. As shown in Guest (2008), RRG templates are more suitable than rules, since many of the words in which errors are made are removed from the core parsing. This can be explained by the fact that functional words, which are denoted as operators in RRG, are not part of the syntactic representation, but rather are part of the operator projection (cf. Van Valin 2005). The idea of using syntactic templates rather than ID rules proposed in Van Valin and LaPolla (1997) however results in problems with respect to a formal analysis of RRG for which the present study is the initial starting points. This approach also results interesting problems from a computational point of view.

As pointed out by Langer (personal communication), the essential question with respect to the complexity of tree generation is the following: Is there a finite set of trees or is there a recursive set of rules generating a non-finite number of trees? If there is a finite set of trees, no problem occurs with respect to computational complexity. If, however, a recursive set of rules generating a non-finite number of trees, the situation is more difficult. If a generic tree is an instance of a graph the situation becomes even more difficult. In these situations, typically three possible variants are found (a) practically computational (b) belonging to context free grammars and related kinds of grammar with cubic computing time (c) computability is not possible. With respect to situation (c) this means that the generation of trees is approachable. However, it is not manageable with respect to huge amounts of data. This is the case with respect to unification grammars, Turing machines, DATR and programming languages. Also with respect to NULL or zero copular constructions in RRG, the situation becomes difficult with respect the computability of RRG. In these constructions, the nucleus is usually not occupied, which results in an ambiguity of this node which means that these trees may belong to category (b). However, this situation is close to the computational worst case (Langer personal communication). This means while the approach to syntactic templates proposed in Van Valin and LaPolla (1997) might be reasonable with respect to developing a robust algorithm, as pointed out in Guest (2008) it is not clear yet whether this position is reasonable from a complexity theory point of view. To be able to answer questions of the computability as well as the complexity of RRG, this study is a starting point which can be used in further studies of the computability of RRG. The principles governing the selection of appropriate core templates used in RRG are given in (14):

- (14) Syntactic template selection principle
- a. The number of syntactic slots for arguments and argument-positions within the core is equal to the number of distinct specified argument positions in the semantic representation of the core.
 - b. Language specific qualifications of the principle in (a):
 1. All cores in the language have a minimum syntactic valence of 1.
 2. Argument-modulation voice constructions reduce the number of core slots by 1.
 3. The occurrence of a syntactic argument in the pre/postcore slot reduces the number of syntactic slots by 1 (may override (1) above).
- (Van Valin 2005: 130)

The general idea of the principles in (14) is: if a verb has n arguments, there need to be n positions in the core for the arguments appearing in it. This is necessary in order to satisfy the completeness constraint in (13). The principles given in (b) are language specific and apply to English, which requires dummy subjects for argumentless verbs like *rain*, which has a passive and in which WH-words occur in the precore slot, while none of them apply to a language like Lakhota (cf. Van Valin 2005: 130). The linking procedure from the semantic structure and this way from LSs to the syntactic representation (layered structure of the clause) is given in (15).

- (15) Linking algorithm: semantics \rightarrow syntax (Van Valin 2005: 136)
1. Construct the semantic representation of the sentence, based on the logical structure of the predicator.
 2. Determine the actor and undergoer assignments, following the actor-undergoer hierarchy [...]
 3. Determine the morphosyntactic coding of the arguments
 - a. Select the privileged syntactic argument, based on the privileged syntactic argument selection hierarchy and principles [...]
 - b. Assign the arguments the appropriate case markers and/ or adpositions.
 - c. Assign the agreement marking to the main or auxiliary verb, as appropriate.
 4. Select the syntactic template(s) for the sentence following the syntactic template selection principle.
 5. Assign arguments to positions in the syntactic representation of the sentence.
 - a. Assign the [-WH] argument(s) to the appropriate positions in the clause.
 - b. If there is a [+WH] argument of a logical structure,
 1. assign it to the normal position of a non-WH-argument with the same function, or
 2. assign it to the precore or postcore slot, or
 3. assign it to a position within the potential focus domain of the clause (default = the unmarked focus position).
 - c. A non-WH argument may be assigned to the precore or postcore slot, subject to focus structure restrictions (optional).
 - d. Assign the [-WH] arguments(s) of a logical structure(s) other than that of the predicator in the nucleus to
 1. a periphery (default), or
 2. the precore or postcore slot, or
 3. the left- or right-detached position

What is of importance here is that all steps in the linking from semantics to syntax are subject to cross-linguistic variation. Languages like German and English for example show variable undergoer selection in three-place predicate constructions (cf. Van Valin 2005: 136). This is of crucial importance for step 2 in the linking algorithm in (15). Also, the privileged syntactic argument selection principles vary along two major parameters. In this case the accusative vs. ergative privileged syntactic argument selection and whether privileged syntactic argument selection is restricted to macrorole arguments or not (cf. Van Valin 2005: 136). This is of importance in step 3a. Also Van Valin (2005: 137) explains:

[...] information from constructional schemas can play a crucial role at this point. Case and agreement show substantial cross-linguistic variation (step 3b, c). The positions to which XPs are assigned in sentences varies not only within languages but across languages (step 5a), and the possibilities under step 5b cover the range of WH-question types found in human languages.

This in fact means example (4) lays out the general linking algorithm, which would have to be specialized for each individual language. The task for of this research work in progress is to formalize the linking algorithm in terms of a pseudo-code meta-language as introduced in section 1 in order to be able to investigate the computational adequacy of RRG as a long term aim. I will show that already steps 1 and 2 result in computational difficulties for the linking algorithm to be executed on a RAM which results in RRG not being computationally adequate at this point in the study. In this context Van Valin (2005: 137) explains:

The system in (15) [Van Valin's (5.5)] presumes that a speaker is realizing a specific communicative intention, and consequently whether the sentence will be, e.g. active or passive, declarative or interrogative, figures into the formulation of the semantic representation and concomitant syntactic template selection. Moreover, the discourse status (activation level) of the referents of the NPs is also represented [...].

The first question with respect to the computability of RRG in terms of a pseudo-code meta-language on a RAM occurs with respect to step 1 in the linking algorithm. Here, the task is to construct a semantic representation of the sentence, based on the logical structure of the predicator. In fact this is not only a lexical process where the LS is constructed in the lexicon and the variables in the LS are filled with referring expressions based from input of either mental states, external states and a knowledge base containing world knowledge. This means a mechanism is needed explaining how via a unification approach, as proposed in Gottschalk (2010a, 2011), the logical structure can be constructed.

To be able to account for this problem in a computational linguistic framework it is necessary to use the concept of a learning agent as introduced in section 2. A semi-formalization in terms of a pseudo-code meta-language looks as follows in (16).

(16)

```

algorithm step1
function Learning-Agent-with-State(percept) returns an action
    static: state, a description of the current world state;
             rules, a set of condition-action rules;
             action, the most recent action, initially none;
             learning, the state of being able to learn
             critic, the module criticizing the learning process
             problem generation, the module generating problems

state          Udate-States(state, action, percept);
rules          Rule-Match(state, rules);
learning       Udate-States (state, action, percept, critic);
critic         Udate-Learning (state, action, percept);
problem generation  Update-ProblemGeneration (state, action, percept, learning);
action
lexical_template = (state of internal && external affairs)
//instantiation of internal and external states of affairs with a referring lexical
template in the mental lexicon
array referring_expressions[ ] from lexicon && database
for number_argument_slots in lexical_template do
    if number_argument_slots == 1 do
        x = referring_expression;
    end if.
    if number_argument_slots == 2 do
        if referring_expressions[i] == animate and referring_expressions[j] =
        = inanimate do
            x = referring_expression(animate);
            y = referring_expression(inanimate);
        else
            choice
        end if.
    end if.
    if number_argument_slots == 3 do
        choice
    end if.
end for.
semantic_representation = lexical_template;

```

This algorithm instantiates a learning-agent which is in a specific state, has a learning element, a critic and a problem generator, as well as access to a number of rules, which determines its actions and also has access to specific actions it can execute. Neither the states nor the rules are further defined. However, the action is defined. In this case the action to execute is the instantiation of the semantic representation. What first happens is that a lexical template is instantiated with an internal or external state of affairs and then the referring expressions are stored in an array and the current state of the world is called. For the number of argument slots in this lexical template a number of routines is executed. What is checked first is if the number of argument slots in this array is 1, then

the only element of the array is assigned to x. If the number of referring expressions in this array is two, then it is checked whether there is an *animate* and an *inanimate* referring expression in the array. If this is the case, the x argument is assigned to the referring expression which has the attribute *animate* and the y variable is assigned to the referring expression which has the attribute *inanimate*. If there is none such ideal situation, the assignment of referring expressions depends on *choice*, a function which is not further described in this situation. In principle, *function* should be based on the static set of rules and mainly on perception which are not further described in this context. If, on the other hand, the number of argument slots is 3 then there is only *choice* since otherwise it is not possible to determine which referring expression should be assigned to the x variable and which referring expression should be assigned to the y and z variables in the lexical template. The last step in this algorithm assigns the now filled lexical template to the variable semantic representation, which will be used as expression in the remainder of this semi-formalization of the linking algorithm.

What is obvious from this algorithm developed in pseudo-code is that a full-fledged language processing account is difficult to formulate within the mechanisms described in RRG. This is also explained in Van Valin (2006), where he describes how the RRG-framework could be included to a processing model as suggested in Levelt (1989). This in fact means that to develop a language-processing model it is crucial for RRG to account for cognitive processes not taken into account in RRG. In fact, the attempt to formalize the first step in the RRG linking algorithm from semantics to syntax means to formalize RRG as a processing model, in this case a production model rather than a formal grammar. For reasons pointed out above, it is necessary to formalize cognitive processes, which requires a full-fledged processing model with RRG as ‘linguistic engine’. The questions immediately arising are: How can RRG as functional linguistic theory be formalized if the first step in the algorithm already requires a cognitive model as backbone? What are the consequences of this for a formalization of RRG? It will be a task for future research on the formalization of RRG to account for this. The next step in the linking from semantics to syntax in RRG is concerned with the assignment of Actor and Undergoer based on the Actor-Undergoer-Hierarchy as given in (15). A semi-formalization of this part of the algorithm is given in (17).

(17)

```

algorithm step2
if number_argument_slots == 1 in logical struture do
    if lexical_entry_verb == takes_undergoer do
        undergoer = referring_expression_x;
    else
        actor = referring_expression_x;
    end if.
if number_argument_slots == 2 in logical structure do
    actor = leftmost_argument;
    undergoer = rightmost_argument;
end if.
if number_argument_slots == 3 in logical structure do
    actor = leftmost_argument;
    undergoer = new.choice( );
    non_macrorole = new.choice( );
end if.

```

What is shown in the algorithm in (17) is that if the number of argument slots in the logical structure equals 1 it is necessary to have access to the lexicon in order to determine whether the lexical entry of the verb suggests that it can only be satisfied by an undergoer or whether it can be satisfied by an actor. However, the situation in which the verb takes an actor is the default situation. What is crucial in this part of the linking algorithm is that it is not possible to determine the macroroles of the sentence solely on the basis of the AUH, since in cases where the algorithm cannot determine which macrorole should be assigned, it needs to use the function choice, which is not described in more detail. Rather, and this is not stated in the linking algorithm as described in Van Valin (2005: 136), access to the lexicon is of crucial importance. However, even access to the lexicon cannot account for three-place predicates.

As shown in (17), the only situation where the AUH can apply as only basis for the determination of macroroles is a situation in which two argument slots occur in the logical structure. This suggests that from an RRG-perspective, being transitive is the default situation for verbs. However, this results from theory internal considerations in which the application of the AUH is an essential part of the theory, since as pointed out in Van Valin (2005) the assignment of macroroles in the lexicon is the marked situation (cf. Van Valin 2005: 66).

If three argument slots in the LS occur, RRG runs into a difficult problem, since as shown in the algorithm in (17), RRG cannot account for three-place predicates solely based on its procedural approach and on the AUH. As pointed out in section 4, Van Valin (2007) deals with this situation and describes how it is possible to account for three-place predicates in the semantics to syntax linking. However, the preposition assignment rules as proposed in Van Valin (2007) cannot apply to this part of the algorithm, since the assignment of prepositions takes place in step 3 of the linking algorithm in Van Valin (2005: 136). In addition, the AUH developed in Van Valin (2007) leaves a choice with respect to the assignment of three-place predicate. However, as will be shown in section 8 variable undergoer linking in English is governed by information structure considerations.

The question is: What basis can a variable undergoer be assigned on and how it is possible not to use the function choice? As will be shown later in this paper it is possible to structurally account for the assignment of undergoers in English. This can be done with the help of focus structure analysis, since, in fact it is focus structure which governs the assignment of variable undergoers in English. For this, discourse representation structures can be used. This will be described in section 8. Therefore, in this paper, I will revise the linking algorithm proposed in Van Valin (2005: 136) and use an approach in which discourse representation structures [DRS] are used in order to account for information structure considerations in three-place predicates.

The next step in the linking algorithm, as described in Van Valin (2005: 136), given in (15) is the determination of the morphosyntactic coding of arguments. A semi-formalization of this step looks as given in (18):

(18)

```

algorithm step3a
if number_argument_slots == 1 and actor = true do
    PSA = actor;
else
    PSA = undergoer;
end if.
if number_argument_slots == 2 and actor = direct_core_argument do
    PSA = actor
else
    PSA = undergoer
if number_argument_slots == 3 and actor = direct_core_argument do
    PSA = actor
else
    PSA = undergoer
end if.

```

The semi-formalized algorithm given in (18) accounts for step 3a in a language where the actor is a direct core argument as given in German. In situations where the number of argument slots equals 1, the situation is straightforward, since if ‘actor = true’ applies, actor is assigned PSA. If, however, ‘actor = true’ is not true, undergoer is assigned PSA. The situation becomes difficult, however, in situations where the number of argument slots equals 2. In this situation, the intelligent software agent and thereby the algorithm needs to have a mechanism to test in advance whether the actor is a direct core argument or not. However, in the linking algorithm as provided in Van Valin (2005: 136), no account is made for such a test, since in fact Van Valin (2005) seems to claim that sentences are constructed on the fly, which makes the application of some ‘pre-testing’ difficult. The same difficult situation applies in three-place predicates where the number of argument slots equals 3. Again, some pre-testing in order to account for the fact that only direct core arguments can be actors in languages like German, for which this algorithm is developed, would be necessary. Just like in two-place predicates, this algorithm also applies for passive constructions, since if actor is not a direct core argument then the passive applies which results in the undergoer being the PSA. The next substep in the semantics to syntax linking algorithm as developed in Van Valin (2005: 136) and specifically described for English will be described in (19) below.

The algorithm in (19), developed based on Van Valin and Diedrichsen (2006) for English, is straightforward in some respects, if the number of argument slots equals 1. In these situations, the PSA is assigned nominative case via default. In general, case assignment is also clear, if the number of argument slots is two, since in situations like these the PSA is assigned nominative and the accusative is assigned to the direct core argument. If a three-place predicate construction occurs, the algorithm checks whether undergoer is assigned to the y-Argument and then it assigns the PSA nominative case. The non-macrorole is accusative, and the dative undergoer. If, however, the y-Argument is under the PSA, it is assigned nominative case. The accusative is assigned non-macrorole and the dative is assigned undergoer. In cases where the first argument of **be-LOC**’(x, y) is true then this argument is assigned dative case. If, however, the

situation ‘first_argument_of_**be_LOC**’(x, y) == true’ is true, then the first argument in this construction receives accusative case. The last substep within step 3 in the linking algorithm given in (15) is detailed in (20).

(19)

```

algorithm step 3b
algorithm step3b
if number_argument_slots == 1 do
    nominative = PSA
end if.
if number_argument_slots == 2 do
    nominative = PSA;
    accusative = direct_core_argument;
end if.
if number_argument_slots == 3 and undergoer = z-Argument do
    nominative = PSA;
    accusative = undergoer
    dative = non-macrorole
else if number_argument_slots == 3 and undergoer = y-Argument do
    nominative = PSA
    accusative = non-macrorole
    dative = undergoer
if first_argument_of_be_LOC’(x, y) == true do
    dative = first_argument_of_be_LOC’(x, y);
end if
if first_argument_of_BECOME/INGR_be_LOC’(x, y) == true do
    accusative_case = first_argument_of_BECOME/INGR_be_LOC’(x, y);
end if

```

(20)

```

algorithm step3c1
access state of the world && database
if simple_present == true or past_tense == true do
    new.agreement_nucleus( );
end if.
if complex_tense or passive or copula_construction do
    new.agreement_auxiliary( );
end if.

algorithm step3c2
new.nominal_agreement;

```

The algorithm in (20) realizes verb agreement and nominal agreement. The crucial point with respect to agreement in verbs is how both the nucleus and the auxiliary are determined. This is difficult, since, as pointed out in Van Valin (2005), in these steps apply to logical structures rather than to fully populated sentences. If, however, an LS is

populated with verb agreement, there is no way to determine whether an auxiliary occurs or not. In English, auxiliaries are used in complex tense forms, passive or copula constructions, while nucleus agreement occurs in sentences which are simple present, or past tense. The use of different tense forms heavily depends on language external considerations or on internal states coded by database access. This means the intelligent agent used in this framework needs to have access to internal and external states of the world and a database with world knowledge in order to determine the assignment of tenses, since this assignment is not governed by language internal considerations. In a full-fledged framework in which an intelligent software agent is used it is necessary to account for the interaction of language external considerations, which are realized in the grammar. A semi-formal representation of the algorithm in step 4 for English is given in (21).

(21)

```

algorithm 4
access state of the world && database && DRS
if topicalization == true or W_question == true do
    new.PrCS_template( );
end if.
if embedded_clause == true do
    new.subordinate_clause_template;
end if.
if core_template == true do
    syn_arg_slots_core == num_dist_spec_arg_pos_sem_rep_core;
    min_core_valence = 1;
if passive == true do
    syn_arg_core_slots_passive = syn_arg_core_slots – 1;
end if
if PrCS == true or PoCS == true do
    syn_arg_slots_core_prepost = syn_arg_slots_core – 1;
end if
if nucleus_template == true do
    branching_template = non_finite_nuclear_auxiliary,
    else
    new.non_branching_template( ),
end if.
if RP == true and pronoun do
    new.pronoun_template( );
end if.
if RP == true and common_noun == true do
    new.common_noun_template( );
end if.
if RP == true and proper_noun == true do
    new.proper_noun_template( );
end if.
if adjunct_modifier == true do
    new.periphery_template( );
end if.

```

In the semi-formalized algorithm in (21), the referring syntactic templates are assigned to the referring expressions in the LS. Thereby, a syntactic structure is constructed from the LS. First, it is checked whether a topicalized clause or a W-question is used and the PrCS template is assigned. As pointed out in Van Valin (2005), sentence types are determined based on the operator projection. However, what is important in this part of the algorithm is that the sentence type is basically determined by external consideration. The intelligent software agent needs to take mental states and external states derived from the environment and a database with world knowledge into consideration. If these cognitive mechanisms were modeled within a computational framework, it would be possible to account for the determination of sentence types in this step. Also, the algorithm in (21) tests whether an embedded clause is found, so that a subordinate clause template is activated.

If a core template occurs, the number of distinct argument positions in the logical structure is assigned to the number of syntactic argument slots. The minimal core valance is 1. Also, in the algorithm in (21) it is checked whether a passive sentence occurs. In fact the occurrence of a passive can be determined by the application of auxiliaries. However, as pointed out above the question is how the application of passive is determined. Basically, the application of passive can be regulated by mental states or by information from the environment, which is not accounted for in the algorithm developed in Van Valin (2005), but which I have accounted for by the access from states in the world and the database. If, however, a mechanism is found to determine whether passive occurs, the number of syntactic argument slots is reduced by 1 and assigned the number of syntactic argument slots in the passive.

Since the PrCS basically occurs in cases of topicalization in English, information structure plays an important role in its application. This means that a mechanism for the determination of topic and focus needs to be applied in the linking algorithm in order to fit for cases of topicalization. In fact, RRG provides a mechanism to account for the determination of topic and focus, which however is highly underestimated in the framework developed in Van Valin (2005) and Van Valin and LaPolla (1997). This mechanism employs discourse representation structures that can be used in order to determine topic and focus. These structures will be employed in the course of this paper in order to account for three-place predicates, which this paper mainly focuses on. I have already accounted for this by accessing DRSs in the first step of this algorithm.

Also in the semi-formalized version of the semantic to syntax linking it is tested if a nucleus template occurs, since if this is the case the non-finite nuclear auxiliary is assigned a branching template and otherwise a new non-branching template is called and by this constructed. What is crucial with respect to the occurrence of these templates is that these templates can only occur if it is already determined whether a nucleus template occurs.

If it is true that an RP or a pronoun occurs, a pronoun template is constructed. If, however, an RP and a common noun occur, a new common noun template is constructed. The same mechanism occurs with proper nouns, since a proper noun template is constructed if an RP and a proper noun occur. These mechanisms indeed work in a semi-formalized version of the linking algorithm, since based on the LS it is possible to determine RPs as well as pronouns, common nouns and proper nouns.

Also, the intelligent software agent tests whether an adjunct modifier occurs, which can be determined based on the LS. If such an adjunct modifier occurs, a new periphery template is constructed.

In (22), the pseudo-code semi-formalization of step 5 in the semantics to syntax linking is given:

(22)

```

algorithm step5
nucleus = predicate;
complete_nucleus = nucleus + new.operator_projection_template( );
complete_clause = nucleus + clause;
if nucleus == finite and topicalization == false do
    complete_nucleus = nucleus + second_position_core;
else
    complete_nucleus = nucleus + second_position_core
end if.
if focus_structure_restrictions == true do
    core = +1.argument == true
    new.place_arguments_before_first_argument_in_Core;
end if.
if remaining_elements == true do
    if pronoun == true do
        remaining_positions = pronoun
    end if.
    if RP > PP == true do
        remaining_positions = RP
    else
        remaining_positions = PP
    if accusative == pronoun do
        remaining_positions = accusative;
    else
        remaining_positions = dative
    end if.

```

The algorithm in (22) assigns arguments to the positions in the syntactic representation of the sentence based on the selection of syntactic templates in (22). The operator ‘+’ is used to denote the concatenation of syntactic templates. The first step in this algorithm is the assignment of the predicate in the LS to the nucleus in the syntactic template. What is important is that the operator projection is generated and assigned to the nucleus template in order to generate the complete nucleus. The clause on the other hand is a combination of the nucleus and the clause. These conjugations are indicated by the use of the operator ‘+’ in order to account for concatenation of syntactic templates. In the next step, the nucleus is assigned to the second position of the core. This step takes place if the nucleus is finite and if no case of topicalization occurs. If, however, this statement is false and therefore a case of topicalization occurs, the nucleus is assigned to the second position, too. This statement seems strange, however if a case of topicalization occurs then an RP occurs in the first position of the clause,

while the topicalized element is in the PrCS. As shown in the algorithm in (22), the remaining positions in the clause are assigned after the nucleus is occupied. In these situations it is first tested whether a pronoun exists. If this is the case, the pronoun is assigned to the remaining positions in the clause. If, however, the statement 'RP > PP' is true, then RP is assigned to the remaining positions. Otherwise the PP is assigned to the remaining positions. In cases where an accusative pronoun occurs, the accusative pronoun is assigned to the last remaining positions. If however this is not true, dative is assigned to the remaining positions.

What has been shown in this section is that the linking algorithm as developed in Van Valin (2005) faces numerous problems when it is semi-formalized and executed on a RAM, since in various situations the algorithm developed based on Van Valin (2005) is way too coarsely grained and should mainly be understood as a guiding principle rather than as a formal grammar. This in fact means that RRG in its current state is not computationally adequate, since it is not possible to execute a semi-formal version of the algorithm on an abstract machine model. Based on the Church-Turing thesis described in section 1, it results in an algorithm which is neither executable on a machine nor is intuitively executable, if one accepts Turing's strict perspective on cognition as it is done in this framework with respect to application and executability of algorithms. In the following sections I will introduce constructional schemas as developed in Nolan (2011).

6. Constructional schemas

As shown in section 5, RRG cannot account for variable undergoer linking, since either a high degree of cognitive indeterminism needs to be applied in terms of the function *choice*, in which a coarsely grained fuzzy algorithm leads to the necessity of mapping cognitive images of internal mental states or images of the external world in order to model the outer world in terms of logical structures. As pointed out in section 1, RRG is developed in order to be a psycholinguistically adequate theory. This is also shown in Van Valin (2007). In this paper, Van Valin shows that RRG can easily be plugged in into a psycholinguistic model of language processing. However as shown in sections 4 and 5, RRG is neither empirically adequate with respect to three-place predicates, since considerations of the architecture of RRG are not properly accounted for, as the analysis of three-place predicates in Van Valin (2007) is not in accordance with native speaker intuitions. Nor is RRG computationally adequate, since the algorithm cannot account for three-place predicates in its coarsely grained and fuzzy form. Therefore, in this section I will introduce a new way of analyzing three-place predicates in RRG which is both empirically adequate and computationally adequate.

The point is RRG wants to be a cognitive functional linguistics theory, as proposed in Van Valin (2006) as well as in Van Valin and LaPolla (1997). This paper wants to develop a theory of RRG which is computationally adequate and therefore implementable in applications based on artificial intelligence and psycholinguistically adequate. However, as pointed out by Langer (personal communication), from a philosophy of science point of view the fuzziness proposed in the RRG linking algorithm, which employs the application of a cognitive endowment - not further developed - as well as the metaphorical use of the term *algorithm* in Van Valin and LaPolla (1997) and Van Valin (2005) and more recent work on RRG, as well as the omission of details, its reduction to small amounts of data, is at least potentially

immunized against falsification. However, this means that RRG as a cognitively functional linguistic model is more unscientific as it could potentially be. To account for three-place predicates in RRG, I will use constructions as grammatical models, as developed in Nolan (2011). Nolan (2011: 2) notes that there is current linguistic evidence, suggesting that to a certain degree, grammatical knowledge is organized in constructions and that these constructions may include both information about form and function/meaning. In RRG, constructions are used to capture idiosyncratic linguistic behavior and are stored within the syntactic inventory of constructions within the grammar (cf. Van Valin 2005). As pointed out by Nolan (2011: 3), this position in RRG is different from the one in other linguistic models that take constructions as more mainstream and central in form of a mapping function between both form and meaning. Van Valin (2005: 131f) characterizes construction as follows:

RRG recognizes the importance of grammatical constructions, and they are represented in terms of constructional schemas. Cross-constructional and cross-linguistic generalizations are captured in terms of the general principles and constraints that constitute the linking algorithm, e.g. the actor-undergoer hierarchy, the layered structure of the clause, the privileged syntactic argument selection hierarchy. Only the idiosyncratic, language features of constructions are represented in constructional schemas. Hence constructional schemas, by virtue of their reference to general principles, permit the capturing of cross-linguistic generalizations, while at the same time expressing language particular properties of grammars. (Van Valin 2005: 131f)

Nolan's (2011: 3) critique basically is that RRG seems to have a robust position of constructions, while it still retains the centrality of the lexicon within its lexicalist projectionist framework. However, the point is, the idea of the RRG notion of constructions in a syntactic inventory in which constructions only contain idiosyncratic information is oddly reminiscent of Chomsky's (1957) early idea of the lexicon as a depository of information on verbs with odd behavior in which these are listed. With respect to Van Valin's (2005) idea of a syntactic inventory Nolan (2011: 3f) explains the following:

Indeed, the very term 'inventory' suggests a list. One can make an inventory, a list, of one's books. But, to find an item on this inventory, as it is a list, one would need to search it sequentially. This traversal of a list / inventory would therefore proceed to be searched in sequence, for example almost like searching a phone book page by page / entry-by-entry from the beginning to find 'N' for 'Nolan'. (Nolan 2011: 3f)

Following Nolan (2011: 4), this notion of an inventory is not cognitively plausible, since this way a significant processing overhead, retrieval latency lag and a retrieval delay is created. However, this is not what happens cognitively, since construction retrieval as well as construction processing is immediately and blindingly fast (cf. Nolan 2011: 4). This is the reason why Nolan (2011: 4) proposed a different model for the storage of information on constructions which he describes as follows:

On the other hand, a 'repository' is a place where objects are stored, such that one can find them again. A repository is construed as a database of objects, indexed according to some criteria. In the real world, we can easily understand that a library is a repository of books indexed according to the Dewey numerical categorization system that is searchable; you can find your library item again and again, according to some search criteria. Under this view, we posit that instead of a syntactic inventory, a construction schema repository is therefore a database of constructional schemas. My hypothesis is that a construction is a unique grammatical object identified by a constructional SIGNATURE, which uniquely identifies the correct constructional schema in the repository. The construction can be directly retrieved using the constructional signature, which acts as its identifying retrieval key. (Nolan 2011: 4)

In his approach Nolan (2011: 4) assumes an isomorphic (1:1) relationship between the constructional signature and the schema stored in the repository facilitating the immediate discovery of the relevant and correct schema. Nolan (2011: 5) describes his idea as follows:

Once the schema is retrieved from the construction repository, an instance of it is activated in the mind to process the syntactic input string (the input clause in the syntax semantics direction, for example) to produce an output logical structure. The internal linking within the construction is then activated as an executable process to map between syntax-morphology-pragmatics-semantic etc., according to the internal specification of the particular construction.

In fact, the idea of the construction repository as developed in Nolan (2011) is that it has an internal structure as rich and complex as the lexicon. This repository also contains a structured relationship with the lexicon in which the constructions within draw on information, which is stored in the lexicon. This means the syntactic inventory is a 'database' of constructional schemas which are not stored as a simple list, but has a means to enable an appropriate constructional schema, which can be retrieved as required to certain criteria, and activated (cf. Nolan 2011: 5). The constructional schema proposed in Nolan's (2011: 6) approach has a constructional signature based on syntactic information, in this case a syntactic pattern of occurrence. With this signature it is possible to find the construction stored in the construction repository. The assumption is that in the same way each constructional schema is unique, each constructional signature associated with the schema body is unique. If an input sentence meets the pattern of occurrence with the construction signature, a constructional schema is selected from the construction repository (cf. Nolan 2011: 6). Nolan (2011: 7) describes the application of the construction signature as follows:

We must also recognize that a construction has an input. For example, from syntax, a clause is received for processing when the construction instance is activated following a schema retrieval based on the uniquely identifying signature match. Once the construction instance is activated and the various criteria at the syntax-semantic-pragmatic interfaces are applied within the construction is generated. This will deliver, assuming a construction executing in the syntax-semantics direction, a rich populated logical structure.

If the direction is from semantics to syntax, the idea is that the construction instance, which is once activated, will generate a well-formed clause as output in the target language. This works according to the principles of the particular construction. What is crucial is that it is possible to consider that the construction has a unique signature and an input string, which is processed in the activated schema, as well as an output of a particular kind (cf. Nolan 2011: 7). The exact nature of these depends on the direction of the execution of the schema, which has been activated before, either from syntax to semantics or from semantics to syntax. Also of importance is the construction body, which encodes the relationship between morphosyntax, semantics and pragmatics appropriately (cf. Nolan 2011: 7). Based on this, Nolan (2011: 7) concludes the following:

Within this perspective, we can usefully consider the construction as a type of grammatical object that can be uniquely identified, has internal structure, accepts an input and produces an output. The execution of the construction schema instance is sensitive to the direction of application, as we mentioned.

Based on Nolan (2011: 7) a construction has the following architecture as a structured grammatical object as shown in figure 5 below:

Signature: some pattern of [... x ₁ , y ₂ , z ₃ ...]
Input: clause (token ₁ , token ₂ , ... token _n)
WORKSPACE: input [1], [2], [3] and output [1]
Construction body Syntax: PSA Semantics: Linking Morphology: Prosody: Pragmatics:
Output: [LS]

Figure 5: Architecture of constructional schemas

The question to be asked with respect to the application of grammatical schemas and the linking roles that apply is, according to Nolan (2011: 7): *Where do lexical and/or grammatical rules reside?* The question is whether they are associated with constructions or whether there is some part of the model where they need to be stored for their activation as required. Also an important question is if the rules reside within the lexicon in a principled way. In Van Valin (2005: 161), a ‘workshop’ is proposed which according to Nolan (2011: 7) is some kind of cognitive factory for linguistics in the mind. In his approach to constructional schemas Nolan (2011: 7) however locates this concept as a motivated processing space, which he calls ‘workspace’. The workspace is located in each construction with a robust computational capability (cf. Nolan 2011: 7). The idea is that the relationship between the lexicon and the syntactic inventory of constructions and the application of various rules are applied within the workspace. In the workspace particular linguistically significant output is produced by the application of rules, which are construed as a generalized way for RRG to differentiate between information stored in the lexicon, versus what is actually computed on the fly in real-time speech act production (cf. Nolan 2011: 8). In this context, Nolan (2011: 8) notes the following:

Therefore, if one takes this, the online computation of the various constructions in real-time at speech act production, as something that needs to be accounted for, the question is where do the processing rules that are applied in real-time online computation reside. Obviously, of course, these reside in human memory and have real-time access to a processing workspace. This leads one to consider that an account of real time online computation of the speech act could be motivated as residing within the construction instance that is retrieved from the construction repository and activated each time as a ‘live’ grammatical object, for each construction.

In this approach to constructional schemas, each construction has its own workspace, which stores the internal linking processes of the construction store in the construction itself. This means the construction linking processes both address and manipulate this workspace in a principled way (cf. Nolan 2011: 8). What is crucial in this account is that the workspace is local with respect to the construction in question. This way it is an intrinsic part of the internal structure of a particular construction. It is partitionated

according to the needs of the construction (cf. Nolan 2011: 8). With respect to ditransitive constructions, Nolan (2011: 8) explains the following:

For example, a ditransitive construction will have a workspace with capacity to store the abstract information requirements of the three arguments and all language specific relevant features, for example, such that these can be accessed and processed within the construction as part of the mapping between form and meaning for the computation of meaning. This would allow slight clausal differences across constructions to be computed, for example, in the way construction of English, ‘he danced his way ...’, ‘the car made it’s way ...’, ‘musicians went on their merry way’, etc., within the ‘x:NP₁ V-ed PN way’ construction.

In the next section, I will introduce typed feature structures as means for the storage of linguistic knowledge and will also show how thematic relations are stored in terms of typed feature structures in an inheritance network of lexical semantic relations and a well defined number of thematic relations. They account for the fact that macroroles as used in Van Valin (2005) are epiphenomenal in fact. Since constructional schemas developed in Nolan (2011) are mainly concentrate on the syntax to semantics linking I will change Nolan’s account to constructional schemas in some way in order to fully account for Nolan’s idea of the construction as grammatical object. This will be done in section 8.

7. Typed feature structures and the storage of thematic relations in RRG

In this section, I will develop a revised version of the theory of the mental lexicon developed in Gottschalk (2010a, 2011b) in order to show that macroroles as proposed in Van Valin (2005) are in fact epiphenomenal, since they are rather attributes in typed feature structure than independent constructs in the grammar. Evidence for macroroles being epiphenomenal comes from the constructional schema, developed in Nolan (2011), which does not refer to macroroles in any way. Instead, the constructional schema developed in this section uses thematic relations. The use of typed feature structure representations is reasonable within a computationally adequate version of RRG, since this structure uses two paradigms found in computer science: the first one is the object-oriented approach in which complex, recursive and - in the case of the typed feature structures developed in this section - nested objects are used, which are attribute-value restrictions and constraints as well as multiple inheritance. The second paradigm from computer science employed in typed feature structures is the relational programming approach, which is declaratively, uses logical variables and non-determinism, in which backtracking can take place and existential query evaluation is possible²⁶. This way, RRG becomes computationally adequate and both the aim of formalization and implementability can be achieved.

In Gottschalk (2010a, 2011b), an account of a unification-based theory of the mental lexicon within RRG is given (cf. Gottschalk 2011b). The architecture of the RRG-lexicon as proposed in Gottschalk (2010a, 2011b) is based on the concepts used in the programming language DATR, which was invented by Evans and Gazdar (1996) in the late eighties, used for the representation of lexical knowledge of various domains (mostly applied in morphology and phonology) (cf. Gottschalk 2010a 33). These inheritance hierarchies and inference rules apply within the lexicon. In this architecture, individual elements in the networks, as well as the various inheritance hierarchies, are

²⁶ <http://www.ims.uni-stuttgart.de/~emele/TFS.html>

connected to each other (cf. Gottschalk 2010b: 33). This concept is very similar to inference rules in DATR, which can be monotonic on the one hand and non-monotonic on the other. Based on this conception, the issue of how Aktionsarten in general and particularly verbs of motion, with their various alternations, are structured and how they are stored in an RRG-compatible lexicon is investigated. A time-line model for RRG-Aktionsarten, based on Reichenbach (1947), which was developed in Gottschalk (2010a, 2011b) to give a description of the internal structure of events assumed within RRG. It is assumed that human knowledge is often represented in terms of inheritance networks and, therefore a model of inheritance networks to modify the present account to the lexicon in RRG is used. For this purposed inheritance networks of the operators constituting the logical structures for Aktionsarten in RRG are developed, as well as an inheritance work of the RRG-Aktionsarten, which shows how they are stored in the mental lexicon. Also, an inheritance network of the specific selection properties of a domain of verbs is developed and it is argued that verbs are stored in so-called Neighborhood Clusters. These neighborhood clusters form a further inheritance network which is stored in the mental lexicon. In Gottschalk (2010a, 2011b) it is argued that basic Aktionsarten in the lexicon are not needed, if Aktionsarten are analyzed and decomposed and operators are stored in terms of inheritance networks. It is also shown in Gottschalk (2010a, 2011b) that multiple lexicon entries for verbs are not needed, even if they occur in a multitude of contexts with different Aktionsart readings, if the idea of inheritance network is accepted. In this case, the concept of a workshop module and lexical rules as suggested by Van Valin and LaPolla (1997) and Van Valin (2005) is not needed (cf. Gottschalk 2010: 20).

Lexical entries, or lexical fingerprints as they are called in Gottschalk (2010a, 2011b), constitute a lexical semantic structure which contains a linguistically relevant subset of inheritance relations among elements in a semantic neighborhood cluster, referring to a specific semantic domain of verbs. The semantic neighborhood cluster of a specific domain of motion verbs inherits selectional properties of verbs from an inheritance network of selection properties. These properties refer to the manner of the specific verb domain and it shows the semantic restrictions of arguments a verb can take. In the model proposed in this paper I will use typed feature structures to capture lexical semantic information in order to represent how lexical semantic relations, which in some way refer to thematic relations of classes of semantic roles, are stored and how they interact with the selection property network of a specific verb domain and the lexical fingerprints of a domain of verbs. These semantic relations are represented in terms of typed feature structures. In these typed feature structures, a set of thematic relations similar to macroroles as proposed in Van Valin (2005) is used, which are merely attributes depending on a configurational approach to the assignment of thematic relations in the constructional schema, introduced in section 6, rather than having an independent status in the grammar as proposed in Van Valin (2005) (cf. Davis 2001: 76).

The lexical semantic representations for both lexical entries for verbs and lexical semantic representations for semantic roles developed in this section are stored in multiple non-monotonic inheritance networks. Davis (2001: 76) describes this idea as follows:

This provides the basis for relating semantically defined classes of verbs to one another, with the members of a given class sharing a portion of their semantics and not needing to specify semantic commonalities in each individual lexical entry. The advantages of a hierarchy of semantic

relations with proto-role attributes are that the overriding effect of certain entailments, such as causation, can be readily modeled, and that they provide a level of representation distinct from surface argument structure and transitivity suitable for stating linking principles. (Davis 2001: 76)

In this new approach, lexical semantic relations which describe the argument structure of verbs belonging to a specific lexical domain containing thematic relations are stored in a separate inheritance network. I will assume six typed feature structures for these relations, which are associated with the configurational approach to the assignment of thematic relations. For this I will introduce a number of thematic relations used in this specific approach which are stored as attributes in typed feature structures. These thematic relations are defined based on a generalization of possible arguments a verb can take. Thereby, the thematic relations assumed in this new approach to RRG differ from semantic macroroles, as assumed in Van Valin (2005). The thematic relations I will use in this account of RRG are structured in terms of lexical semantic representations, in terms of relations as typed feature structures and they can be viewed as partially decompositional. In this case their decomposition can be confined to a few elements, such as the causal structure of the semantics of a predicated element (cf. Davis 2001: 76).

In this section I will analyze a domain of transfer verbs in English. Many, but not all of these verbs are three-place predicates. Some of them are generic three-place predicates and some of them are verbs which can have a valence alternation. The domain of verbs I will investigate are the following: *put, give, load, present, lend, sell, receive, buy, borrow* and *transfer*. In a first step I will develop a neighborhood cluster for this domain of verbs to which I will refer to as transfer verbs. A neighborhood cluster consists of verbs belonging to a closed domain of very specific verbs. In the case of this study I will be concerned with transfer verbs. This class of verbs can be determined by a number of decomposition tests. The granularity of district clusters depends on the granularity of these tests. In this paper I will develop a rather coarsely grained neighborhood cluster of transfer verbs, which is mainly used for the purpose of representing how neighborhood clusters of verbs should interact with typed feature structures of lexical semantic relations. A decomposition of the domain of transfer verbs investigated in this paper is given in (23):

(23)

- a. Abby **gave** the file to McGee:
[do'(x,)] CAUSE [PROC & INGR have'(y, z)]
Transfer of a non-abstract entity realized as z argument from x argument in LS to y argument in LS. Neutral way of causing the y argument to have the z argument.
- b. Abby **presented** Gibbs with a coffee.
Abby **presented** a coffee to Gibbs.
Transfer a non-abstract entity realized as z from x argument in LS to y argument in LS. The agent gives the theme to the participant as a present for free.
- c. Abby **put** the piece of evidence on the desk.
[do'(x,)] CAUSE [PROC & be-LOC'(y, z)]
Transfer a non-abstract entity realized as z from x argument in LS to y argument in LS as change of location.
- d. Gibbs **loaded** the truck.
Gibbs **loaded** the gun into the truck.
Gibbs **loaded** the truck with the gun.

- [do'(x, [be-LOC'(x, y))]
 [do'(x,)] CAUSE [PROC & INGR be-LOC'(y, z)]
 Abstract entity realized as z from the x argument on the z argument.
- e. McGee **lent** Abby the computer game.
 McGee **lent** the computer game to Abby.
 [do'(x,)] CAUSE [PROC & INGR have'(y, z)]
 Transfer a non-abstract entity realized as z LS from the x argument to the y argument. Y-Argument receives z argument from x argument without transferring the ownership of z argument.
- f. Gibbs **sold** his gun.
 Gibbs **sold** Agent Franks his gun.
 Gibbs **sold** his gun to Agent Franks.
 [do'(x, [sell'(x, y))]
 [do'(x,)] CAUSE [PROC & INGR have'(y, z)]
 Transfer a non-abstract entity realized as y argument from x argument transfer of a non-abstract entity realized as z argument in LS from the x argument to the y argument. Describes a monetary transfer of a y z argument from x argument to y argument in cases of occurring as three-place predicates. Otherwise monetary transfer of y argument from x argument.
- g. Tony **received** the file.
 Tony **received** the file from Siva.
 [do'(x, [have'(x, y))]
 [do'(x,)] CAUSE [PROC & INGR not-have'(y, z)]
 Transfer of a non-abstract entity realized as y argument to x argument transfer a non-abstract entity realized as z from y argument to x argument. Describes a neutral way of transfer to x argument.
- h. Tony **bought** a playstation.
 Tony **bought** a playstation from McGee.
 [do'(x, [have'(x, y))]
 [do'(x,)] CAUSE [PROC & INGR not-have'(y, z)]
 Transfer of a non-abstract entity realized as y argument to x argument transfer of a non-abstract entity realized as z argument from y argument to x argument. Describes a monetary transfer of a y argument z argument to x argument from y argument in cases of occurring as three-place predicates.
- i. Siva **borrowed** a motorbike.
 Siva **borrowed** a motorbike from Tony.
 [do'(x, [have'(x, y))]
 [do'(x,)] CAUSE [PROC & INGR not-have'(y, z)]
 Transfer of an non-abstract y argument to x argument transfer of a non-abstract entity realized as z argument from y argument to x argument. Describes a transfer of a y argument z argument to x argument from y argument in cases of occurring as three-place predicates without transferring the ownership of y z.

Based on the decompositional analysis in (23), it is possible to conclude that in the neighborhood cluster of transfer verbs analyzed in this paper, a transfer from one destination to another destination takes place. In this way, it is possible to analyze transfer as some kind of abstract motion. This is also pointed out in Davis (2001: 113). The transfer direction is either $x \rightarrow y$ or $y \rightarrow x$. The transfer direction (23a – 23f) is $x \rightarrow y$. In (23g – 23i) on the other hand the transfer direction is $y \rightarrow x$. As can be seen in these examples, too, the theme of the transfer referred to as z argument in the logical

structure usually is a non-abstract entity like a book, or a computer or a file for example. Also, the x variable in these transfer verbs is usually animate, while the z variable, which is the theme in these examples, needs not necessarily be inanimate. This is the case in *Abby gave McGee the dog*. In this case *the dog* is animate, however in comparison to *Abby the dog* it is less volitional. This is also the case with respect to *McGee*. As can be seen in the examples in (23), all verbs of this domain share some features, however, they also differ in some respects. Each verb has some properties which differentiate it from other verbs in this domain. What will be of importance for the development of a neighborhood cluster of transfer verbs is that the differentiating feature of transfer verbs is [+ moving direction of transfer]. The verbs (23a – 23f) have the feature [+ moving direction $x \rightarrow y$] while the transfer verbs in (23g – 23i) have the feature [- moving direction $x \rightarrow y$]. I will refer to these features of transfer verbs as ontological feature nodes (cf. Gottschalk 2010a, 2011b).

In comparison to the motion verbs analyzed in Gottschalk (2010a, 2011b), there is no neutral way of transfer in this neighborhood cluster, since transfer is always bound to a specific direction. This means a neighborhood cluster for English transfer verbs as an abstract node, which is called transfer and needs to be differentiated from the verb *transfer*. This way, a neighborhood cluster of transfer verbs in terms of an inheritance network looks as follows:

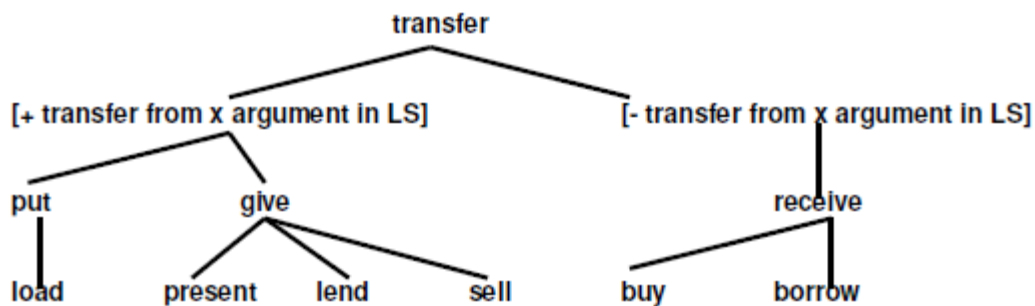


Figure 6: Neighborhood cluster of motion verbs

In this neighborhood cluster the ontological feature nodes, which in a full-fledged theory of the mental lexicon in RRG are semantically defined in a database, inherit everything from the abstract root node, which is connected to the selectional property network, which will be developed in the next step. The verbs *put* and *give* both inherit from the ontological feature node [+ transfer from x argument in LS]. The verbs *put* and *give* have a different status in this network, since *put* refers to a locational transfer of a non-abstract entity, in which in the logical structure the location is decomposed as **be-LOC'**, while *give* refers to the transfer, which is focused on a recipient, which is also a location, but not in the sense of being loaded on a truck or put on a shelf. The verbs *present*, *lend* and *sell* all inherit from *give*, which is more neutral with respect to the transfer. This is because in *present* the transfer is for free, as a present, which is semantically coded, while *lend* refers to a transfer which does not change the ownership of the entity. In *sell* on the other hand, ownership changes, therefore it inherits from *give* and differs from *lend*. The verb *receive* on the other hand inherits from the ontological feature node [- transfer from x argument in LS] and is a neutral way of transfer of the $y \rightarrow x$ direction, as pointed out in the decomposition in (23). *Buy* on the other hand inherits from *receive*. Also, it has some additional features of change with respect to ownership, which is in fact a monetary transfer. The verb *borrow* has the

same status as the verb *lend*; with respect to ownership, however, it describes the $y \rightarrow x$ direction, and therefore inherits from *receive*.

Before I will develop the lexical fingerprints of these transfer verbs, I will develop a selectional property network, which is based in the decompositions in (23). From the decompositions in (23) it is possible to derive a general logical structure [GLS] for the domain of transfer verbs under investigation, which contains internal variables, which mark the semantic differences in verbs of a specific neighborhood cluster. As pointed out in Van Valin and LaPolla (1997: 117), it is possible to unite all verbs of a specific lexical domain in a single general logical structure. The differences in verb meanings are derived from the way internal variables in the GLS are interpreted (cf. Van Valin and LaPolla 1997: 117). In Gottschalk (2010a, 2011), the model of GLSs developed in Van Valin and LaPolla (1997: 116-8) is adapted. Based on the decompositions in (23), it is possible to determine internal variables which have to be realized in the GLS. A possible GLS for two- and three-place transfer verbs is given in (24):

(24)

- a. $[\text{do}'(x, [\text{movement.direction}(\alpha).\text{in}(\beta).\text{manner}'(x, (y))])]$
- b. $[\text{do}'(x, \triangleleft) \text{movement.direction}(\alpha).\text{in}(\beta).\text{manner}] \text{ CAUSE}[\text{PROC} \ \& \ \text{INGR} \text{true.value of.have}'(x, z)]$

As has been pointed out above transfer verbs code some kind of abstract motion. I have accounted for this by using **movement.direction(α)** in order to refer to either the movement direction $x \rightarrow y$ or to the movement direction $y \rightarrow x$. The term **in(β).manner** refers to the manner in which the transfer takes place. At a first glance this encoding seems to be confusing, but in fact *presenting* for example happens in the manner of giving something to someone for free, which is some kind of abstract manner which is encoded in the verb. (24a) refers to two-place predicates or transfer verbs, which can alternate between being transitive and ditransitive, like *sell* for example. As pointed out in Gottschalk (2010a, 2011b), alternations like these are lexically motivated. In fact, none of the verbs under investigation in this paper are lexically transitive or intransitive. Rather, based on an inheritance process within the lexicon, input from internal or external states and input from information structure send to the lexicon, it is possible to determine whether a verb should be transitive or ditransitive in language processing. I will refer to the use of information structure in this revised and computationally adequate version of the semantics to syntax linking algorithm in the next section.

What is also shown in the decompositions in (23) is that only non-abstract entities are transferred in the verbs in the neighborhood-cluster developed in this paper. However, it is also the case that in some verbs, like *teaching* and *learning*, a kind of transfer takes place. Of course these verbs also belong to the domain of cognitive verbs. However, since in these verbs a kind of transfer also takes place, verbs like *teach* and *learn* would inherit properties from two district clusters in some non-monotonic way. This is also pointed out in Davis (2001). Based on these findings, it is possible to develop a selectional property network of transfer verbs given in figure 7. It is important to note that the Selectional-Property-Network [SPN] is a superior network, which is connected to the specific Neighborhood cluster. The concept of SPNs refers to the notion of district clusters, which refer to verbs of a specific lexical category like transfer (cf. Gottschalk 2010a: 36). In fact there exists a big number of other district clusters, for example the district cluster of emotion verbs or of cognition verbs. As can be seen in

figure 7, the SPN for transfer verbs has an abstract node called *transfer*, which has two nodes *abstract entity* and *non-abstract entity*. These nodes also have some semantics which I will not describe in this paper. The α variable in the GLS is satisfied by some non-abstract entity, which is stored in a separate network not developed in this paper, and which is connected with the nodes in this SPN. Information about these variables is inherited from the selectional property network to the neighborhood cluster of transfer verbs, in which the semantic information of the verbs is stored.

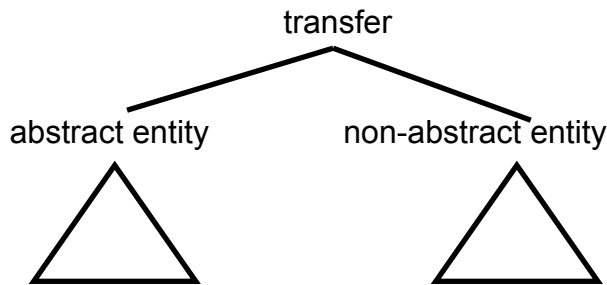


Figure 7: Selectional property network of transfer verbs

In a further network yet to be developed is a network of lexical semantic relations, which are typed feature structures containing information on the possible thematic relations. These lexical semantic relations contain information on the semantic argument structures of verbs, and semantically define the semantic relations realized in a specific verb (cf. Davis 2001). The approach to lexical semantic relations used in this paper is adapted from Davis (2001), but differs in some respects. The basic idea of the use of a network of lexical semantic relations is based on the observations about variable undergoer linking in English three-place predicates. As will be shown in the next section, variable undergoer linking in English is in fact a lexical process pragmatically motivated by information from the information structure, a fact Van Valin (2007) and Van Valin (2005) do not account for. In RRG, it is generally assumed that macroroles, which are a generalization of thematic relations, are part of the grammar. In fact however, semantic roles, which are items of lexical semantic structures, are stored as typed feature structures in the lexicon. The advantages of this account to semantic roles is that variable undergoer linking does not occur randomly based on the AUH, as proposed in Van Valin (2007), but rather based on some lexical and pragmatic processes, taking place within the syntax-semantics-pragmatics interface. However, for a lexically motivated process of variable undergoer assignment it is necessary to somehow place lexical semantic relations, which semantically define which thematic relations are used, in the linking process. Davis (2001) has developed an inheritance network of several lexical semantic relations, found cross-linguistically. This network is given in Figure 9. The inheritance network of lexical semantic relations shows how lexical semantic relations, which describe the argument structure of verbs, are stored lexically and how the different lexical semantic relations inherit information from each other. The root node of this network is *rel*, which is an abstract node referring which node the most basic lexical semantic relations *soa-rel*, *act-rel* and *und-rel* inherit from. A typical *act-rel* would refer to an intransitive activity verb like *sing*, while a typical *und-rel* would refer to a typical intransitive verb, coding a situation where some kind of what Van Valin (2005) would refer to as undergoer occurs, like in *die*. A *soa-rel* on the other hand refers to some intransitive state which is coded within a verb. The other lexical semantic relations referred to in this network are special kinds of the three lexical semantic relations *soa-rel*, *act-rel* and *und-rel*, which I will not discuss

in any detail in this paper. I will rather concentrate on a detailed description of the *receive-rel* and *give-rel*, which are of special interest for the analysis of transfer verbs in English developed in this paper. A representation of these lexical semantic relations in terms of typed feature structures looks as follows (25).

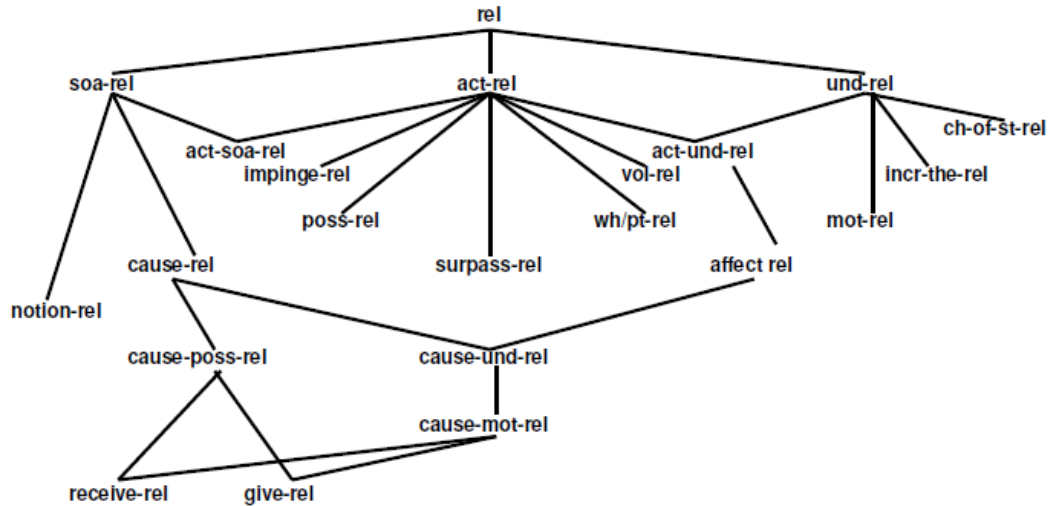
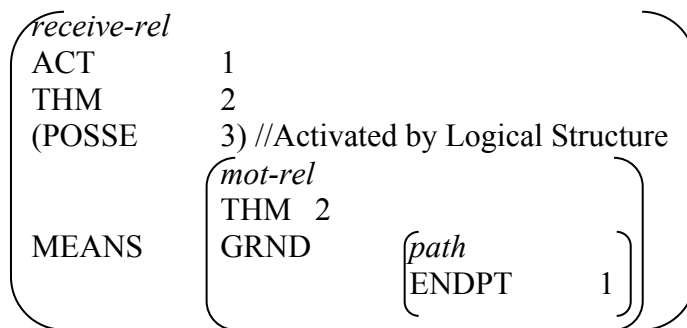


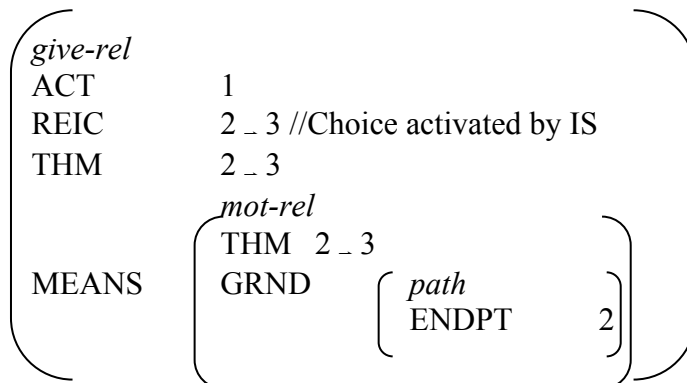
Figure 8: Inheritance network of lexical semantic relations (cf. Davis 2001: 131)

(25) (cf. Davis 2001)

a.



b.



The typed feature structures in (24) are organized as follows: In (24a) there is a constraint referred to by *receive-rel*, which marks the lexical semantic relation. This lexical semantic relation attributes ACT, referring to actor, which in difference to

macroroles, as used in Van Valin (2005), assigns to a thematic relations which has a specific semantic structure which will be described later in this section. The second attribute in this lexical semantic relation refers to theme, which is a thematic relation referred to in the thematic relations continuum in Van Valin (2005: 58). The third attribute in this typed feature structure is POSSE, which refers to possessor, also contained in the thematic relations hierarchy in Van Valin (2005: 58). This attribute is optional, since the same typed feature structure refers to transitive and ditransitive transfer verbs. All these attributes are coindexed and these coindices refer to tokens in the constructional schema for transfer verbs, which will be developed in the next section. These are the tokens which can be activated in the signatures developed in Nolan (2011) and it will be an important task to show how the typed feature structures for lexical semantic relations interact with the constructional schemas developed in Nolan (2011). In fact, tokens in the constructional schemas, coindices in the typed feature structure for lexical semantic relations and variables in logical structures for verbs unify in some way and finally result in an argument in the semantic representation of the clause. In the typed feature structure in (24a), the coindexation is determined, since no case of variable undergoer linking occurs in verbs which inherit from *receive*. The typed feature structure in (24a) has an embedded typed feature structure, which refers to the abstract motion event which takes place in transfer verbs in English indicated by the constraint *motion-rel*. Also, the *motion-rel* has attributes. These attributes are THM for theme and GRND, which refers to the attribute *ground* describing a path transversed by another participant in event (cf. Davis 2001). This thematic relation is not coindexed, since it is an internal thematic relation which is not overtly marked. The *motion-rel* hosts a further typed feature structure called *path*, which refers to the ENDPT referring to endpoint, which in the morphosyntactic realization of the clause refers to the endpoint of a transfer. This is coindexed by 1, which means that it refers to the argument which is coded as token 1 in the constructional schema. The *motion-rel* is in fact a feature of the internal thematic relation MEANS, which refers to the manner in which the transfer takes place and is similar to the manner concept in the GLS.

The architecture of the *give-rel* is nearly the same as the architecture of the *receive-rel*. It also hosts a *mot-rel* hosting a *path* which is a feature of the thematic relation MEANS. However, some of the thematic relations in the *give-rel* are different from the *receive-rel*. As the *receive-rel* the *give-rel* has the thematic relation ACT, which is coindexed with token 1 in the signature of the constructional schema. The *give-rel* has the thematic relation recipient, indicated by REIC and THM. The thematic relation REIC is not found in the thematic relations continuum in Van Valin (2005: 58), but as can be seen here and as already noted by Diedrichsen (2012) and shown in Nolan (2011), there are good reasons to assume that there is a need for the thematic relation theme in RRG. Both thematic relations REIC and THM can be either coindexed with the tokens 2 or 3 in the signature of the constructional schema to be developed in section 6. This indetermined coindexation is necessary, since in *give-rels* cases of variable undergoer linking occur. As will be shown in section 8, information structure plays an important role in variable undergoer linking. Therefore, the lexicon needs to account for this fact by some lexical indeterminism and underspecification, instead of hosting two different types of lexical semantic relations of the same kind. In this new account of semantic to syntax linking in three-place predicates in RRG, it is also necessary to semantically define the attributes referring to thematic relations in the linking algorithm. A semantic decomposition of these attributes is given in (26).

- (26) a. **Actor**
 [+ effecting influencing participants]
 [+ volitional]
 [+ notion perception of participants]
 [+ forceful contact on
 [+ includes another participant in state or event]
 [+ possesses another participant in state or event]
- b. **Undergoer**
 [- effecting influencing participants]
 [\pm volitional]
 [+ undergoes a change of state in event]
 [+ incremental theme in event]
 [+ moves with respect to another participant]
- c. **SOA:**
 [+ conceived perceived by another participant in event or state]
 [+ resulting event state caused by event]
 [+ event state necessarily accompanying another event]
- d. **THM:**
 [+ entity which undergoes a change of state in terms of moving]
- e. **REIC:**
 [+ undergoes a transfer process as receiving entity]
 [+ acts as receiving entity in a transfer process]
- f. **MEANS:**
 [+ abstract instrument used to achieve a state or activity]
- g. **GRND**
 [+ path transversed by another participant in event]
- h. **IMP-ON**
 [+ forcefully impinged in an event]
- i. **PART:**
 [+ included in part of another participant in state event]
- j. **INF:**
 [+ inferior compared to another participant]
- k. **POSSD:**
 [+ possessed by another participant in state event]
- l. **ENDPT**
 [+ state of affairs coding the goal of an activity]
- m. **POSSE**
 [+ acts as possessing entity]
 [+ undergoes a transfer as possessing entity]

(cf. Davis 2001)

In (25a – 25l) a semantic decomposition of attributes referring to thematic relations used in the typed feature structures of the lexical semantic relations in (24) is given. In this decomposition, I mainly refer to the positive features defining the attributes in the typed feature structures. It is possible to represent these attributes in an entailment based inheritance network of attributes, which displays an inheritance hierarchy of these attributes. This inheritance network is given in Figure 9. The hierarchical network of attributes in lexical semantic relations describes an entailment based hierarchy of the attributes used in typed feature structures, which shows entailment relations between the different attributes. This network has an abstract node called *attributes of lexical semantic relations* which is the root. This root has four basic attributes *actor*, *undergoer*, *state of affairs* and *means*, referring to the attributes which form a superset

hierarchy of attributes lower in the hierarchy. The attributes GRND, PART, INF, REIC, POSS, POSSE all inherit features from Actor and Undergoer which are entailed in these attributes. The attribute PART inherits from actor, since they entail features of this attribute, while THM and IMP-ON only inherit from Undergoer, since in these two attributes only features of Undergoer are entailed and this way inherited. The network of lexical semantic relations inherits from the hierarchical inheritance network of attributes in lexical semantic relations, since this way attributes in the typed feature structures in the first network are semantically defined via inheritance.

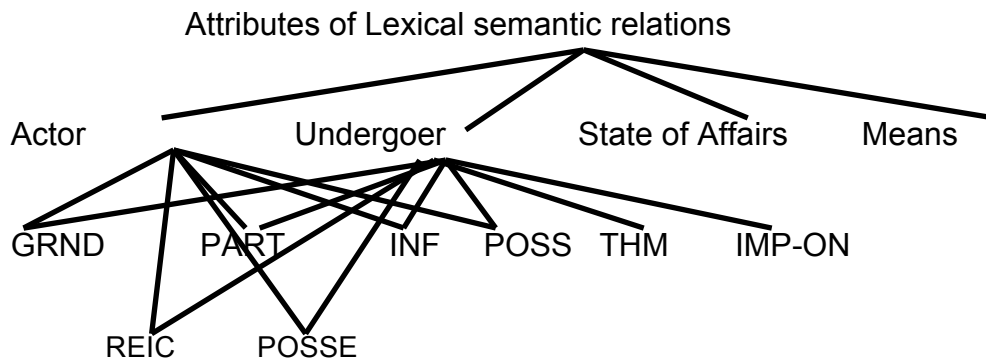


Figure 9: Hierarchical inheritance network of attributes in lexical semantic relations

In the last step of the development of a revised version of the mental lexicon which makes use of typed feature structures, I will develop lexical fingerprints, which in fact form the nodes in the neighborhood cluster of motion verbs, describing the inheritance relations within this neighborhood cluster and how the different networks in this section interact with each other. The neighborhood clusters contain lexical fingerprints as semantic descriptions of the nodes. They are also typed feature structures, since the key concepts of unification-based grammar formalisms are used.

The lexical fingerprints of transfer verbs, which are nodes in the inheritance network of the neighborhood cluster developed in this section, are typed feature structures, too, which make use of unification and contain attributes and constraints. In Gottschalk (2010a, 2011b), lexical fingerprints were not explicitly referred to as typed feature structures, but already in this version of the mental lexicon in RRG they were in fact used as typed feature structures. This inheritance network has an abstract root node, which does not function as primitive. Rather, it is used as an assemblage point for information inherited from the SPN, to spread information to be inherited to the ontological feature nodes and via these nodes to the primitives of the two branches of the neighborhood cluster. Therefore, this assemblage point has no manner qualities. The assemblage point in this network has the following manner of motion qualities: $\langle \text{manner of transfer} \rangle = \text{assemblage point} _ \beta = \langle _ \rangle$. Nevertheless, the assemblage point in this neighborhood cluster inherits all relevant qualities from the non-abstract entity node in the SPN, which on the other hand inherits everything from its mother node of the SPN, which is the abstract primitive of the domain of transfer verbs (cf. Gottschalk 2010: 39).

If a verb inherits all qualities of its predecessor node this is represented by the expression $\langle \rangle = = predecessor^{27}$. In this example, predecessor is used as a variable which can be replaced by the name of the relevant predecessor (cf. Gottschalk 2010: 40). As the root node of a specific neighborhood cluster, the assemblage point contains in its fingerprint the basic information about the selectional properties [SPs] of the domain of verbs under investigation. In the lexical fingerprints, the SPs indicate the content of the variables determined by the GLS (cf. Gottschalk 2010: 40). In case of the verb domain examined here, the SPs look as follows $\langle \text{selectional properties} \rangle y = \alpha \neg$ non-abstract entity $\neg \beta = \langle \text{manner of motion} \rangle$. The SP is satisfied by the non-abstract entity which is always externally realized. The β -variable in the GLS is satisfied by the reference point $\langle \text{manner of transfer} \rangle$ of the particular transfer verb of the neighborhood cluster. Consequently, it is also a kind of variable, or, in this case, it forms a reference point within the particular fingerprints. It is possible to refer to this behavior as local inheritance within a node, or rather a fingerprint (cf. Gottschalk 2010: 40).

There is also a fourth attribute contained in lexical fingerprints for transfer verbs, which does not occur in the framework introduced in Gottschalk (2010a, 2011b). This node is $\langle \text{lexical semantic relation} \rangle$. Since the root node of the neighborhood cluster is an assemblage point, this attribute looks as follows: $\langle \text{lexical semantic relation} \rangle = = give-rel \neg receive-rel$. This means the assemblage point inherits all properties from the typed feature structures of the give- and receive-relation and collects their properties in order to spread them to the other nodes in the network. Nodes lower in the inheritance network can either inherit *give-rel* or *receive-rel* from the assemblage point.

Verbs which are direct daughter nodes of the assemblage point in the neighborhood cluster are basic verbs. In general, basic verbs inherit from the superior ontological feature node, which is connected to a world ontology describing the features of this node in detail. Ontological feature nodes have semantic features, too, which are represented as typed feature structures. As the ontology is based on binary features and in case of transfer verbs the most relevant binary feature is $[\pm \text{transfer from } x \text{ argument in LS}]$, I only use one ontological feature node in this framework. However, if there was a more finely grained semantic description of these verbs, there could in principle be more of such nodes. However, the world ontology of the ontological description nodes is not part of the inheritance network developed in this paper (cf. Gottschalk 2010a: 40). Basic verbs usually inherit all qualities from these ontological feature nodes. In case of this network, ontological feature nodes are $[+\text{transfer from } x \text{ argument in LS}]$ and $[-\text{transfer from } x \text{ argument in LS}]$. Furthermore, basic verbs have a second characteristic: They inherit the Selectional Properties from the root node, which is the assumable point of the particular domain of verbs. Since the semantic qualities of the assemblage point are not passed on to the ontological description node, the inheritance quality inside of this specific network is expressed by the reference point $\langle \text{selectional properties} \rangle = = \text{transfer}$. This can be understood as a global inheritance, which is able to skip nodes, in this case the ontological description nodes. Furthermore, basic verbs contain the reference point $\langle \text{manner of transfer} \rangle$, where their idiosyncratic qualities are determined (cf. Gottschalk 2010a: 40). As pointed out before, basic verbs can either inherit *give-rel* or *receive-rel* from the assemblage point. However, some lexical

²⁷ The structure of typed feature structure of the lexical fingerprints is adapted from DATR (cf. Evans and Gazdar 1996). The terms global inheritance and local inheritance is also adapted from DATR.

fingerprints in this framework have an additional attribute called <pointer to constructional schema> which operates as pointer to a signature in the construction repository, as developed in Nolan (2011). Since this is only pointed, in fact signatures are not stored in the lexical fingerprints; the pointed is rather used as post-it or bookmark, pointing to a signature in the construction repository. This attribute is also inherited from verbs higher in the hierarchy to verbs lower in the hierarchy via default, and therefore only the basic verbs contain this attribute.

The daughter nodes of basic verbs inherit all qualities from their mother nodes, but these sub verbs have their own idiosyncratic qualities as well. This is the reason why they require a <manner of transfer> - attribute, where the qualities of these references, inherited from the basic verb, can be over-written. At this point, the role of non-monotonic inheritance is made clear. The verbs with the most idiosyncratic qualities are farthest below in the hierarchy of this network. The resulting lexical fingerprints in terms of typed feature structures look as follows:

(27)

transfer:

<> == non-abstract entity
 <selectional properties> $y = \alpha \sqcap \text{non-abstract entity} _ \beta = \text{<manner of motion>}$
 <manner of transfer> == assemblage point $_ \beta = \alpha$.
 <lexical semantic relation> == *give-rel* $_$ *receive-rel*.

give:

<> == [+ transfer from x argument in LS]
 <selectional properties> == *transfer*
 <manner of transfer> == Transfer of a non-abstract entity realized as z argument from x argument in LS to y argument in LS. Neutral way of causing the y argument to have the z argument.
 <lexical semantic relation> == *give-rel*
 <pointer to constructional repository> == $\wedge [\text{RP}_{\text{Actor}} \text{ V } [\text{RP}_{\text{Recipient}} \mid \text{PN}_{\text{Recipient}}] \text{ RP}_{\text{Theme}}]; \wedge [\text{RP}_{\text{Actor}} \text{ V } \text{ RP}_{\text{Theme}} [\text{PREPPN} \mid \text{RP}]_{\text{Recipient}}]; \wedge [\text{RP}_{\text{Actor}} \text{ V } \text{ RP}_{\text{Theme}} [\text{PREP} \text{ indef det N}]_{\text{Recipient}}]$

put:

<> == [+ transfer from x argument in LS]
 <selectional properties> == *transfer*
 <manner of transfer> == Transfer a non-abstract entity realized as z from x argument in LS to y argument in LS as change of location.
 <lexical semantic relation> == *give-rel*

present:<> == *give*

<manner of transfer> == Transfer a non-abstract entity realized as z from x argument in LS to y argument in LS. The agent gives the theme to the participant as a present for free.

lend:<> == *give*

<manner of transfer> == Transfer a non-abstract entity realized as z LS from the x argument to the y argument. Y-Argument receives z argument from x argument without transferring the ownership of z argument.

sell:<> == *give*

<manner of transfer> == Transfer a non-abstract entity realized as y argument from x argument – transfer of a non-abstract entity realized as z argument in LS from the x argument to the y argument. Describes a monetary transfer of a y – z argument from x argument to y argument in cases of occurring as three-place predicates. Otherwise monetary transfer of y argument from x argument.

load:<> == *put*

<manner of transfer> == Transfer a non-abstract entity realized as z from the x argument on the z argument.

receive:

<> == [- transfer from x argument in LS]

<selectional properties> == *transfer*

<manner of transfer> == Transfer of a non-abstract entity realized as y argument to x argument – transfer a non-abstract entity realized as z from y argument to x argument. Describes a neutral way of transfer to x argument.

<lexical semantic relation> == *give-rel*<pointer to constructional repository> == \wedge [RP_{Actor} V [RP_{Recipient} | PN_{Recipient}] RP_{Theme}]; \wedge [RP_{Actor} V RP_{Theme} [PREPPN | RP]_{Recipient}]; \wedge [RP_{Actor} V RP_{Theme} [PREP indef det N]_{Recipient}]

buy<> == *receive*

<manner of transfer> ==

Transfer of a non-abstract entity realized as y argument to x argument – transfer of a non-abstract entity realized as z argument from y argument to x argument. Describes a monetary transfer of a y argument – z argument to x argument from y argument in cases of occurring as three-place predicates.

borrow:<> == *receive*

<manner of transfer> ==

Transfer of an non-abstract y argument to x argument – transfer of a non-abstract entity realized as z argument from y argument to x argument. Describes a transfer of a y argument – z argument to x argument from y argument in cases of occurring as three-place predicates without transferring the ownership of y – z.

With respect to the connection of the several inheritance networks developed in this section, the interaction of the networks works as follows: The SPN inherits information about Aktionsarten from the Aktionsart network, which is not described in this paper, but discussed in great length in Gottschalk (2010a, 2011b). Information for both Aktionsarten for two-place predicates and three-place predicates is inherited from this network via unification to the SPN, which inherits information about selectional properties to the neighborhood cluster, containing lexical fingerprints in terms of typed feature structures as nodes in the network. The neighborhood cluster on the other hand also inherits information about lexical semantic relations from the lexical semantic relations network via unification. The lexical semantic relations network on the other hand inherits information on the semantic description from the inheritance network of thematic relations.

What is shown in this section is that it is possible to account for both alternations in verb valence and argument structure with respect to semantic relations lexically. Since thematic relations are used in this framework, it is not necessary to use generalized macroroles as proposed in Foley and Van Valin (1984), Van Valin (1993), Van Valin (2005) and Van Valin (2007). In fact, macroroles as used in RRG are epiphenomenal, since if typed feature structures are used and thematic relations are assigned configurationally, no macroroles are needed. This is also in accordance with Diedrichsen (2012). In the next section I will show with respect to my constructional schemas, English three-place predicates for transfer verbs, that macroroles are not needed if constructional schemas, which are necessary in order to account for variable undergoer linking are used, since, as shown in section 5 the semantics to syntax linking algorithm cannot account for variable undergoer linking. Instead of the application of the AUH as proposed in Van Valin and LaPolla (1997) and Van Valin (2005), it is possible to account for the assignment of thematic relations in the constructional schemas if the information from the lexicon is accessed. If one assumes the existence and importance of signatures in constructional schemas, which are accounted for by the pointers in verbs with lexically three-argument positions in the lexicon, or the

possibility to exhibit a valence alternation which refers to constructions stored in the construction repository, macroroles are not needed in RRG and are epiphenomenal. As pointed out in Davis (2001), they are part of the hierarchical lexicon, since otherwise it would not be possible to explain why some arguments can be assigned to some verbs and some cannot. Therefore, thematic relations belong to the meaning of the verb and are in fact a lexical phenomenon. Based on these findings and on the following it is possible to conclude that macroroles are set on top of the idea of the configurational approach used in RRG, as already pointed out in Diedrichsen (2012). This is the reason why macroroles are epiphenomenal and why they are not needed in RRG. In fact there are no advantages in using macroroles, since even the assignments of PSAs do not need the concept of macroroles. The privileged syntactic argument selection hierarchy as described in Van Valin (2005) does not need macroroles, since it is based on a configurational approach operating on the logical structures of verbs. This means, in order to become more economic and therefore meet the internal principle of economy as referred to in section 1, macroroles are not needed. This idea results in a theory which should be unification-based, as this approach to the computability of RRG already shows, and which needs constructional schemas as pointed out in Nolan (2011). In the next section I will introduce an information structure-based analysis of RRG, which makes use of discourse representation structures and constructional schemas as developed in Nolan (2011) which are as pointed out before are revised to a certain degree in order to account for both the semantics to syntax linking and the syntax to semantics linking as discussed in Nolan (2011). This way I will account for variable undergoer linking in three-place predicates which is computationally adequate.

8. Constructional Schema for three-place predicates in English

For the development of a computationally adequate algorithm for an computationally adequate analysis of three-place predicates in the RRG linking from semantics to syntax, which makes use of constructional schemas, the concept of discourse representation structures [DRSs] is also of crucial importance. This is because in variable undergoer linking, information structure considerations play an important role, as pointed out in Van Valin and LaPolla (1997: 423), Diedrichsen (submitted) and Erteschik-Shir (1979). Therefore, in this section I will develop an information structure based analysis of three-place predicates in English. The data used for this analysis is given in (28):

- (28)
- | | | |
|-----|------------------------------|---|
| a. | Abby gave a file to Gibbs. | |
| a'. | Abby gave Gibbs a file. | √ |
| b. | Abby gave a file to the cop. | |
| b'. | Abby gave the cop a file. | √ |
| c. | Abby gave a file to her. | |
| c'. | Abby gave her a file. | √ |
| d. | Abby gave the file to Gibbs. | |
| d'. | Abby gave Gibbs the file. | √ |
| e. | Abby gave the file to her. | |
| e'. | Abby gave her the file. | √ |
| f. | Abby gave the file to a cop. | √ |
| f'. | Abby gave a cop the file. | |

(cf. Erteschik-Shir 1979)

The examples of three-place predicates, which are marked by a hook, are the unmarked cases based on native speaker interviews discussed in Erteschik-Shir (1979). This is not in accordance with Van Valin (2007), where the non-hooked examples are the unmarked cases, since they are in accordance with the AUH, as already discussed in section 4. In this section, I will show that information structure considerations govern the alternations found in the examples in (27) above. In what follows I will analyze the information structure considerations in these examples before developing constructional schemas in order to account for three-place predicate constructions in English. In the context of information structure, RRG differentiates between pragmatic presupposition and pragmatic assertion. Based on Lambrecht (1994), Van Valin (2005: 69) describes these two concepts as follows:

Pragmatic Presupposition: The set of propositions lexicographically evoked in an utterance which the speaker assumes the hearer already knows or believes or is ready to take for granted at the time of speech.

Pragmatic Assertion: The proposition expressed by a sentence which the hearer is expected to know or believe or take for granted as a result of hearing the sentence uttered.

In RRG, focus is defined as the semantic component of a proposition which is pragmatically structured. In this proposition, focus is what is contained in the assertion but not in the presupposition (cf. Van Valin 2005: 69). Topic on the other hand is information which is both contained in the presupposition and in the assertion (cf. Van Valin 2005). RRG differentiates three focus types (cf. Van Valin 2005: 70). The universally unmarked focus type, which is similar to the traditional notion of ‘topic-comment’, is predicate focus (cf. Van Valin 2005: 70). Following Van Valin (2005: 70), who bases his definition on Lambrecht (2000), predicate focus is defined as follows:

Predicate focus structure: Sentence construction expressing a pragmatically structured proposition in which the subject is a topic (hence with the presupposition) and in which the predicate expresses new information about this topic. The focus domain is the predicate focus phrase (or part of it).

Formally, predicate focus can be described as follows:

(29)

Sentence:	<i>McGee's computer crashed.</i>
Presupposition:	‘McGee's computer is available as a topic for comment x’
Assertion:	‘x = crashed’
Focus:	crashed
Focus domain:	Verb plus remaining post-verbal core constituents (cf. Van Valin 2005: 70)

Sentence focus differs strikingly from predicate focus, since it has no topical subject. Instead, the entire sentence is in the focus domain (cf. Van Valin 2005: 71). Van Valin (2005: 71) defines predicate focus based on Lambrecht (2000) as follows:

Sentence focus structure: Sentence construction formally marked as expressing a pragmatically structured proposition in which both the subject and the predicate are in focus. The focus domain is the sentence, minus any topical non-subject arguments.

In a more formal way, predicate focus can be represented as in (30).

- (30) Question: What happened?
 Sentence: *McGee's computer crashed.*
 Presupposition: None
 Assertion: 'McGee's computer crashed.'
 Focus: 'McGee's computer crashed.'
 Focus domain: Clause (cf. Van Valin 2005: 71)

In narrow focus, the focus domain is a single constituent. This constituent can either be subject, object, an oblique or a verb (cf. Van Valin 2005: 71). A more formal description of narrow focus looks as follows.

- (31) Question: I heard McGee's tablet pc crashed?
 Sentence: *McGee's computer crashed.*
 Presupposition: 'McGee's x crashed.'
 Assertion: x = computer
 Focus: 'computer'
 Focus domain: RP (cf. Van Valin 2005: 72)

As pointed out by Van Valin (2005: 72), Lambrecht (1986) distinguishes unmarked narrow focus and marked narrow focus. The difference is where narrow focus falls. In English, unmarked narrow focus is found if narrow focus falls on the final constituent. Marked narrow focus on the other hand is found when it falls to the left or right of the final constituent. WH-questions are a common example of narrow focus. In a sentence like *Whom did Gibbs shoot?* With the corresponding answer *He shoot* __, the WH-word and the RP filling its slot in a reply are both marked as narrow foci (cf. Van Valin 2005: 72). Also, in yes-no questions narrow focus is found (cf. Van Valin 2005: 72). Formally, the interaction of focus as well as presupposition and assertion is captured by DRSs, which in RRG-terms are introduced in Van Valin (2005: 171). Van Valin (2005: 171) describes the idea of DRSs as follows:

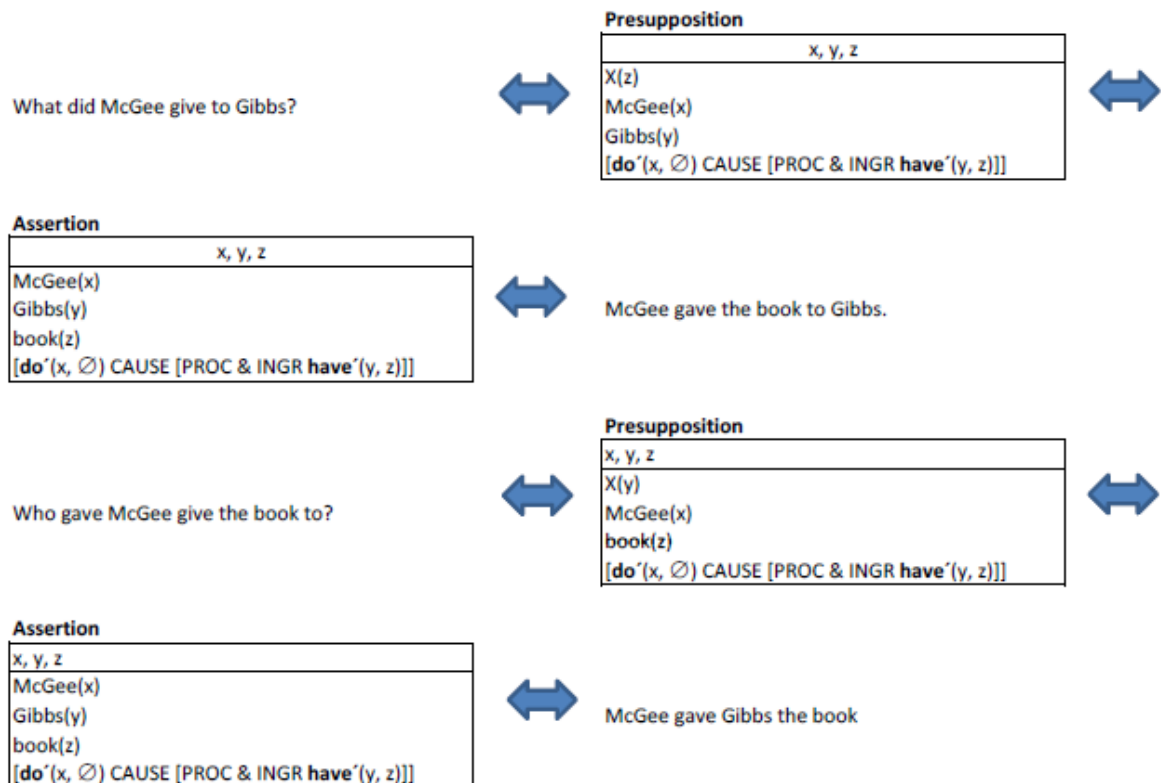
In section 3.1 above, Lambrecht's (1994) definition of 'focus' is 'the semantic component of pragmatically structured proposition whereby the assertion differs from the presupposition'. This yields the actual focus domain, and, in order to derive it, it is necessary to have representations of both the pragmatic assertion and the pragmatic presupposition. This can be done in terms of simplified version of Discourse Representation Theory (Kamp and Reyle 1993; Asher 1999; von Heusinger 1999). [...] These is a discourse representation structure for each sentence, and it contains the referent and the proposition expressed in the sentence. Coreference relations between pronominals and established referents are explicitly represented. In order to derive the different focus structures, it is necessary to have a representation of the presupposition and the assertion. According to von Heusinger (1999: 202), 'the background structure is constructed in the same way [as the foreground, i.e. asserted, structure] except for focused expressions, which are represented by designated variable of the appropriate type'.

An example of how DRSs interact with focus assignment in English three-place predicates is given in (32) below.

- (32) a. Speaker A: What did McGee give to Gibbs?
 Speaker B: McGee gave the book to Gibbs.
 b. Speaker A: Who did McGee give the book to?
 Speaker B: McGee gave Gibbs the book.

In speaker A's utterance in (32a) *what* is the focus and in speaker A's utterance in (32b) *who* is the focus; both utterances are examples of narrow focus. The interesting question now is which focus structure types are found in the responses from the B-speakers in (32). Since the B-speaker-responses are used in order to respond to a sentence, which is of the narrow focus type, also these sentences are narrow focus. This is because the focus domain is a single constituent in this case an RP (cf. Van Valin 2005: 72). It is possible to represent (16) in the following DRSs.

(33) DRS structures



The question is *What did McGee give to Gibbs?* and the presupposition of the speaker uttering this sentence is 'x was given to Gibbs by McGee'. The assertion uttered in response is that *the book* was given to Gibbs by McGee. What is new in this assertion and this way a possible candidate for focus is *the book*. The second question in figure 1 is *Who gave McGee give the book to?*. Here, the presupposition of the speaker is 'X was given a book by McGee'. In the response *McGee gave Gibbs the book*, the RP *Gibbs* is not in the presupposition, however, it is in the assertion and this means it is focus. This can clearly be seen in the DRSs used. Based on the native speaker interviews introduced in Erteschik-Shir (1979) and also shown in the example in 31, it is also possible to conclude that in cases of predicate focus and sentence focus the order is *McGee gave Gibbs the book*. This conclusion is possible, since this is the unmarked situation. Unmarked situation in these examples does not mean that this word order is the basic word order, since in this approach both constructions the ditransitive and the dative-shift are treated alike. This is in contrast to Van Valin's (2007) analysis.

What was shown thus far is that information structure as assumed in Erteschik-Shir (1979) governs variable undergoer linking in three-place predicates in English. It was

also shown that DRSs, as used in Van Valin (2005) can be used in order to determine the focus of a sentence. However, it is important to note that the postverbal element in three-place predicate constructions is not always focus, since, following Lambrecht (1994), focus usually is a pragmatically relation of an element to a proposition (cf. Lambrecht 1994: 217).

As pointed out by Nolan (personal communication) it is an empirical question whether there is one constructional schema which can handle the linking bi-directionally or whether there are two separated constructional schemas; if the latter was the case there would be two constructional schemas, one for the semantics to syntax linking and one for the syntax to semantics linking. In this paper I will use an approach to constructional schemas which is somewhere in between these two ideas. My idea is that a construction, like three-place predicates in English, is a grammatical object in the sense that the construction can be compared with an object in programming languages which can be manipulated by the programming language. This idea is similar to the concept of the construction as grammatical object developed in Nolan (2011). In Nolan's approach a construction as grammatical object is a structured grammatical object which has a unique constructional signature as was pointed out in section 6. In my approach to constructional schemas the idea is very similar and here a grammatical object within a computational adequate version of RRG is a data structure which has two methods, the syntax to semantics linking and the semantics to syntax linking. For illustrative purposes the method for the semantics to syntax linking in three-place predicates is also illustrated in the fashion of a constructional schema. In this approach, as in Nolan (2011), a constructional schema has signature which can be used to identify the constructional schema and then it contains these two methods, one for each linking direction. In some way these different methods have similar structures however they differ with respect to the explicit algorithm they contain which is to be used to model the appropriate linking direction. The advantage of this approach in which constructional schemas are developed along the lines of a concept from computer science is that on the one hand the bi-directionality of the linking algorithm is reflected more naturally and on the other hand this approach supports the concept of computational adequacy I have developed in this paper.

In (34) the architecture of the constructional schema as grammatical object for three-place predicates in English is shown. As can be seen the construction as grammatical object for three-place predicates in English which is represented by a constructional schema as developed in Nolan (2011) has a signature which uniquely identifies the construction. The object which is represented by the constructional schema in (34) refers to transfer situations in English and can be used to represent both the semantics to syntax linking and the syntax to semantics linking in RRG in a computationally adequate version, which can be executed as part of an intelligent software agent on a RAM. The constructional schema in (34) has three possible signatures, which can be used to identify the construction and activate it in the sense of Nolan (2011). English three-place predicates for transfer verbs have three different signatures. In the first one, the first RP is the actor, while the third token can either be an RP or a pronoun, which are both recipient. The last RP in the signature is the theme. However, this construction can also be activated by two further signatures. The second signature also has an RP as first token, which is actor. The third token in this signature is an RP, which is theme, while the forth token is a pronoun or an RP, which is both marked by a preposition and is a recipient. In the third signature, an RP is actor and the third token is an RP, which

is theme. The last token can either be an indefinite RP, which is recipient, and marked by a preposition. In all examples, the verb is in V2-position. It is also noted that the signature consists of four tokens with an optional preposition. This constructional schema can either receive a clause consisting of tokens [1], [2] or [3] as input or it can receive an LS as input. Here, grammatical patterns for sentences are stored, which in an implementation of intelligent software agents are identified after parsing took place. In these grammatical patterns, the verbs in V2-position are inflected. Since this construction schema is activated by a signature, also semantic roles are assigned. The other possibility is that the constructional schema receives an LS as input which is generated within the lexicon in advance and sent to the constructional schema as grammatical object. This will be described later in this paper.

(34)

Signature [1] = [RP _{Actor} V [RP _{Recipient} PN _{Recipient}] RP _{Theme}] OR [2] = [RP _{Actor} V RP _{Theme} [PREP PN RP] _{Recipient}] OR [3] = [RP _{Actor} V RP _{Theme} [PREP indef det N] _{Recipient}] as tokens [1 2 3 (PREP) 4]
Input RP _{Actor} [_] and V = pred. [TNS: _] and [RP _{Recipient} [_] PN _{Recipient} [_]] and RP _{Theme} [_] = [4] elseif RP _{Active} [_] and V = pred. [TNS: _] and RP _{Theme} [_] and [[PREP] PN _{Rec} [_] RP _{Rec} [_]] = [5] elseif RP _{Actor} [_] and V = pred. [TNS: _] and RP _{Theme} and [[PREP] PN _{Rec} [_] RP _{Rec} [_]] = [6] or LS = [do'(x, <) CAUSE [PROC & INGR have' (x, y)]]
Method body if semantics to syntax linking == true do syntactic pattern = semantics.to.syntax.linking(LS) else LS = syntax.to.semantics.linking([4] or [5] or [6], tokens[1, 2, 3, prep 4])
Output [do'(x, <) CAUSE [PROC & INGR have' (x, y)]] = LS or Well formed three-place predicate construction = LS for semantics to syntax linking or RP _{Actor} [_] and V = pred. [TNS: _] and [RP _{Recipient} [_] PN _{Recipient} [_]] and RP _{Theme} [_] = syntactic pattern elseif RP _{Active} [_] and V = pred. [TNS: _] and RP _{Theme} [_] and [[PREP] PN _{Rec} [_] RP _{Rec} [_]] = syntactic pattern elseif RP _{Actor} [_] and V = pred. [TNS: _] and RP _{Theme} and [[PREP] PN _{Rec} [_] RP _{Rec} [_]] = syntactic pattern

The grammatical object for three-place predicates which is represented as constructional schema does not contain a workspace since as pointed out by Nolan the workspace is construction dependent since however this construction consists of two methods as shown in the method body of the grammatical object the workspace is actually part of the methods which describe the linking direction. What happens in the method body is that it is tested whether semantics to syntax linking takes place or whether syntax to semantics linking takes place. In the first case a semantics to syntax linking method is called which receives an LS as input and in the latter case the syntax to semantics linking takes place; in this case the method receives a clause as input. After a method is executed within a constructional schema which is represented as a sub constructional schema the result is stored in either a variable called LS or in a variable called syntactic patterns which in the output section of the constructional schema assign the proper output to this variable. The output of construction as grammatical object of the constructional schema which represents a grammatical object is the LS [do'(x,) CAUSE [PROC & INGR have' (x, y)]] or the information *Well formed three-place predicate construction*. The information which output should be realized by the assignment from the method for the syntax to semantics linking by the syntax to semantics linking method. Basically the representation in this case is a bit fuzzy from a computational point of view but clear for illustrative purposes since generally the output is realized by the variable LS and this can either be an LS or the information that the sentence is well-formed. The same is true for the three different possibilities for the output. In an implementation only the variable would be represented however for purposes of illustration it is shown that the variable can be realized by three different syntactic patterns. By realizing the construction as grammatical object represented as constructional schema containing methods it is possible to have a close set of language specific constructions which are treated as objects which can properly account for the bi-directional linking in RRG with the use of methods representing the two linking directions. With the use of constructional schemas which represent constructions as grammatical objects the linking algorithm developed in Van Valin (2005: 136) becomes computational adequate in the sense that it can be executed on a RAM. A possible method for the semantics to syntax linking in for three-place predicates in English whose , which exhibits variable undergoer linking is given in (35) below.

The semantics to syntax method which is part of the constructional schema which realizes three-place predicates as objects in this approach contains as workspace as exemplified in Nolan (2011) which contains the input which is sent to the method which is called in the method body of the constructional schema for the grammatical object. However most importantly this method which is part of the constructional schema contains a construction body in which the actual linking takes place. In the construction body of the semantics to syntax linking is described. First, the logical structure retrieved from the linking algorithm to which this information was sent from the lexicon in advance. Information of lexical semantic relations is inherited.

(35)

English three-place predicate construction ‘give-rel’ Semantics to Syntax Linking
Workspace: input [1], [2] or [3]
Construction Body [SEM → SYN] Retrieve the logical structure from linking algorithm Inherit information of lexical semantic relations from lexicon Assign LS(x) argument with actor according inherited information from lexical semantic relations from lexicon if predicate focus structure == true or sentence focus == true or token 3 == narrow focus do coindex token [3] with recipient in logical structure coindex token [4] with theme in logical structure generate syntactic pattern = [1] elseif signature [3] == true do coindex token [3] with theme in logical structure coindex token [4] with recipient in logical structure generate syntactic pattern = [2] elseif coindex token [3] with theme in logical structure coindex token [4] with recipient in logical structure generate syntactic pattern = [3] end if Morphology: none Pragmatics: topic = PSA

Arguments in the LS are assigned actor, which is defined based on the signature, which was activated based on typed feature structures stored in the lexicon is retrieved. If an example of predicate focus structure is found or sentence focus is true, or token 3 is in narrow focus, then token 2 is coindexed with recipient in the logical structure, and token 4 is coindexed with theme in the logical structure, and syntactic pattern [1] is generated and stored in the variable ‘syntactic pattern’. If, however, signature [3] is true because it is activated based on the interaction of the construction repository and the lexicon, then token [3] is coindexed with theme in the logical structure, and token [4] is coindexed with recipient, and syntactic pattern [2] is generated. In all other cases, token [3] is coindexed with theme in the logical structure and token [4] is coindexed with recipient in the logical structure, and syntactic pattern [3] is generated. As noted in the constructional schema, morphology does not play any role, while the PSA is always topic in this construction. What is important to note in this context is that of course the method cannot only retrieve values by the object of which it is part but it can also retrieve information from the general linking algorithm. This is what takes place in the construction body. After the constructional schema has applied as kind of method in the pseudo-code meta-language, the populated logical structure is sent to the algorithm again and the usual linking process can start. For a revision of the semantics to syntax linking algorithm, this means in the first step DRSs automatically filled in discourse situation are analyzed and focus structure is determined algorithmically. The determination of topic and focus is of importance for the new version of the RRG linking from semantics to syntax developed in this paper. The algorithm for the determination of the different focus types is given in (36) below:

(36)

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access information from DRS for presupposition;
access information from DRS for assertion;
if RP in presupposition and assertion do
    topic = RP;
if (NUC and RP1 ... RPn in assertion == true) and (NUC and RP1 ... RPn in
presupposition == false) do
    predicate focus = (NUC and RP1 ... RPn);
if DRS for presupposition == false and DRS for assertion == true do
    focus = assertion;
if (RP or PP or NUC not in presupposition) and (RP or PP or NUC in assertion) do
    narrow focus = RP or PP or NUC;

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In the pseudo-code representation of an algorithm for the determination of focus types as given in (34), what happens first is that information is accessed from both the DRS for presupposition and the DRS for the assertion. In a first step it is checked whether an RP is contained in both presupposition and assertion. If such an element exists, it is assigned topic. In case NUC and RP₁ ... RP_n are contained in assertion and not in the presupposition, these constituents are assigned predicate focus. In cases where no presupposition exists but the statement 'DRS for assertion == true' is true, then the whole assertion is assigned focus. In situations where RPs, PPs, or NUCs are not contained in the presupposition, but occur in the assertion, either the RP, PP or NUC is assigned narrow focus. In the second step of the new version of the semantics to syntax linking algorithm in RRG, the logical structure is accessed from the lexicon via unification of the logical structure, information from the lexicon and a database containing world knowledge. Afterwards a logical structure is accessed from the lexicon. In the next step of the new linking algorithm, a populated logical structure is accessed from the lexicon. In this paper I will not give an algorithmic description of the cognitive processes which construct a full-fledged logical structure. It will be a task for future research to describe how logical structures are constructed in the lexicon, since it would be necessary to develop lexical entries for all parts of the lexicon. I will assume that logical structures are already constructed when they are accessed from the lexicon. The next step in the new version of the linking algorithm takes place after the fully populated logical structure is sent from the lexicon to the linking algorithm. In Van Valin (2005: 137) it is proposed that the output of speech as well as having a rough architecture of a database containing world knowledge. This task is way beyond the scope of this paper. Therefore, in the next step of the new linking algorithm, the first step in the linking algorithm is a fully constructed logical structure with attached operators and a notion of the discourse status of the referents in the logical structures. Such a logical structure is given in (37) below:

(37)

a. McGee gave Siva the USB-stick.

b. $\langle_{\text{IF}} \text{DEC} \langle_{\text{TNS}} \text{PAST} \langle [\text{do}'(\text{McGee}_{\text{ACT}}, \langle)]$
 CAUSE [PROC & INGR have'($\text{Siva}_{\text{ACS}}, \text{USB-stick}_{\text{ACT}})$]] $\rangle \rangle \rangle$
 (cf. Van Valin 2005: 137)

Following Van Valin (2005: 79), it is noted that the activation level of referents of RPs filling argument positions is coded in logical structures. Van Valin (2005: 79) differentiates five levels of activation:

For simplicity's sake, only five levels of activation will be coded: active, i.e. actively under consideration in the discourse by means of direct mention; accessible, i.e. not actively under consideration but readily recognized by the addressee due either to knowledge of the world or to occurrence in the immediate environment of the speech situation; inactive, i.e. previously mentioned but not actively under consideration and not assumed by the speaker to be recognized by the addressee; brand new – anchored, i.e. not previously mentioned but related to something already mentioned or accessible; and brand new – unanchored; i.e. not previously mentioned or related to anything previously mentioned (Prince 1981b, Chafe 1987). Propositions may also have different levels of activation (Dryer 1996).

Since, however, in the new version of the linking algorithm topic and focus are determined in the first step rather than later in the algorithm, topic and focus are assigned in the lexicon within a logical structure construction processes. This is possible since the arguments in the logical structure are matched with information from DRSs. Also, the activation levels are assigned in this step of the linking algorithm. Besides information on the activation level – topic and focus as well as the attachment of operators to the logical structure – also pointers to possible signatures in the construction repository are contained in the logical structure, which is sent from the lexicon to the algorithm. These pointers to the construction repository occur in situations where the necessity of a construction is coded in the lexicon. This way the logical structure, which is sent to the linking algorithm, looks as given in (38).

- (38) a. Whom did McGee give the USB-stick?
 b. McGee gave Siva the USB-stick.
 c. $\langle_{\text{IF DEC}} \langle_{\text{TNS PAST}} \langle_{\text{[[do' (McGee}_{\text{ACT}} \rightarrow \text{Topic}_{\text{agent}}, \langle)]}}$
 CAUSE
 $[\text{PROC \& INGR have' (Siva}_{\text{ACS}} \rightarrow \text{Focus}_{\text{recipient}}, \text{USB-stick}_{\text{ACT}} \rightarrow \text{theme})]] \rangle \rangle \rangle$
 and $\wedge [\text{RP}_{\text{Actor}} \vee [\text{RP}_{\text{Recipient}} \mid \text{PN}_{\text{Recipient}}] \text{RP}_{\text{Theme}}];$
 $\wedge [\text{RP}_{\text{Actor}} \vee \text{RP}_{\text{Theme}} [\text{PREP PN} \mid \text{RP}]_{\text{Recipient}}]; \wedge [\text{RP}_{\text{Actor}} \vee \text{RP}_{\text{Theme}} [\text{PREP}$
 indef det N] $_{\text{Recipient}}]$

The next step in the linking algorithm therefore looks as follows (39).

(39)

access full-fledged logical structure from the lexicon
if pointer to signature in construction repository == **true do**
 new constructional schema **in** construction repository;
else determine morphosyntactic coding properties in one-place predicates
or determine morphosyntactic coding properties in two-place predicates.

This part of the algorithm accesses populated logical structures from the lexicon and checks whether a pointer to a signature in the construction repository exists. If this is the case, a new constructional schema is called. Otherwise, the morphosyntactic coding properties of the logical structures with assigned thematic relations are determined. In cases where a constructional schema is called, the assignment of thematic relations within the constructional schema takes place. Afterwards a logical structure with

assigned thematic relations is sent to the linking algorithm, where the other linking steps take place. Constructional schemas are flexible with respect to what part of the linking takes place within them. It is possible, as in the case of three-place predicates of the *give-rel* in this section, that they only take place to a certain degree. However, it is also possible that the whole linking takes place in the constructional schema. Since in this paper I focus on the generation of three-place predicates, I will not go on to describe how the linking should precede in more detail.

9. Conclusion

In this paper the concept of computational adequacy as an important theory external principle was developed and it was shown that this principle is of greatest importance if the Church-Turing-thesis is taken into account. The concept of intelligent software agents was introduced as important basis for the implementation of a functional linguistic theory, as RRG and a pseudo-code-based analysis of the semantics to syntax linking algorithm was developed, which was executed on a RAM. It was shown that the semantics to syntax linking algorithm, as developed in Van Valin (2005), is too coarsely grained and fuzzy to account for three-place predicates with variable undergoer linking. Based on a lexical approach to transfer verbs, typed feature structures for the give- and receive-relation were introduced and it was shown that thematic relations are stored in the mental lexicon within an inheritance network. As shown in section 7, this unification-based approach can be used in order to show that semantic macroroles, as developed in Van Valin (2005), are epiphenomenal and that the AUH is superfluous. Also, a constructional schema for the give-relation of transfer verbs in English was developed, which is connected with the lexicon via unification. It was shown that the analysis of DRSs should be the first step in the semantics to syntax linking and that it is possible to account for variable undergoer linking in English via information structure. In general, it was shown that in a new version of the linking algorithm from semantics to syntax it is necessary to first analyze DRSs by parsing and that this information is sent to the lexicon. Also, it was shown that topic and focus are assigned to the logical structure in the mental lexicon and that a pointer to the signatures in the constructional schemas stored in the construction repository, as developed in Nolan (2011), is used to connect logical structures in the mental lexicon. It was shown that the second step in the semantics to syntax linking algorithm is the access to the lexicon and that a test as to whether a constructional schema for the particular sentence exists. If this is the case, constructional schemas are called as functions. Since this paper is concerned with research work in progress, it will be a task of future research to answer the several questions left open in this paper.

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