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Turkish RelativeParticiples.
A Reanalysis inCategorial Grammar.

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Klaus von Heusinger

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A Reanalysis in Categorial Grammar.*

Klaus von Heusinger, FG Sprachwissenschaft

Universität Konstanz Postfach 5560 D 185, 78434 Konstanz

email:klaus.heusinger@uni-konstanz.de

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CONTENTS:

1. Introduction

Underhill (1972) analyzes the two types of relative construction in Turkish. One type is applied if the subject of the embedded clause is relativized, whereas the second construction covers all the other cases. In this paper, I try to give a transparent reanalysis of the suffix *-diği* which forms relative constructions of the second type. The relative clause in (2) is derived from the simple sentence in (1) by modifying the verbal stem *bekle* with the participle suffix *-diğ* and the possessive suffix *-i*. The subject of the relative clause is realized by the genitive modifier *kardeşimin* of the participle *beklediği*:

(1)   *kardeş-im   misafir-i   bekli-yor*
        brother-pos.1.sg   guest-acc expect-pres
        'My brother expects the guest.'

(2)   *kardeş-im-in   bekle-diğ-i   misafir*
        brother-pos.1.sg-gen   expect-part-pos.3.sg   guest
        'the-waiting-of-my-brother-guest' = 'guest that my brother expects'

On one hand the participial suffix *-diğ* forms a participle from a verbal stem, which modifies the head noun *misafir*. On the other hand the possessive suffix *-i* refers to the genitive *kardeş-im-in*, which is the subject of the relative clause. This causes a double bracketing paradox: The participial suffix *-diğ* refers to the head noun *misafir* while the possessive suffix refers back to the genitive *kardeş-im-in* crossing the attributive participle: [₁ *kardeş-im-in bekle-*[₂ *diğ-i*]₁ *misafir*]₂. These complex functional relations can only be explained if the morphology/syntax border is made more transparent than it is assumed in most theories about syntax. I argue with special reference to the relative suffix *diği* that a categorial analysis gives new insights into the syntax-morphology interface. It will be shown that Turkish relative clause constructions can be traced back to general syntactic and morphological rules of Turkish.

This paper is organized as follows: In section 2, I give a short outline of categorial grammars in linguistic theory. The basic ideas are introduced by the example of the classical formalism due to Ajdukiewicz. Then, generalized categorial grammars are discussed, which are able to describe more complex phenomena, like bracketing paradoxa. In section 3, I sketch some essential constructions of Turkish which are crucial to the analysis of relative clause constructions: nominal constructions, genitive groups and participles. Turkish nouns can be used as substantives, attributes or predicates. The Turkish genitive

group or definite izafet-construction is marked by an agreement feature between the modifying genitive and the head noun. Participial constructions and nominalizations play an important role in Turkish because they are the means to form subordinate clauses. The categorial description of these three grammatical constructions yields a transparent analysis of Turkish relative clauses and relative clause suffixes in section 4. It can be shown that the reanalysis of the function of the suffix *-diɡi* does not only solve the double bracketing paradox, but also provides a transparent composition of its lexicalized meaning. Finally, the analysis is applied to the construction that Lewis (1967) called 'bah¦bozuk' ('broken head') like *oɡlan-ɨn mekteb-in-e git-tiɡi adam* 'The man, to whose school the son goes'.

2. Categorial Grammar and Linguistic Theory

Categorial grammars are the oldest explicit formal systems for the description of sentence structure. They are based on three main ideas: Husserl's notion of 'Bedeutungskategorie' ('category of meaning'), Frege's reasoning on the functionality of language and Russell's formulation of the stratification of language. The first categorial grammar unifying the three components was formulated by Le‚niewski (1929) and elaborated by his pupil Ajdukiewicz (1935). Bar-Hillel (1953) applied this logical and formal approach to the notion of constituents used in the structuralist tradition and coined the notion of *categorial grammar*. Later he followed Chomsky in doubting the adequacy of categorial grammars, which are a weakly equivalent to constituent structure grammars. This caused a lack of interest in the linguistic application of categorial grammars during the following decades. However, categorial grammars were investigated by mathematicians like Lambek (1958), philosophers like Geach (1972) or semanticists like Cresswell (1973). They were also applied by Montague (1974) as the syntactic equivalent to the semantic component supporting the central principle of compositionality.

   Not until the eighties were categorial grammars back in linguistic discussion (cf. Buszkowski et al. 1988 and Oehrle et al. 1988). There are the following reasons among others: The growing research in automatic language processing caused the interest in syntactic languages that entail their semantics unambiguously. The shift of grammatical complexity from the syntax to the

lexicon leads to a recollection of very simple syntactic mechanisms, which had been investigated by categorial grammar for a long time. Finally, extensions of the theory like polymorph categories, complex feature structures and the rule of unification have opened new applications (cf. Haddock et al. 1987 or Klein & van Benthem 1988).

2.1 Classical Categorial Grammar

The concept of 'classical categorial grammar' denotes a formal system going back to Ajdukiewicz and Bar-Hillel. It is characterized by the following three points:

(i)   There exists a strict parallelism between syntactic and semantic categories.

(ii) The only syntactic operation permitted is concatenation of a functor with its argument.

(iii) Syntactic concatenation is interpreted semantically as functional application, i.e., as the application of the meaning of the functor to the meaning of the argument.

Classical categorial grammar uses only two basic categories, *n* for *name* and *s* for *sentence*. All other linguistic categories are functors that receive more complex indices constructed out of the basic ones. Table (4) shows a preliminary assignment of indices to linguistic expressions in a simple grammar with forward application.

(4)

category	categorial index	language expression
sentence	s	*the rose blooms*
name	n	*Socrates*
common name	s/n	*rose, bear, duck*
nominal, term	$s/(s/n)$	*nobody, the rose*
intransitive verb	s/n	*bloom, laugh*
modal verb	$(s/n)/(s/n)$	*can, must*
attributive adjective	$(s/n)/(s/n)$	*big, small*
article	$(s/(s/n))/(s/n)$	*the, a(n)*
adverb	$(s/n)/(s/n)$	*strongly, loudly*
sentence operator	s/s	*not, necessary that*

The formalism works with one basic syntactic rule, namely concatenation or forward application. A functor expression *A* can be applied to an argument expression *B* if *A* has the categorial index *X/Y* (*X* over *Y*) and *B* the categorial index *Y*. The resulting index of the concatenated expressions *A^B* is *X*. Concatenation is interpreted as functional application, i.e. as the application of the meaning of the functor category to the meaning of the argument category.

(5)   *Concatenation or forward application:* X/Y Y $\rightarrow$ X

f   x $\rightarrow$ f(x)

A categorial grammar with forward application and the indices given in (4) can already analyze fragments of English as illustrated in (6) and (7). The derivations are represented in 'flat' structures, contrary to the hierarchical trees of constituent structure grammars. The categories are concatenated from left to right applying a functor to the argument on its right.

(6)   *the   rose blooms*
        (s/(s/n))/(s/n)   s/n   s/n
              s/(s/n)
                    s

(7)   *the   little   bear   could   loudly   laugh*
        (s/(s/n))/(s/n)   (s/n)/(s/n) s/n   (s/n)/(s/n) (s/n)/(s/n) s/n
                              s/n   s/n
              s/(s/n)   s/n
                          s

However, the range of application of classical categorial grammar is restricted, because it can only give derivations for structures that have a functor expression occurring before its argument.

2.2 Generalized Categorial Grammars

Generalized categorial grammars use additional rules in order to describe a wider range of data: backward application, functional composition, type change rules and unification. The rule of backward application (8) gives a greater flexibility in the directionality of concatenation. Backward application permits a functor to take the arguments on its left side, like in

(9a). The meaning of the intransitive verb *walk* in (9a) is applied to the meaning of the name *Mary*: *walk'(Mary')*.[1] The basic word order in English can be described by a categorial grammar combining forward and backward application, as illustrated in (9b).

(8)   *backward application*   Y Y\X → X
                                     x   f → f(x)

(9a)   *Mary   walks*
         n_____n\s
              s

(9b)   *Mary   beats   Harry*
         n   (n\s)/n n
              ____n\s
          s

Backward application as well as forward application is interpreted as the operation of applying the meaning of the functor to the meaning of the argument. Since the two rules of application are not semantically distinguished, they are summarized as functional application (= *FA*). We will mark the direction of application with a lower-case letter (*FAf* vs. *FAb*). A categorial grammar with only one direction of application is called *unidirectional*, and a grammar with both applications *bidirectional*.

   Functional composition combines two functor categories if the type of the argument that the first functor demands is equal to the resulting value of the second functor. Functional composition is interpreted as the semantic operation that assigns the function $\lambda x\ [f(g(x)]$ of type *X/Z* to the composition of a function *f* of type *X/Y* and a function *g* of type *Y/Z*. There are two directional versions:

(10)   *functional composition* (FC)
        (i) forward (FCf):   X/Y Y/Z → X/Z
                                f   g→ $\lambda x\ [f(g(x))]$
        (ii)   backward (FCb): X\Y Y\Z → X\Z
                                g   f   → $\lambda x\ [f(g(x))]$

_____

[1] The meaning of predicates and names is not analyzed further. Following Montague (1974), they are represented by the '' (prime) on the corresponding constants for predicates and individuals.

The application of functional composition can be illustrated by example (11). The adverbial *all year* is categorized as a sentence modifier of type *s\s*. In (11a) it modifies the sentence *no lady wept*. However, in (11b) it combines first with the predicate *wept* yielding a new predicate *wept all year,* which is the argument of the quantifier phrase *no lady*. The construction *wept all year* is licensed by functional composition, which constructs the functor of type *s\s* with another functor of type *n\s* yielding the complex functor of type *n\s*. The order of application causes a difference in meaning. Derivation (11a) means that all the year, there is no lady who wept, whereas derivation (11b) expresses that there is no lady who wept the whole year:

(11a) *No lady*   *wept*   *all year*
       s/(n\s)   n\s $_{FAf}$ s\s
         $\underline{\text{s} \hspace{3cm}}$ FAb
           s   'all year: no lady wept'

(11b) *No lady*   *wept*   *all year*
       s/(n\s) $\underline{\text{n\s} \hspace{1cm} \text{s\s}}$ FCb
         $\underline{\hspace{3cm} \text{n\s}}$ FAf
        s   'no lady: wept all year'

This set of syntactic rules is completed by type changing rules, with the Geachian rule being the only one discussed here. According to this rule, the index of a functor category may be expanded to a more complex index:

(12) *Geachian rule (G)*
       X/Y $\rightarrow$ (X/Z)/(Y/Z) or Y\X $\rightarrow$ (Z\Y)\(Z\X)
       f $\rightarrow \lambda g \lambda x$ [f(g(x))] with g of type Y/Z and x of type Z

The Geachian rule is closely related to functional composition, which can be illustrated by comparing (11b) with (13). In (11b) the two functor categories are combined by functional composition, whereas in (13) the functor *all year* of type *s\s* is first extended to a more complex functor of type *(n\s)\(n\s)*, which then is concatenated with the predicate *wept* of type *n\s* by functional application.

(13) _No lady_   _wept_   _all year_
      s/(n\s)   n\s   s\s
                              | G with Z = n
                    (n\s)\(n\s) FAb
      _____
                 n\s FAf
      _____
          s

Another extension of the grammar concerns polymorph categories and unification (Uszkoreit 1986). An adverb can be assigned the different category indices _s/s, (n\s)/(s\n), ((n\(n\s))/((n\(n\s)) or (n\(n\(n\s)))/(n\(n\(n\s)))_ modifying a sentence, a transitive, an intransitive or a bitransitive verb, respectively. Although these category indices could be derived by the Geachian rule from the basic type _s/s_, unspecified or polymorph category indices do the same job without derivations. An adverb is assigned the underspecified index _(x\s)/(x\s)_ with _x_ being a variable whose value is determined by unification.

The same holds for the conjunction _and_ whose function is to combine two expressions of the same kind to a complex expression of that kind. This can be generally captured by the underspecified index _x\x/x_.[2] In (14) _and_ combines two expressions of type _n_, and in (15) two sentences of type _s_. The adequate index is derived by unification, which assigns the index _n\n/n_ for the coordination of names and _s\s/s_ for the conjunction of sentences:

(14) _Dädalus_   _and_ _Ikarus_   _are flying_
        n   x\x/x   n   n\s
                    | U with x = n
                  n\n/n
      _____
          n
      _____
                s

(15) _Dädalus flies to Crete_ _and_ _Ikarus plunges in the ocean_
              s   x\x/x   s
                               | U with x = s
                    s\s/s
      _____
                s

---

[2] The unspecified category _x\x/x_ is given here without any brackets, and this means, that it is not important, whether the functor expression takes the first argument from the left or from the right or from both sides at the same time.

Summarizing, we can state the following category indices and some abbreviations for complex functor indices. *N* replaces the index *n\s* for common nouns, while *IV* substitutes the category *n\s* for intransitive verbs and *TV* stands for *n\(n\s)* for transitive verbs. Other abbreviations are used according to table (16):

(16)

category	*category index*	*abbreviation*
common nouns	n\s	N(Montague: CN)
NP, term	s/(n\s)	NP (Montague: T)
verb intransitive	n\s	IV
verb transitive	n\(n\s)	TV
modal verb	(x\s)/(x\s)	IV/IV or TV/TV
adverb	(x\s)/(x\s)	IV/IV or TV/TV
attributive adjective	(n\s)/(n\s)	Adj or N/N
article	(s/(n\s))/(n\s)	NP/N
prepositional phrase	(x\s)/(x\s)	PP
conjunction	x\x/x	conj.

2.3 Morphology and Bracketing Paradoxes

Bidirectional categorial grammars without any type change rules can be used for the description of large fragments of morphology. Morphological derivations are analyzed by assigning a lexical category to the stem, and functor categories to derivational affixes. In (17) *law* has the lexical category *N* for common nouns. The derivational morpheme *-ful* derives an adjective from a noun, and therefore, is of the type *N\Adj*. The negation suffix *un-* is of the type *Adj/Adj*, for deriving an adjective from an adjective. Finally, the suffix *-ness* can be categorized as *Adj\N*, because it forms a noun from an adjective. In (17) the adjective *lawful* is derived from the nominal stem *law*. This is then transformed to the adjective *unlawful,* which finally leads to the noun *unlawfulness*. The semantic analysis is correspondingly interpreted as the subsequent functional application of the derivational morphemes: *NOM(NEG(ADJ(law')))*.
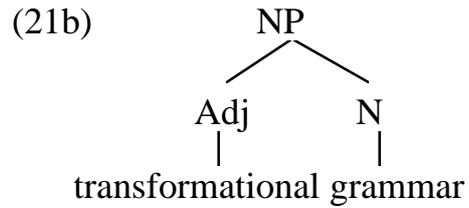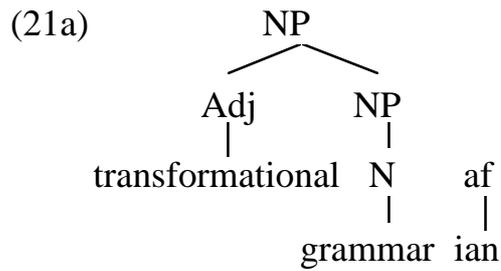
(17) *un-   law- ful-ness*
       Adj/Adj   <u>N N\Adj</u> Adj\N   ADJ(law'))
       <u>   Adj</u>   NEG(ADJ(law'))
       <u>   Adj   </u>   NOM(NEG(ADJ(law')))
                        N

The step-by-step derivation in (17) is morphologically and semantically transparent by attesting a linguistic form for every stage in the derivation. Furthermore, the order of the derivation is directly related to the semantic composition of the meaning which is constructed out of the meanings of the lexical stem and the meanings of the derivational affixes. However, in other cases there is no such a clear structuring. On one hand, many derivations are not transparent anymore, and on the other hand, the morpho-syntactic order of derivation deviates from the semantic composition. The cases in question are the so called 'bracketing paradoxes' (see Williams 1981). Moortgat (1988) investigates bracketing paradoxes in a categorial framework.

In (18) the adjective *sprachlos* ('speechless') is composed of the nominal stem *sprach* ('speech') and the suffix *-los.* ('-less') The noun *Sprachlosigkeit* ('speechlessness') is derived from this adjective. However, there exists no intermediate form *sprachlosig*. Therefore, Moortgat (1988, 325) assumes a lexicalized suffix *-igkeit* of type *Adj\N*, which is an allomorph to *-heit* or *-keit.*

(18) *Sprach- los-   [ig- keit]*
       speech-less-   ness
       <u>N   N\Adj</u>   Adj\N   ADJ+WITHOUT(speech')
          <u>   Adj   </u>   NOM(ADJ+WITHOUT(speech'))
                        N

Preliminary stages of this phenomenon can be synchronically observed in the form of 'reanalysis'. In the morphologically motivated simple analysis in (19), the nomen agentis *Spieler* is derived from the verbal stem *spiel*. The suffix *-in* forms the female form *Spielerin*. However, in the reanalysis the two suffixes are first connected by functional composition, and then they are applied as a complex suffix to the verbal stem. It is interpreted as follows: The function *FEM*, which constructs a female noun from a male noun, is applied to the function *AGENS*. Though the semantics of both derivations is identical, the reanalysis provides a proper meaning of the complex suffix *-erin*. A certain tendency towards lexicalization of this suffix *-erin* can be seen in the derivation

Gebärerin (female that gives birth to somebody) that obviously is not derived from the substantive *Gebärer*.

(19) *simple* $\underline{\quad\quad N\quad\quad}_{FAb}$ FEM(AGENS(play'))

  analysis $\underline{\quad N\quad\quad}_{FAb}$ AGENS(play')

       V   V\N N\N

  Spiel- er- in

       V $\underline{V\backslash N\ \ N\backslash N}_{FCb}$ λP FEM(AGENS(P))

  Reanalyse $\underline{\quad\quad\quad V\backslash N\quad}_{FAb}$ λP FEM(AGENS(P)) play'

          N   = FEM(AGENS(play'))

Another prominent example of reanalysis is discussed by Di Sciullo & Williams (1987, 71ff.). Here, the word *hydroelectricity* is represented by the structure in (20) for purely morphological reasons, although it is derived from *hydroelectric*. Its meaning can be compositionally built up from the meaning of the word *hydroelectric* and the meaning of the affix *-ity*. But the morphological structure doesn't correspond with this semantic composition, because *-ity* is an affix of class I, which can not be affixed to a word that already begins with an affix like *hydro* belonging to class II (Selkirk 1982):

(20)   N
        ╱   ╲
    N/N   N
     | ╱   ╲
   hydro   Adj   Adj\N
            | |
         electric   ity

Di Sciullo & Williams (1987, 73) show that "the bracketing paradoxes span syntax and morphology. For example, the syntactic phrases *transformational grammar* and *transformational grammarian* are 'related' exactly as *hydroelectricity* and *hydroelectric* are:"

(21a)

```
              NP
            /    \
        Adj      NP
         |        |
 transformational N      af
                  |      |
               grammar  ian
```

(21b)

```
              NP
            /    \
        Adj       N
         |        |
 transformational grammar
```

Following Williams (1981), Di Sciullo & Williams (1987, 72) define the 'relation' as a configuration of lexical units specified by the following definition:

(22) X is related to Y if X can be got from Y by substituting for a head of Y, including substituting 0 for a head of Y.

This definition is rather general and concerns only the interpretation of expressions, but not the derivation. The following example shows how this pure semantic 'relation' can influence the syntactic description. The relation between the noun *relation* and the noun *relationship* can be described in the following way: The derived noun subcategorizes for the same prepositional phrase as the base *relation*. However, according to morpho-syntactic principles, the nominalizing suffix *-ship* is first applied to the noun, and the resulting noun is then applied to the PP. In contrast, the semantic interpretation process first merges the expression *relation* and the PP, and then nominalizes the whole:

(23)

```
                              NP
                            /    \
morphological        N          \
                   /   \          \
             Adj/PP  Adj\N        PP
             relation- ship       to NP

             Adj/PP  Adj\N        PP
             ‾‾‾‾‾‾‾‾‾‾‾‾‾‾
semantic         Adj  ⌣
                    Adj\N
                    ‾‾‾‾‾
                      N
```
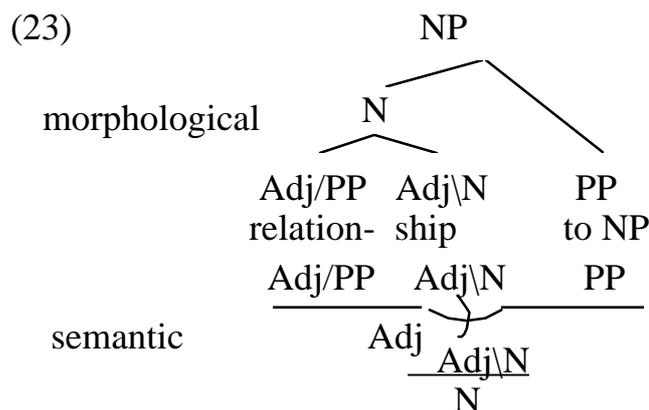
A 'disharmonic' functional composition must be formulated in order to compose *relation* and *ship*. Differing from the harmonic functional composition rules in (10), the disharmonic or 'mixed composition' rule (Moortgat 1988, 320)

combines two functors of different directionality. This composition rule adequately describes the semantic relations in (23) as the derivation (23a).

(24)   disharmonic functional composition

   (FCdish) X/Y X\Z   → Z/Y

               g   f   → λx [f(g(x))]

(23a) *relation- ship*   <u>*with NP*</u>

   <u>N/PP   N\N</u> FCdish   PP

           <u>N/PP</u>   λx (NOM(relation'(x))

                    N   λx (NOM(relation'(x)) (to_NP')

                                         = (NOM(relation'(to_NP'))

It was shown that the simple categories of categorial grammar give a greater transparency of grammatical constructions between morphology and syntax. This constructive possibility of analyzing structures is applied to Turkish relative clause constructions, which are traditionally considered as being very complex. But before a description of this heterogeneous structure is given, the next section provides a short introduction to the grammatical data of Turkish that are important to this investigation.

3. Turkish as a Categorial Language

Turkish is an agglutinative language with suffixes and SOV word order. Modifying elements like genitives, attributive adjectives, numerals, adverbs and relative clauses precede the modified element.[3] In sentence (25), the subject *ressam* stands in initial and the predicate *gösterdi* in final position. In the canonical word order, the indirect object precedes the direct object, which is located just before the verb. The verb, as head of the sentence, demands its arguments of type *NP* or *s/(n\s)* from right to left. The adverbial complement *geçen hafta* modifies a constituent of type *IV* (= intransitive verb). The complement itself is constructed according to the principle 'modifier precedes modified': the modifying element *geçen* precedes the modified element *hafta*. The derivation of sentence (25) can be described in a bidirectional categorial grammar with functional application as being the only construction rule:

(25)   *ressam geçen hafta   bize   resim-ler-i-ni   göster-di*
           artist   last week   1.pl.dat   picture-pl-pos.3.sg-acc show-di.past
           NP   IV/IV   NP   <u>NP</u>
           <u>NP\(NP\(NP\s))</u>
                  =   <u>   NP\(NP\s)</u>
             <u>(NP\s)/(NP\s)   NP\s</u>
            <u>   NP\s</u>
      s
'Last week the artist showed his pictures to us.'

3.1 Nominals and Nominal Constructions

Turkish nominals are traditionally categorized into nouns and adjectives, although there is no clear cut distinction (Lewis 1967, 53):

> The dividing line between noun and adjective is a thin one, but still worth drawing. If we take as the criterion of a noun the permissibility of using the plural, case, and personal suffixes after it, or the indefinite article **bir** before it, very few of the words classed as adjectives in the dictionary will be excluded. **büyük** 'big', 'old', **büyüklerim** 'my elders' (...).

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[3] See the grammars of Kissling (1960) and Lewis (1967) for a comprehensive introducion, and Underhill (1986) for a short overview.

I assume that nominals can take three different modes in a sentence: They function either as substantives or modifiers or predicates. The function of a substantive is marked by the substantival suffixes. The substantive, or the head noun of an NP, stands in phrase-final position, i.e., all modifying elements like adjectival attributes, modifying genitives or relative clauses are located before it, while the substantival suffixes follow it. A substantive consists of a stem and the plural suffix *-lEr*,[4] a possessive suffix, and a case suffix. Binding consonants bridge two vowels, e.g., the *n* in *resim-ler-i-ni* is put between the possessive suffix *i* and the accusative suffix *i*. The absolute, i.e., the nominative and the indefinite (or nonspecific) accusative, is not overtly marked by a case suffix. Both plural suffixes and possessive suffixes are optional elements:

(26)   stem (+ plural) (+ possessive) + case

(27)   *ressam-Ø   güzel   resim-ler-i–ni   göster-di*
        artist-nom   beautiful picture-pl-pos.3.sg-acc   show-di.past
        'The artist showed his beautiful pictures.'

In the second function, nominals can act as modifiers. However, there is some lexical restriction which divides nominals into two lexical classes: nouns and adjectives. The latter can undergo comparison and modify nouns as attributive adjectives. The former can modify another noun only by means of an izafet-construction (see section 3.2. below).

Thirdly, nominals are predicates in nominal sentences. The difference between the attributive and predicative use of adjectives can only be inferred from the position in the sentence, as is illustrated by the contrast in (28):

(28)   *güzel resiml-er*   vs.   *resiml-er güzel (dür)*
        beautiful picture-pl vs.   picture-pl beautiful (copula)
        'beautiful pictures'   'The pictures are beautiful.'

Nouns are either of the type *s/(n\s)* being NPs, or of the type *n\s* being predicates. Due to their semantic characterization as properties, they are

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[4] Following a general convention, upper case letters represent underspecified phonemes. They are subject to vowel harmony and other morpho-phonemic processes. The *I* stands for the fourfold vowel harmony, according to which the vowel depends in frontness and roundness on the preceding vowel, i.e., it is realized as *i, ı, ü* or *u*. *E* stands for the binary vowel harmony, which predicts *e* or *a* according to the frontness of the preceding vowel.

assigned the lexical type *n\s*. The nominal type *s/(n\s)* is derived by the application of case suffixes, which get the same category index as the articles in English (cf. (16)). They change an expression of the type *n\s* to an expression of the type *s/(n\s)*. Possessive and plural suffixes are of type *(n\s)/(n\s)*.

(29) *substantival suffixes*

suffix	*type*	*abbreviation*
plural	(n\s)\(n\s)	N\N
possessive	(n\s)\(n\s)	N\N
case	(n\s)\(s/(n\s))	N\NP

(27a) *ressam-Ø   güzel   resim-ler-i-ni   göster-di*

artist-nom	beautiful	picture-pl-pos.3.sg-acc	show-di.past
N N\NP	N/N	N N\N N\N N\NP	NP\(NP\s)

      NP   N
                               NP
                                 NP\s
                s

Adjectives, on the other hand, receive the underspecified category index *(n\s)/x*, which is flexible enough to describe the contrast between their attributive and predicative function. For the attributive use the variable *x* is instantiated by *n\s* and results in the index *(n\s)/(n\s)* or *N/N*, whereas in the predicative use the *x* is instantiated by *Ø*, which yields the index *n\s*. The substantival function is determined by case suffixes, whose category index, however, must be modified: It takes an expression with the polymorph index *(n\s)\x* as its argument. The contrast between the predicative and the attributive mode in (28) can be described as follows:

(30) *the modes of adjectives*

	predicative	*attributive*	*substantival*
lexical type	(n\s)/x	(n\s)/x	(n\s)/x
syntactic constr.	predicative	attributive	+ case suffix
operation	U with x = Ø	U with x = n\s	((n\s)/x)\s/(n\s)
resulting type	n\s = IV	(n\s)/(n\s) = N/N	s/(n\s) = NP

(28a) *güzel*   *resim-ler-Ø*   *resim-ler-Ø*   *güzel*

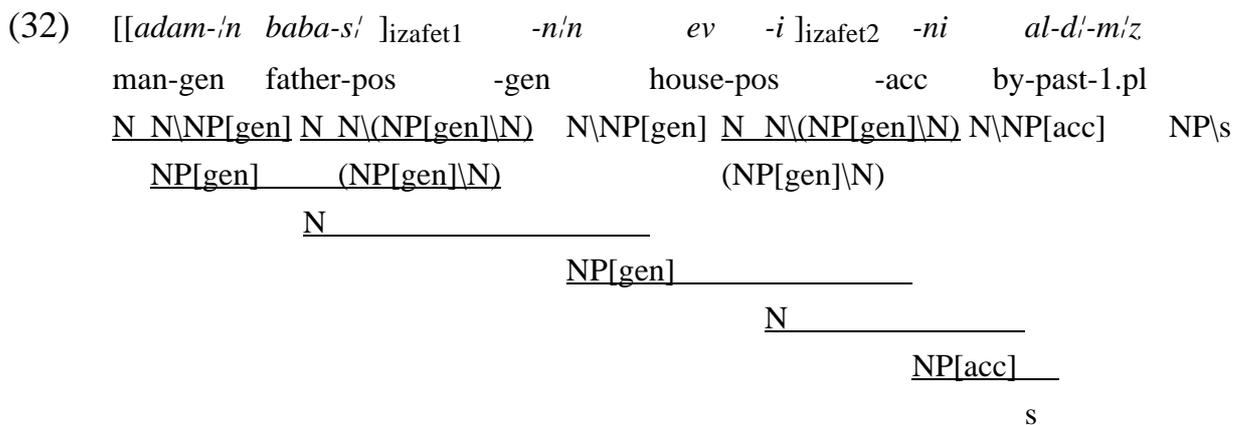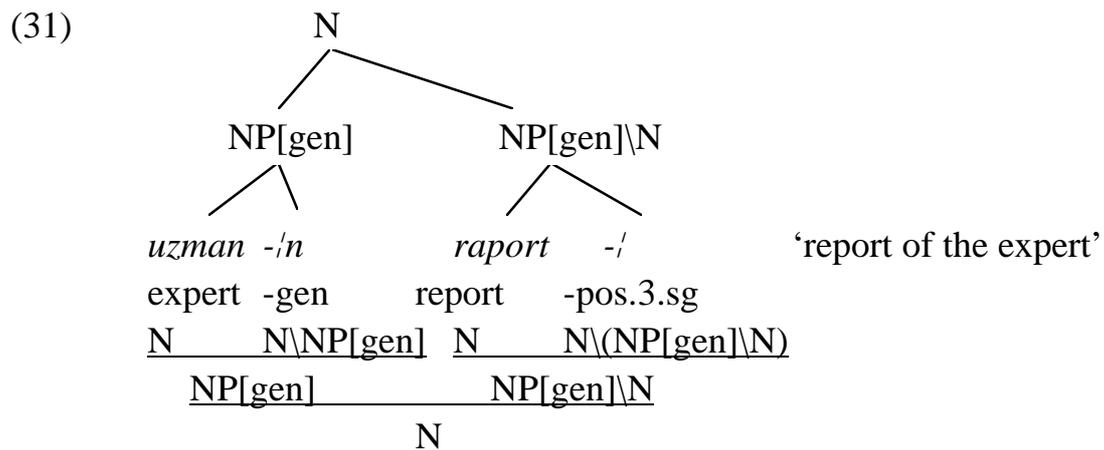   beautiful picture-pl-nom   picture-pl-nom   beautiful

         N/x   N   N\N N\(NP)   N N\N N\NP   (n\s)/x

          | U x = N   NP   U x = Ø |

         <u>N/N</u>   = <u>s/(n\s)</u>   n\s

              <u>N</u>   s

                 NP

3.2 The Izafet-Construction

Nouns can modify other nouns by means of a genitive construction or izafet-construction, like in (31). The agreement in person and number between the genitive and the head noun is marked in the possessive suffix adjoined to the head noun.[5] In the categorial analysis, the genitive suffix is taken as a functor category that is applied to a common noun of type *N* and yields an NP with the sub-category *gen*. Subcategories are drawn in square brackets behind the corresponding main category. The possessive suffix is taken as a functor, which changes a *N* to an NP that lacks a genitive phrase of the type *NP[gen]*. Izafet-constructions can be embedded almost without restriction as illustrated in (32). The izafet-group *adam-ⁱn₁ baba-sⁱ₁-nⁱn₂* modifies the head noun *ev–i₂–ni*, which itself stands in the accusative case:

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[5] The constructions discussed here belong to the group of definite izafet-constructions. In the indefinite izafet-construction, the modifying noun recieves no genitive case, and the grammatical relation is rather 'qualifying'. The difference can be illustrated with the following pair (cf. Lewis 1967, 41ff.).

   (i)   *universite-nin profesörler-i*   vs.   *universite profesörler-i*

             'the professors of the university'   vs.   'university professors'

(31)

```
                              N
                 _____/ _____
              NP[gen]              NP[gen]\N
              _/ \_                _/ \_
```

uzman -ın   *raport*   -ı   'report of the expert'
expert -gen   report   -pos.3.sg
N   N\NP[gen]   N   N\(NP[gen]\N)
     NP[gen]   NP[gen]\N
                    N

(32)   [[*adam-ın baba-sı*]izafet1   *-nın*   *ev*   *-i*]izafet2   *-ni*   *al-dı-mız*
       man-gen   father-pos   -gen   house-pos   -acc   by-past-1.pl
       N N\NP[gen] N N\(NP[gen]\N)   N\NP[gen]   N   N\(NP[gen]\N) N\NP[acc]   NP\s
          NP[gen]   (NP[gen]\N)   (NP[gen]\N)
                    N
                              NP[gen]
                                        N
                                          NP[acc]
                                                    s

'We bought the [house of the [father of the man]]'

3.3 The Verbal Complex

Turkish verbs consist of a stem and a variety of suffixes: The base or extended stem is composed of the stem and optional derivational suffixes, which form different diatheses, and an optional suffix for negation. The base is completed with tense and aspect suffixes and a personal ending. The personal ending of the 3rd person can be deleted (cf. Lewis 1967, 153):

(33)   stem (+ derivation) (+ negation) + tense/aspect + personal ending
            base or extended stem

(33a) *tanı-h-tır-ıl-ma-dı-lar*
       know-rec-caus-pas-neg-di.past-pl
       'they were not caused to know each other'
       = 'they were not introduced to one another'

(33b)   *acı̵-n-dı̵r-ı̵l-ma-dı̵-k*
        feel pain-refl-caus-pas-neg-di.past-1.pl
        'we were not caused to feel pain in ourselves'
        = 'we were not made to grieve'

Nominals can be derived from all verbs. They are categorized as substantives or adjectives according to their construction and syntactic function. In the following, I distinguish between participles and verbal nouns. Both groups are semantically different, because participles express a property whereas verbal nouns denote facts or propositions. Both groups show verbal subcategorization for the internal arguments and nominal subcategorization for the subject, which is constructed as genitive. Participles or deverbal aare mostly constructed attributively, but they can also be used as substantives or predicates. Verbal nouns are normally used as substantives and they stand for subordinated clauses. The relative clauses ending in *-DIgI* take an interesting intermediate position, because they are constructed like verbal nouns on the one hand, but can be used attributively on the other hand.

3.4 Participles

The participles are formed by a set of suffixes adjoined to the base. They partially correspond to the finite tense/aspect forms as shown in (34). The following analysis concentrates on the two suffixes that play a primary role in building relative clauses: The *En*-suffix forms the subject participle (SP), whereas the object participle (OP) is built by the *DIK*-participle and the possessive suffix *-I*.[6]

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[6] The aorist participle *-Er* and the past participle *-mi*h behave similar to the present participle *-En*, while the future participle *-EcEK* is constructed in the same way as the *DIK*-participle. The notions 'subject participle' and 'object participle' are due to Underhill (1972) and Hankamer & Knecht (1976). They describe the function of the participle in the derivation of the relative clause (cf. section 4).

(34) tense/aspect finite verbal form participle   form of suffix

present   *geli-yor-um*   *gel-en*   *En*
aorist   *gel-er-im*   *gel-er*   *Er*
*mi*ḥ.*past* *gel-mi*ḥ-*im*   *gel-mi*ḥ   *mi*ḥ
di.past   *gel-di-m*   *gel-dik*   *DIK*[7]
future   *gel-ece*g-*im*   *gel-ecek*   *EcEK*

The subject participle is derived from the verbal stem with the suffix *-(y)En*. Hence the participle *bekli-yen* 'waiting' can be obtained from the verbal stem *bekle-* 'wait'. We can also form the participle *bekle-mi-yen* 'not waiting' from the corresponding base *bekle-me* 'not-wait'. The participle inherits the subcategorization from the verbal base: *biz-i* (acc) *bekliyen* 'waiting for us'. Participles that are built in this way can function as attributives or substantives. In (36), the participle suffix *-En* changes an intransitive verb to an adjective; in (37) the accusative case suffix *-i* forms a nominal from the participial form. There is no independent predicative use, which is rather covered by the corresponding verbal form as in (35):

(35) *misafir   biz-i   bekli-yor*
      guest   we-acc wait-pres   'The guest is waiting for us.'

(36) *biz-i   bekli-yen misafir*
      we-acc wait-SP   guest   'guest that is waiting for us'

(37) *biz-i   bekli-yen-i   gör-dü-m*
      we-acc wait-SP-acc   see-di.past-1.sg
      'I saw the one waiting for us.'

The participial suffix *-En* receives the type *IV\(N/N)* due to its function of forming an (attributive) adjective from an intransitive VP. The substantival use of such a verbal adjective is derived through the application of the case suffix of type *(N/x)\NP*.

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[7] The *K* of the *DIK-* and *EcEK*-suffixes changes intervocalically to 'yumuhak ge', i.e. a 'soft G', which is realized, depending on the dialect, as vocalic lengthening or as a glide.

(36a) *biz-i   bekli   -yen   misafir*
　　　we-acc wait   -SP   　　guest
　　　NP   　　NP\(NP\s)   IV\(N/N) N
　　　　NP\s = IV
　　　　　　　　　N/N
　　　　　　　　　　　N

(37a) *bizi   　　bekli   -yen   -i   　　gör-dü-m*
　　　we-acc wait   -SP   acc   　　see-di.past-1.sg
　　　NP   NP\(NP\s) IV\(N/N) (N/x)\NP   NP\s
　　　　NP\s = IV   　　　　　　　　　|
　　　　　　　　　N/N   　　　　| U with x = N
　　　　　　　　　　　　　(N/N)\NP
　　　　　　　　　　NP
　　　　　　　　　　　　s

The distribution of the *DIK*-participle is restricted. It either exists in lexicalized forms like in (38) or it is constructed with negated verbal stems like in (39):

(38a) *bil-dik*   　　know-OP   　　'acquaintance'
(38b) *oku-ma-dik*   read-neg-OP   'unread'

(39) *oku-ma-dik   　　gazete   　　kal-ma-di*
　　　read-neg-OP   newspaper   stay-neg-di.past
　　　'not-read-newspaper not stays' = 'No newspaper was left unread.'

Lewis (1967, 163) notices that the *DIK*-participles often show a passive meaning, although they are constructed in the active form. This observation can be stated more specifically as: The *DIK*-suffix changes verbal stems to passive participles. In other words, it deletes another internal argument of the verb beside the external argument. Lexicalized forms as in (38) and data from Old Turkish (750-1300 B.C.), where these participles are employed in passive function, confirm this point. Originally, all participles expressed an open diathetic relation, i.e., they had either active or passive meaning (von Gabain 1974, 76; 116). This can still be seen in certain uses of the future participle -*EcEK*: *yiy-ecek bir* h*ey al^jm* 'being-eaten something buy-I', 'I buy something to eat'. In the case of the *DIK*-participle, which primarily bears a perfective meaning, the passive use is lexicalized in Modern Turkish. In earlier times, the external argument (or subject) of the predicate used to be implicit to the

construction, while later it was expressed in the form of the possessive suffix corresponding to the derivation of verbal nouns (cf. von Gabain 1974, 116).

The participle suffix *-DIK* can now be assigned a type that takes a transitive VP and gets a participle of the type *N/N: (NP\(NP\s))\(N/N)* or *TV\(N/x)*. Though in (35) the subject *gazete* bears no overt case ending, we assume an underlying case suffix for the analysis.

(39a)   *oku-ma-dik*   *gazete -Ø*   *kal-ma-di*
         read-neg-OP   newspaper-nom   remain-neg-di.past
         <u>TV   TV\(N/N)</u> N   <u>N\NP   NP\s</u>
             <u>N/N   </u>
                    <u>N   </u>
                         <u>NP   </u>
                            s
         'No newspaper was left unread.'

This participle is rarely used in non-negated forms, since it contrasts with the active participle *-En* formed from the corresponding passive verbal base:

(40)   **kullan-dʲk*   vs.   *kullan-ʲl-an*
        use   -OP   use   -pas -SP
        TV   TV\(N/x)   TV   TV\IV IV\(N/x)
        'used' (no record)   '(being) used'

In the substantival use participles behave like verbal nouns. It is not clear from the literature why the attributive use of the participles has developed in a different direction than the nominal use of the infinitives (cf. Kissling 1960, 179).

3.5 Verbal Nouns

Subordinate clauses are usually realized by nominalized sentences, which can function as subjects like in (44) or as objects with case endings in a matrix sentence like in (41-43). The internal arguments of the verb remain unchanged and stand in the canonical order. The subject of such embedded sentences can either be identical with the subject of the matrix sentence as in (41), or it can be marked with a possessive suffix on the nominalized verbal form. This is illustrated in (42) where the possessive suffix of the first person singular *-(I)m*

indicates the subject to the nominal *okuma* 'reading'. This construction has been extended to the izafet-construction, where the subject of the subordinate clause is a genitive modifying the nominalized verb. Generally one can relate type *IV\(N)* to the nominalization suffixes, i.e., they take an intransitive verb and change it to a nominal, which then can be modified with the possessive, plural and case suffixes. However, verbal nouns of this class can not be used attributively.

(41) *siz-i   gör-me-ye   gel-di-k*
      you.pl-acc   see-NOM-dat   come-di.past-1.pl
      'We came to see you.'

(42) [*bu yazı-yı   oku-ma -m*]   *-ı   söyle-di*
      this article-acc   read-NOM -pos.1.sg -acc   say-di.past
      'he said the-my-reading-of-this-article' =
      'He told me to read this article.'

(43) [*her yiğid-in   bir yogurt yiy-ih   -i   *]-Ø   *var*
      every young_man-gen a   yoghurt-acc eat-NOM-pos.3.sg-nom   there is
      'There is a manner to eat a yoghurt of every young man'
      'Every young man has his own style to eat a yoghurt.'

The nominal use of the *DIK* participle is sometimes categorized as a verbal noun (cf. Lewis 1967; Kissling 1960). However, it can only occur in this function together with the possessive suffix: the form *yaz-dığ-ım* means either 'the fact that I wrote' or 'that which I wrote'. Similar to the case of nominalization suffixes, the possessive suffix marks the subject, which receives nominal subcategorization, i.e., the genitive. The nominalized sentence can take different case suffixes according to its function in the matrix sentence:

(44) [*Beatles'ler-in her   yap-tiği]-Ø   Inglitere'de moda olu-yor*
      B.-pl-gen everything do-OP.3.sg-nom E.-loc   fashion be-pres
      'Everything the Beatles do is becoming the fashion in England.'

Here, the participial suffix *-DIK* is unified with the possessive suffix *-I* to build up the unit *-DIgI*, which in general cannot be analyzed any further and is taken as a lexicalized nominalization suffix like *-mE* or *-Ih*. However, in the remainder of the discussion I show that this composed suffix can be given a reanalysis that explains the complex functional dependencies in relative clause constructions.

4. Turkish Relative Clauses

Turkish relative clauses are prenominal and marked by a relative suffix on the predicate. There are two constructions for relative clauses, which are used depending on whether the relativized element is the subject (or part of the subject) or not (Lewis 1967; Underhill 1972; Hankamer & Knecht 1976).

If the head noun refers to the subject of the relative clause, the relative construction is marked by a participial suffix of type 'SP': *-En, -mi*h or *-Er.* The suffixes are assigned the type *IV\(N/N):* They take an intransitive verb and yield an attributive adjective. The missing position in the sentence is then filled by the head noun.

(45) *o*ɡ*ul   mekteb-e   gid-er*
     son   school-dat   go-aor.3.sg
     'The son goes to school.'

(46) *mekteb-e   gid-   en   o*ɡ*ul*
     school-dat   go-   SP   son
     <u>NP</u>   <u>NP\IV</u> IV\(N/N) N
          <u>IV</u>
               <u>N/N</u>
                  N
     'tgoing to school-son' = 'son that goes to school'

If the head noun refers to a position other than the subject position in the relative clause, the OP suffix *-DI*ɡ*I* or *-Ece*ɡ*I* has to be chosen. The subject of the relative clause is expressed in the genitive which forms an izafet-construction with the participle. In (48), the participial suffix *-DI*ɡ*I* is first applied to the transitive verb *bekle* yielding the nominalized form *bekledi*ɡ*i.* This form looks for an NP in the genitive, here *karde*h*-im-in,* to form the relative clause *karde*h*-im-in bekle-di*ɡ*-i,* which modifies the head noun *misafir.* The OP suffix is assigned the complex functional type *TV\(NP[gen]\(N/N)):*

(47) *karde*h*-im   misafir-i   bekli-yor*
     brother-my guest-acc   expect-pres
     'My brother expects the guest.'

(48) *karde*h-*im-in*   *bekle*   *-di*g*i*   *misafir*
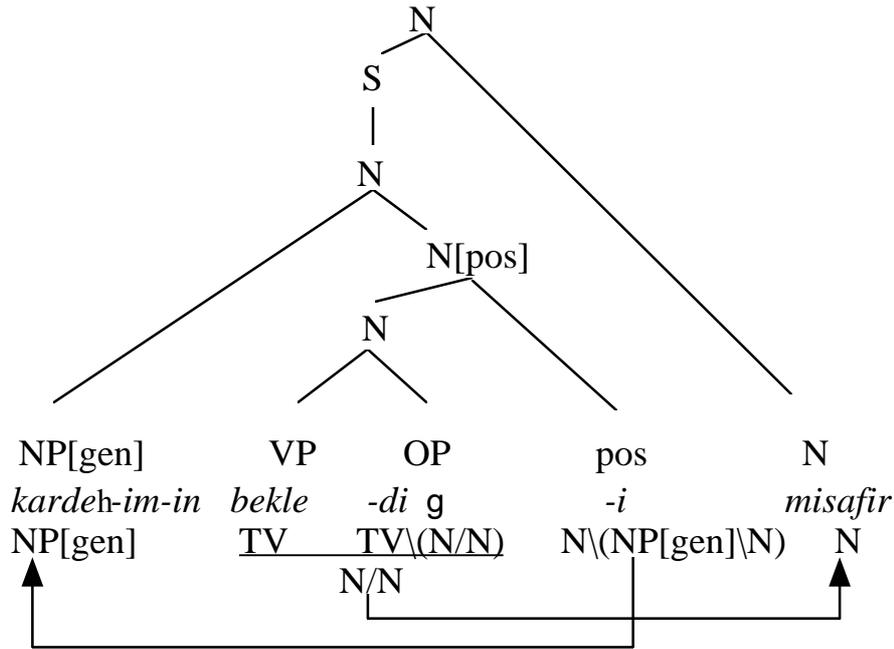   brother-my-gen   expect-<u>OP.pos.3.sg</u>   guest
      NP[gen]   TV   TV\(NP[gen]\(N/N))   N
      <u>   NP[gen]\(N/N)</u>
      <u>   N/N   </u>
                            N

'guest that my brother expects'

This construction corresponds to the nominalized sentences discussed in section 3.5. Although the suffix *-DIgI* seems to be an allomorph of the nominalizing suffixes described there, it is a rather different morphological operator. It can form relative clauses, whereas the other nominalizing suffixes cannot. The difference between the *-DIgI* suffix and nominalizing suffixes becomes obvious under a transparent reanalysis of the lexicalized complex consisting of the *DIK*-participle and the possessive suffix *-I*.

4.1 A Double Bracketing Paradox

Tracing back the functional structure of the OP-suffix *-DIgI* to the functional structure of its parts, a double bracketing paradox appears: The participial suffix *-DIK* was categorized above as *TV\(N/N)*, which corresponds to its characterization as a morpheme forming a past perfect participle from a transitive verb. The possessive suffix *-I* obtained the category index *N\(NP[gen]\N)* for marking the genitival modification on the head noun. The double bracketing paradox arises through the application of the suffix *-DIK* to the head noun crossing the possessive suffix *-I*, while the possessive suffix refers back to the genitive: [1 *karde*h-*im-in bekle*-[2 *di*g-*i*]1 *misafir*]2. Thus, the head of this relative clause construction points in two directions. The functional relations in (49) are illustrated with arrows: The VP is changed to a nominal that receives its subject from the izafet-construction.

(49)

N

S

N

N[pos]

N

NP[gen]	VP	OP	pos	N
*karde*h-*im-in*	*bekle*	*-di* ǧ	*-i*	*misafir*
NP[gen]	TV	TV\(N/N)	N\(NP[gen]\N)	N
		N/N		

This bracketing paradox can be solved with neither a harmonic nor a disharmonic functional composition. The two category indices in (50) can in no way be combined to yield the necessary category index *TV\(NP\(N/N))* for the lexicalized suffix *DIǧI*. The composition is only possible if we assume an underspecified or polymorph index. As shown in section 3.1, all nominal suffixes look for arguments of the polymorph type *N/x*, i.e., nouns or adjectives. Therefore, we suppose that the possessive suffix *-I* is of the underspecified type *(N/x)\(NP[gen]\(N/x))*. If it is applied to a nominal of type *N* and then applied to an NP in the genitive, it forms an expression of type *N/x*. In (51) the modified indices are combined with the help of the harmonic functional composition to the index of the complex suffix *-DIǧI*.

(50)   *DIǧ*   *-I* $\Rightarrow$ *DIǧI*
        TV\(N/N) N\(NP[gen]\N) $\Rightarrow_{??}$ TV\(NP[gen]\(N/N))

(51)   *DIǧ-*   *-I* $\Rightarrow$ *DIǧI*
        TV\(N/N) (N/x)\(NP[gen]\(N/x)) $\Rightarrow_{FCb}$ TV\(NP[gen]\(N/x))

Using underspecified indices we can explain the relative clause constructions in (48) as well as the nominal sentences in (44). The difference between the simple nominalizing suffixes and the suffix *-DIǧI* is expressed in the different type assignments: nominalizing suffixes are of tye *IV\N*, whereas the suffix *-DIǧI*

receives the polymorph type *IV\(N/x)*. Only the latter index licenses the modifying use of a nominal as a relative clause.

4.2 The *Ba*h*ı̷bozuk* or 'Broken Head' construction

The notion *ba*h*ı̷bozuk* or 'broken head' construction was coined by Lewis (1967, 259f.), who gave the following example for illustration: The genitive h*u adamı̷n* of the subject *ba*h*ı̷* in (52) becomes the head noun of the relative clause construction in (53). The possessive suffix -*ı̷* on *ba*h marks the reference of the head noun to the genitive in the relative clause.

(52) [[h*u   adam-ı̷n*]NP[gen] *ba*h-*ı̷-Ø*]NP[nom]   *bozuk*
      this   man-gen   head-pos-nom confused
      'The head of this man is confused.'

(53) *ba*h-*ı̷*   *bozuk*   *adam*
      head-pos   confused man   'man, whose head is confused'

This construction can be transferred to verbal sentences having a finite verb form instead of the copula in (52). In this way the genitive *adamı̷n* can be the head of the relative clause *kı̷zı̷ hukuk okuyan*, which is formed with the SP-suffix *-En*. The possessive suffix on the subject of the relative clause marks the missing genitive, to which the head noun refers:

(54) *adam-ı̷n*   *kı̷z-ı̷*   *hukuk oku-yor*
      man-gen   daughter-pos.3.sg   law   read-pres
      'The daughter of the man studies law.'

(55) *kı̷z-ı̷*   *hukuk oku-yan   adam*
      daughter-pos.3.sg law   read-SP man
      'man, whose daughter studies law'

This construction can be expanded to cases where the head noun refers to a genitive in a constituent, which is, contrary to (55), the subject of the relative clause. In these cases the OP-suffix has to be used to form a relative clause: From sentence (56) the genitive *adamı̷n*, which is located in the dative NP *adamı̷n mektebine*, can be relativized. The genitive *oglanı̷n* in (57) does not modify the possessive NP *mektebine,* but the object *gittigi*:

(56) *oglan   adam-ın   mekteb-in-e   gid-er*
      son   man-gen school-pos.3.sg-dat   go-aor
      'The son goes to the school of the man.'

(57) *oglan-ın   mekteb-in-e   git- tigi   adam*
      son-gen   school-pos.3.sg-dat   go-OP   man
      'man, to whose school the son goes'

The general strategy as to what kind of relativation principle is used depends on the constituent in which the genitive is located. For genitives that modify subjects, the SP-participle is used, while for genitives that modify objects like in (57), the OP-suffix is chosen.

The analysis starts with two suggestions: (i) The choice of an appropriate suffix depends on the number of unfilled argument slots of the predicate, as shown in section 4.1. (ii) The missing genitive, which is marked with the possessive suffix, can be 'passed on' using functional composition, until, on the level of the argument places, it influences the selection of the suffix. In (55a) only one argument is missing and accordingly the SP-suffix is selected, while in (57a) two arguments are missing, which governs the selection of the OP-suffix. The subject *oglanın* of the relative clause (57a) modifies the participial expression *mekteb-in-e git-tigi*.

(55a) *kız-   ı-   Ø   hukuk oku-yan   adam*
      daughter-pos.3.sg   study law-SP   man
      N   N\(NP[gen]\N)   N\NP NP\s (NP\s)/N/N N
                  NP[gen]\N_____ FCb
                    NP[gen]\NP____ FCb
                      NP[gen]\s_____ FCb
                        N/N_____
                          N

'man, whose daughter studies law'

(57a) *oglan-ɩn mekteb-in   -e   git -tigi   adam*
 <u>son-gen</u> school-pos.3.sg- dat   go   -OP   man
 NP[gen]   <u>N N\(NP[gen]\N) N\NP</u> _{FCb} TV TV\(NP[gen]\(N/N)) N
             <u>NP[gen]\NP   NP\(NP\s)</u> _{FCb}
                         <u>(NP[gen]\NP)\s   </u>
                          <u>NP[gen]\(N/N)</u>
 <u>   N/N   </u>
                              N

'man, to whose school the son goes'

4.3 Flat Reconstruction of Embedded Sentences

The examples of the last section showed that the choice of a relative clause construction does not depend on the function of the expression to which the head noun refers, but is indeed dependent on the function of the co-constituent of the predicate to which the head noun refers. Turkish seems to be 'blind' to a deeper hierarchical structure; rather it operates on the highest syntactic level. Whether this is the case for other grammatical phenomena as well will need further investigation.

    Finally, the embedding of relativized elements in subject sentences is briefly discussed (cf. Hankamer & Knecht 1976, 127ff.). If an element of a subject sentence is relativized, the corresponding strategy is oriented towards the function of the sentence regarding the matrix predicate: The nominal sentence *yɩlanɩn kabagɩ yedigi* in (58) is the subject of the predicate *hüpheli(-dir)*. If the genitive *yɩlanɩn*, which is the subject of the nominal sentence, is relativized as in (59), the SP-participle *olan* is selected as copula.

(58) [*yɩlan-ɩn*   [*kabag-ɩ*]_{NP[acc]}*ye-digi-Ø*]_{NP[nom]} h*üpheli(-dir)*
   snake-gen   squash-acc   eat-OP-nom   doubtful(copula)
   'That the snake ate the squash is doubtful.'

(59) [[*kabag-ɩ*]_{NP[acc]} *ye-digi-Ø*]_{NP[nom]} h*üpheli ol-an   yɩlan*
   squash-acc   eat-OP-nom   doubtful be-SP   snake
   'snake of which it is doubtful whether it ate the squash'

However, if a genitive that is subject of an object sentence is relativized, the OP-strategy has to be employed. In (60) the verb *sanɩyor* governs the object sentence *yɩlanɩn kabagɩ yedigini* 'the snake's eating of the squash', where the genitive *yɩlanɩn* is the subject. If this genitive is relativized like in (61), the

whole sentence is nominalized to a participial form, which is formed by the OP-suffix *DIgI*. In (61), the genitive *Hasanın* is the subject of *sandıgı*, while the relativized genitive is the subject of *yedigini*.

(60) *Hasan* [*yılan-ın* [*kabag-ı*]ₙₚ₍ₐ𝒸𝒸₎ *ye-digi-ni*]ₙₚ₍ₐ𝒸𝒸₎ *sanı-yor*
Hasan-nom snake-gen squash-acc eat-OP-acc believe-pres
'Hasan believes that the snake ate the squash.'

(61) [*Hasan-ın* [[*kabag-ı*]ₙₚ₍ₐ𝒸𝒸₎ *ye-digi-ni*]ₙₚ₍ₐ𝒸𝒸₎ *san-dıgı* *yılan*
[Hasan-gen [squash-acc eat-OP]-acc believe-OP] snake
'snake, of which Hasan believes that it ate the squash'

To summarize, we can state that the mechanism of generalized categorial grammars is able to analyze the complex functional relations of Turkish relative clause constructions. The function of the complex suffix *-DIgI* has been composed from the functions of the participial suffix *-DIK* and the possessive suffix *-I*. With this the difference to other nominalizational suffixes has been reconstructed. It has been shown on embedded genitives that Turkish doesn't employ a hierarchical structure in the selection of the relative clause constructions, but uses a 'flat' analysis, a fact that has been reconstructed very well by using the categorial grammatical mechanisms.

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