Chapter 17

Slovak verbal inflection in a declarative lexicalist approach to morphology

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Inspired by Zimmermann (2019) who dared to take on the task to model Spanish verbal inflection within a declarative approach to morphology, the present contribution seeks to do something similar with respect to Slovak. The paper provides readers with basic facts about Slovak phonology and verbal paradigms, outlines the essentials of the framework, and tries to reconstruct how (first- and second-language) learners of Slovak are likely to deduce word-schemas (generalizations) on the basis of the input they are exposed to. Ultimately, a moderate word-form lexicon is suggested to be the most cognitively realistic scenario of lexical access.

1 Introduction

In one of her last papers, Ilse Zimmermann (2019) pursued a new avenue in her research agenda: She explored the theoretical possibility of a declarative (word-based) rather than a derivational (morpheme-based) approach to verb forms, and she demonstrated its possibilities for Spanish. As she states in a footnote, the appeal of such an approach was partially also based on her personal experience as a foreign language teacher. More generally, she felt the urgency of the question

of what constitutes the difference between the two approaches with regard to the phenomena of linguistic competence and language acquisition.[1]

The present contribution seeks to explore the same path, but with regard to Slovak, a West Slavic language. I would like to show that the declarative way of treating Slovak verbs – and Slavic in general – is indeed promising and has a number of advantages as compared to (purely) derivational approaches.

The paper is structured as follows: As a basis, Sections 2 and 3 provide necessary pieces of information on Slovak phonology and verbal paradigms, respectively. Section 4 introduces the crucial concept of word-schemas, while Section 5 is concerned with the format of lexical entries. Section 6 is dedicated to reconstructing the process of creating word-schemas by learners of Slovak, tackling major verbal inflectional categories. Section 7 summarizes the paper.

2 Some notes on Slovak phonology

Codified standard Slovak has the six short vowel phonemes in (1) (see Short 1993: 534; orthographic representations added in angle brackets).

(1)   a.   front vowels: /æ/ ⟨ä⟩ – /e/ ⟨e⟩ – /i/ ⟨i/y⟩
        b.   back vowels: /a/ ⟨a⟩ – /o/ ⟨o⟩ – /u/ ⟨u⟩

However, only about 5% of Slovak speakers are observed to pronounce /æ/, while most speakers merge it with /e/ (see, a.o., Short 1993: 534; Hanuliková & Hamann 2010: 375).

The system of long vowel phonemes (i.e., vowels in long syllables) is more complex: Here we find the five phonemes in (2a) as well as the four diphthongs in (2b) (see Short 1993: 534).[2]

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[1]"In meinen bisherigen Arbeiten zur Laut-Bedeutungszuordnung bin ich immer einer lexikalistischen Position gefolgt. Eine deklarative Betrachtungsweise probiere ich erstmals in der vorliegenden Studie aus. Angesichts meiner Erfahrungen als Fremdsprachenlehrkraft erscheint sie mir verlockend. Ganz allgemein stellt sich ja die Frage, was für die Phänomene der Sprachkompetenz und des Spracherwerbs der Unterschied zwischen derivationellen vs. deklarativen Aspekten in den verschiedenen Grammatikmodellen ausmacht." (Zimmermann 2019: 1) ["So far in all of my work on sound–meaning correspondence I have adhered to a lexicalist position. In the present study, I try pursue a declarative approach for the first time. Due to my experience as a foreign-language teacher [in the far past; added by the editors], this approach seems appealing to me. In general, the question arises what consequences the differences between derivational vs. declarative aspects have for the treatment of the phenomena of language competence and language acquisition in the different models of grammar." (translation mine)]

[2]There is no diphthong corresponding to /iː/.

(2)   a.   /aː/ ⟨á⟩ − /eː/ ⟨é⟩ − /iː/ ⟨í,ý⟩ − /oː/ ⟨ó⟩ − /uː/ ⟨ú⟩
      b.   /ia/ ⟨ia⟩ − /ie/ ⟨ie⟩ − /uo/ ⟨ô⟩ − /iu/ ⟨iu⟩

The long vowels in (2a) are supplemented by the diphthongs in (2b) in the follow-
ing way: While the latter occur only after palatal(ized) consonants, the former
never do.[3] So both sets are in complementary distribution, while together they
are in opposition to the matching short vowels in (1). This system of oppositions
is depicted in Table 1.[4]

Table 1: Vowel oppositions

short		long	
		after /C/	after /C'/
/a/ ⟨a⟩	:	/aː/ ⟨á⟩	/ia/ ⟨ia⟩
/e/ ⟨e⟩	:	/eː/ ⟨é⟩	/ie/ ⟨ie⟩
/i/ ⟨i/y⟩	:	/iː/ ⟨í/ý⟩	
/u/ ⟨u⟩	:	/uː/ ⟨ú⟩	/iu/ ⟨iu⟩

     Most relevant in the context of Slovak verbal paradigms will be the phonemes
/a/−/aː/−/ia/, /e/−/eː/−/ie/, and /i/−/iː/.

3 Slovak verbal paradigms

Slovak has only two synthetic finite verb forms: the present tense (see Tables 2
and 3) and the imperative mood (Table 4). Of non-finite forms, it features an
infinitive, three participles, and the so-called transgressive (gerund); see Table 5.[5]

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[3]Slovak has only four truly palatal consonants, namely /d'/, /t'/, /n'/, and /l'/. Other "soft" con-
sonants result from palatalization that occurs when the consonant precedes either of the front
vowels /e/ and /i/. Moreover, some consonants are "historically soft", e.g., the affricate /c/ in
vraciam '(I) return'. In what follows, I note palatalization of underlyingly "hard" consonants
only where it cannot be inferred from their position before a front vowel.

[4]/C/ and /C'/ stand for any non-palatal or palatal consonant, respectively. Note that /aː/ may
occur after the palatal /j/ under certain morphological conditions, and that /eː/ and /oː/ occur in
borrowings only. /oː/ and /uo/ are not subject to the non-/palatal restriction and are therefore
not in the table. /iu/ is restricted to few morphologically restricted environments.

[5]I omit the gerund in Table 5 since it can be easily derived by removing the agreement marker
from active participles (e.g., *volajúc-a* → 'calling-SG.F' *volajúc* 'calling').

Table 2: Present-tense paradigms 1/2

	'call'	'return'	'understand'	'do'	'see'
1SG	volám	vraciam	rozumiem	robím	vidím
2SG	voláš	vraciaš	rozumieš	robíš	vidíš
3SG	volá	vracia	rozumie	robí	vidí
1PL	voláme	vraciame	rozumieme	robíme	vidíme
2PL	voláte	vraciate	rozumiete	robíte	vidíte
3PL	volajú	vracajú	rozumejú	robia	vidia

Table 3: Present-tense paradigms 2/2

	'hide'	'buy'	'forget'	'postpone'	'carry'
1SG	skryjem	kupujem	zabudnem	odsuniem	nesiem
2SG	skryješ	kupuješ	zabudneš	odsunieš	nesieš
3SG	skryje	kupuje	zabudne	odsunie	nesie
1PL	skryjeme	kupujeme	zabudneme	odsunieme	nesieme
2PL	skryjete	kupujete	zabudnete	odsuniete	nesiete
3PL	skryjú	kupujú	zabudnú	odsunú	nesú

Table 4: Imperative forms

	2SG	1PL	2PL
'call'	volaj	volajme	volajte
'return'	vracaj	vracajme	vracajte
'understand'	rozumej	rozumejme	rozumejte
'do'	rob	robme	robte
'see'	viď	viďme	viďte
'hide'	skry	skryme	skryte
'buy'	kupuj	kupujme	kupujte
'forget'	zabudni	zabudnime	zabudnite
'postpone'	odsuň	odsuňme	odsuňte
'carry'	nes	nesme	neste

Table 5: Non-finite forms

	INF	L.PTCP (SG.F)	ACT.PTCP (SG.F)	PASS.PTCP (SG.F)
'call'	volať	volala	volajúca	volaná
'return'	vracať	vracala	vracajúca	vracaná
'understand'	rozumieť	rozumela	rozumejúca	rozumená
'do'	robiť	robila	robiaca	robená
'see'	vidieť	videla	vidiaca	videná
'hide'	skryť	skryla	skryjúca	skrytá
'buy'	kupovať	kupovala	kupujúca	kupovaná
'forget'	zabudnúť	zabudla	zabudnúca	zabudnutá
'postpone'	odsunúť	odsunula	odsunúca	odsunutá
'carry'	niesť	niesla	nesúca	nesená

Section 4 introduces the concept of word-schemas which is vital for the present analysis.

4 Word-schemas

A plausible language acquisition scenario is that learners discover and construct the productive rules of a given language on the basis of the primary input they are exposed to. In this process, they observe some collection of words that are partially similar in phonology and semantics and formulate a hypothesis about the general pattern instantiated by these words (see, e.g., Haspelmath 2002, Tomasello 2003, Culicover & Nowak 2003, Haspelmath & Sims 2010, Jackendoff & Audring 2018).

A way to represent this process and its results in a theory of the mental lexicon is the assumption of declarative WORD-SCHEMAS.[6] Zimmermann (2019) adopts this idea, as I will do in the present paper. Thus, the lexicon contains not only entries of complete word forms but also "rules of grammar, encoded as declarative schemas" (Jackendoff & Audring 2016: 467). Importantly, these schemas have the same format as words but contain variables. They are declarative rather than procedural in that they do not express procedures to convert an input into an

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[6]Jackendoff & Audring (2016: 471) note that the linguistic term "schema" goes back at least to Bybee & Slobin (1982). More general antecedents are cited in Rumelhart (1980).

output but motivate their INSTANCES. Nevertheless, schemas can serve to decompose and construct word forms by unifying their variables with other pieces of structure – which is their generative function (Jackendoff & Audring 2016: 472). Moreover, schemas capture generalizations as they encode what the instances of lexical items have in common – which is their relational function. From a cognitive perspective, it follows that the respective instances take less effort to be learned and processed.

The assumption that full word entries and word-schemas are stored in the lexicon side-by-side has yet another important consequence: It means that lexical items are stored in their entirety, even where redundant (see Jackendoff & Audring 2016: 476). Clearly, such a view contradicts common assumptions stating that some notion of economy underlies lexical storage. Jackendoff & Audring (ibid.) suggest an alternative view, namely that "the brain *embraces* redundancy, at least up to a point", and that "[r]edundancy appears to have the effect of making mental computation more robust (Libben 2007: 6)". Returning to Zimmermann's initial question, it might turn out that this is just one of the crucial aspects that allow an evaluation of the performance of the declarative approach as compared to the derivational one with regard to linguistic competence and language acquisition.

5 Lexical entries

The format of lexical entries employed in the present paper follows the notation used in Haspelmath (2002) and Haspelmath & Sims (2010) (which, in turn, is based on Becker 1990, 1993a,b and Bochner 1993) as well as in Jackendoff & Audring (2016, 2018). The crucial assumption underlying it is that lexical entries contain at least three levels of linguistic information: phonology, morphosyntactic features, and semantics (similar assumptions are made by Manfred Bierwisch, e.g., Bierwisch 1983, 1997, 2007). Each level is linked to the others ("Parallel Architecture"; Jackendoff 2002, 2007, 2010, Culicover & Jackendoff 2005). The general format of a verbal lexical entry is given in (3).[7]

$$(3) \quad \begin{bmatrix} /xyz/_V = \text{Phonology} \\ x.y.z = \text{Morphosyntax} \\ \text{`xyz'} = \text{Semantics} \end{bmatrix} \qquad \text{(cf. Haspelmath 2002: 48–49)}$$

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[7]Zimmermann (2019) uses her own notation, i.e., tripartite entries quite similar to (3). But where she uses binary morphosyntactic features to reveal markedness relations, I use privative features for sake of simplicity. I follow Haspelmath & Sims (2010) in noting lexical categories as subscripts to the phonological representation.

The following subsections are concerned with how learners of Slovak are likely to decompose verb forms on the basis of the input they are exposed to, i.e., on the basis of full word entries. In other words, the task is to demonstrate how learners may build word-schemas ("rules") that allow them to access verb forms not only directly (by searching for the respective full word entries) but also by decomposing them into their morphological segments (see Haspelmath & Sims 2010: 72–74).

6 Decomposing verb forms

To fill (3) with substance, (4) and (5) show tentative lexical entries for two imperfective present-tense verb forms: *volám* '(I) call' and *robíš* '(you) do'.[8]

$$(4) \quad \begin{bmatrix} \text{/vola:m/}_\text{V} \\ \text{IPFV.NPST.1SG} \\ \text{'call'} \end{bmatrix} \qquad (5) \quad \begin{bmatrix} \text{/robi:š/}_\text{V} \\ \text{IPFV.NPST.2SG} \\ \text{'do'} \end{bmatrix}$$

In what follows, I will try to reconstruct how learners of Slovak may arrive at the featural specifications presumed in (4) and (5), and how they are likely to deduce "rules" (i.e. word-schemas) from this input. In doing so, a number of morphological and syntactic peculiarities will be inspected in more detail.

6.1 Aspect

Following Zimmermann (2013, 2019), fully-fledged words are equipped with inflections and the matching formal features in the lexicon. On the other hand, the semantics associated with these markers and features is not part of the lexical entries but rather of functional heads in syntax. These heads agree with, and are thus licensed by, the features of the verb (see also Pitsch 2013, 2015, 2017). According to Zimmermann (2009: 486, 498), declarative and interrogative sentences in Slavic languages have the functional spine in (6), where Mod and Pol stand for (verbal) mood and sentence polarity, respectively. AspP is supplemented from Zimmermann (2019).[9]

(6)   CP ModP TP PolP AspP *v*P VP

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[8]The phonemic transcription is traditional. I make use of the feature non-past (NPST) to capture the fact that Slovak perfective present-tense forms regularly yield a future interpretation.

[9]Zimmermann (2009) does not assume AspP in Slavic clauses. I take a different view and analyze aspect as a grammatical category represented in syntax. It thus behaves like tense and mood, i.e., the association of its morphological exponents with their respective semantics is delayed until agreement with the relevant functional head takes place. But unlike Svenonius (2004), who argues for two AspPs (see also Despić 2020), I assume only one.

I take it that both (viewpoint) aspect and tense are grammatical categories the semantics of which is conveyed by the functional heads Asp and T, respectively. Consequently, both (4) and (5) include the features IPFV and NPST but not the respective semantics. The latter is provided by the syntactic heads Asp and T which agree with *v*/V as depicted in Figure 1.[10]
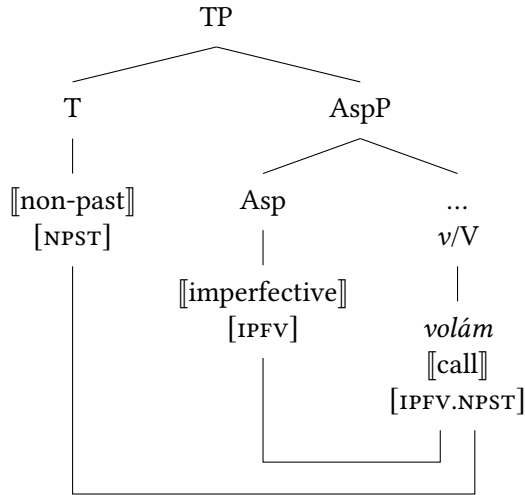

Figure 1: Delayed interpretation of aspect and tense

As both *volám* and *robíš* are imperfective simplex verbs, the IPFV-feature does not relate to any particular piece of morphology but to the forms in their entirety. This is different in (7) which gives the entry of *vyrobíš* '(you) produce', a perfective derivative based on (5). Here the PFV-feature can be linked to the telicizing prefix *vy-* (see Biskup 2019 as to perfectivizing prefixes).[11]

(7)
$$\begin{bmatrix} \text{/virobi:š/}_V \\ \text{PFV.NPST.2SG} \\ \text{'produce'} \end{bmatrix}$$

I argue that the feature last added by way of (aspectual) affixation is the one to prevail, i.e., to agree with the functional head Asp which adds semantics. In case of (7) this is the feature PFV. In other words, PFV overwrites the IPFV-feature

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[10]Verbal arguments are omitted from the representations.

[11]Jackendoff & Audring (2018) note such links with indices. I omit indexation for ease of exposition.

of the underlying stem. We are now also in the position to formulate a (clearly simplified) entry for the telicizing prefix *vy-* (*X* stands for any stem):

(8)
$$\begin{bmatrix} /\text{vi}X/_V \\ \textsc{pfv} \\ \text{'perform } X \text{ exhaustively'} \end{bmatrix}$$

This is a word-schema, as it differs from pure word entries in that it contains variables (here: V and *X*). It states that the affixation with *vy-* takes place on verbal stems, that it adds telicizing semantics, and that it furnishes the resulting verb with a PFV-feature. In a next derivational step, a prefixed perfective verb like (7) may undergo so-called secondary imperfectivization through *a*-suffixation (here accompanied by a stem alternation); see (9).[12]

(9)
$$\begin{bmatrix} /\text{vira:baš}/_V \\ \textsc{ipfv.npst.2sg} \\ \text{'produce'} \end{bmatrix}$$

Secondary imperfectivization as in (9) corresponds to the addition of an IPFV-feature by means of suffixation. This feature overwrites the PFV-feature of the input form and will thus be the one to agree with Asp. The distinct syntactic configurations in the context of (7) and (9), respectively, are depicted in Figures 2 and 3.
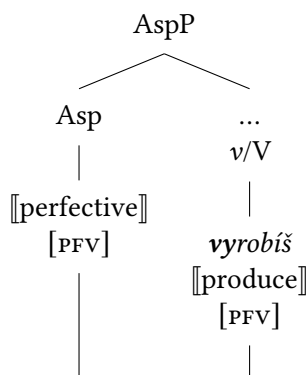

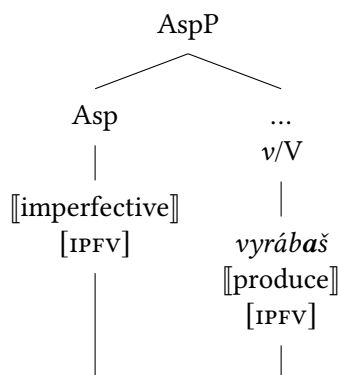Figure 2: AspP based on perfective *vyrobíš*

Figure 3: AspP based on imperfective *vyrábaš*

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[12] There is no lengthening of the pre-inflectional vowel in (9) due to the so-called LAW OF RHYTHMICAL SHORTENING which requires that quantity is neutralized in a morphophonemically long syllable after a preceding long syllable (Short 1993: 538).

Next, Section 6.2 deals with the Slovak verb stems and their representation in lexical entries.

6.2 Stems

In the process of acquiring Slovak, learners will come across sets of forms of one and the same verbal lexeme as exemplified in Tables 2–5. From such input, they will soon identify portions of verb forms that regularly recur in all forms, i.e., stems. Some stem entries are formulated in Table 6 (see notation in Haspelmath & Sims 2010: 70). These are word-schemas, where *X* stands for inflectional material. The distinction of an INFINITIVE STEM as opposed to a PRESENT STEM reflects the traditional view that Slovak verbs (as Slavic verbs in general) usually come with two stem variants.[13]

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[13] As an example, (i) and (ii) give full stem entries for VOLAŤ 'call'. To distinguish the infinitive stem from the present stem, I choose the arbitrary features #1 and #2, respectively.

$$
\text{(i)} \quad \begin{bmatrix} /\text{vola}X/_\text{V} \\ \#1 \\ \text{'call'} \end{bmatrix}
\qquad\qquad
\text{(ii)} \quad \begin{bmatrix} /\text{vol\{a:/aj\}}X/_\text{V} \\ \#2 \\ \text{'call'} \end{bmatrix}
$$

Table 6: Stem entries

	infinitive stem (#1)	present stem (#2)
VOLAŤ 'call'	/vola$X$/$_\text{V}$	/vol{a:/aj}X/$_\text{V}$
VRACIAŤ 'return'	/vrac'aX/$_\text{V}$	/vrac'{a:/aj}X/$_\text{V}$
ROZUMIEŤ 'understand'	/rozume$X$/$_\text{V}$	/rozum{e:/ej}X/$_\text{V}$
ROBIŤ 'do'	/robi$X$/$_\text{V}$	/robi:X/s$_\text{V}$
MYSLIŤ 'think'	/misl'iX/$_\text{V}$	/misl'i:X/$_\text{V}$
STÁŤ 'stand'	/sta:X/$_\text{V}$	/stoji:X/$_\text{V}$
ODSUNÚŤ 'postpone'	/odsunu$X$/$_\text{V}$	/odsun'(e:)X/$_\text{V}$
BRAŤ 'take'	/bra$X$/$_\text{V}$	/ber'(e:)X/$_\text{V}$
NIESŤ 'carry'	/ne:sX/$_\text{V}$	/nes(e:)X/$_\text{V}$
ZABUDNÚŤ 'forget'	/zabud(nu)X/$_\text{V}$	/zabud(n(e))X/$_\text{V}$
PRIAŤ 'wish'	/pr'a:X/$_\text{V}$	/praj(e)X/$_\text{V}$
SKRYŤ 'hide'	/skri$X$/$_\text{V}$	/skrij(e)X/$_\text{V}$
BUDOVAŤ 'build'	/budova$X$/$_\text{V}$	/buduj(e)X/$_\text{V}$
PÍSAŤ 'write'	/pisa$X$/$_\text{V}$	/pi:š(e)X/$_\text{V}$

While infinitive stems end in a vowel with the only exception of verbs like *niesť* 'carry' and (partially) *zabudnúť* 'forget',[14] the present stem has usually two variants: one consonantal, the other vocalic (only present stems in *-i* are vocalic only). Furthermore, the consonant that precedes the last vowel in a stem may be non-palatal as with /vol-/ 'call' or palatal(ized) as with /odsun'-/ 'postpone'. This in turn affects the articulation (and spelling) of the relevant vowel (see Section 2). Moreover, attention should be paid to the fact that the stem-final vowel can either be long or short.

6.3 Present-tense (non-past) forms

In addition to stems, learners discern inflectional markers. Thus they will easily detect that the present-tense (non-past [NPST]) 1SG is consistently marked with the suffix *-m*, the 2SG with *-š*, the 1PL with *-me*, and the 2PL with *-te*. From that learners are able to deduce a generalization ("rule") which can be formulated as a morphophonological correspondence as shown for the 1SG in (10) (see Haspelmath & Sims 2010: 47–48; *X* stands for any stem material). Similar rules exist for *-š*, *-me*, and *-te*.[15]

$$(10) \quad \begin{bmatrix} /XV/_V \\ \#2 \\ `x' \end{bmatrix} \longleftrightarrow \begin{bmatrix} /XVm/_V \\ \text{NPST.1SG} \\ `x' \end{bmatrix}$$

This correspondence says that for verbal stems matching the schema on the left, there are corresponding word forms matching the schema on the right. In other words, the speaker should take the vocalic present-stem variant of the verb (e.g., /vola:/ 'call', /zabudne/ 'forget') and add *-m* to form the 1SG (*volám* and *zabudnem*, respectively). Importantly, speakers deduce such "rules" and the respective word-schemas on the basis of full word entries, i.e., (10) exists alongside the complete set of 1SG verb entries the speaker has ever stored, for instance the one in (11) for *zabudnem*.

$$(11) \quad \begin{bmatrix} /zabudnem/_V \\ \text{PFV.NPST.1SG} \\ `forget' \end{bmatrix}$$

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[14]While the infinitive stem of *niesť* is truly consonantal, *zabudnúť* has also a vocalic variant which is employed when using the (shorter) consonantal variant would result in a hard-to-pronounce sound sequence (cf. infinitive *zabudnúť* instead of **zabudť*).

[15]Note that the features of the word-schema on the right imply that it is the personal marker, not the verb stem, which adds the feature NPST.

Taking the perception perspective, this coexistence means that the speaker can retrieve the meaning of *zabudnem* from their lexicon either through decomposition by resorting to the entry of the stem as well as of the inflection, or directly by resorting to (11). As Haspelmath & Sims (2010: 72) argue, there is evidence that speakers try both routes simultaneously, and the "winner" is whichever way is faster in accessing the information. They discuss the factors frequency, morpheme segmentability, and allomorphy to show that each way has specific advantages. Crucially, they conclude that "[w]hile a moderate word-form lexicon is not very economical, research to date suggests that it is the most cognitively realistic of the three proposals" (Haspelmath & Sims 2010: 74), i.e., a morpheme lexicon, a strict word-form lexicon, and a moderate word-form lexicon.

Third-person inflections call for a more detailed discussion. As Table 2 shows, 3sg forms lack an overt marker. While morpheme-based (derivational) accounts usually resort to null suffixes, the word-based (declarative) approach can do without (see Jackendoff & Audring 2016: 470). This is demonstrated by means of the 3sg entries in (12) and (13).

$$(12) \quad \begin{bmatrix} /\text{vola:}/_V \\ \text{IPFV.NPST.3SG} \\ \text{'call'} \end{bmatrix} \qquad (13) \quad \begin{bmatrix} /\text{buduje}/_V \\ \text{IPFV.NPST.3SG} \\ \text{'build'} \end{bmatrix}$$

When learners perceive these phonological strings, they associate them with the pertinent features and semantics and store all together as in (12) and (13). Put differently, they link the person and number features to the words as a whole, not to a particular piece of (potentially invisible) morphology. In addition, they can deduce a correspondence parallel to (10) capturing the formation of 3sg forms; see (14).[16]

$$(14) \quad \begin{bmatrix} /XV/_V \\ \#2 \\ \text{'x'} \end{bmatrix} \longleftrightarrow \begin{bmatrix} /XV/_V \\ \text{NPST.3SG} \\ \text{'x'} \end{bmatrix}$$

This correspondence states that the 3sg form of Slovak verbs is formally identical to the vocalic variant of their present stem (cf. Table 6).

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[16]Ilse Zimmermann held the view that the 3sg is the unmarked paradigmatic form with the negative features [−I,−II,−PL]. Her view is corroborated by the absence of inflectional morphology in the respective forms in Slovak. While I use the notation "3sg" in (12), (13), and (14) for sake of clarity, I consider it possible and in fact plausible that the relevant forms lack any agreement feature whatsoever and are marked only as being NPST.

3PL forms, on the other hand, are formed by adding one of the suffixes *-ú* or *-a*. The latter is confined to verbs with present stems in /i:/, whereas the former is used in all other cases and always attaches to a consonant. The relevant correspondences look thus as in (15) and (16), respectively.[17],[18]

$$
(15) \quad \begin{bmatrix} /Xi:/_V \\ \#2 \\ \text{`}x\text{'} \end{bmatrix} \longleftrightarrow \begin{bmatrix} /Xia/_V \\ \textsc{npst.3pl} \\ \text{`}x\text{'} \end{bmatrix}
$$

$$
(16) \quad \begin{bmatrix} /XC/_V \\ \#2 \\ \text{`}x\text{'} \end{bmatrix} \longleftrightarrow \begin{bmatrix} /XCu:/_V \\ \textsc{npst.3pl} \\ \text{`}x\text{'} \end{bmatrix}
$$

Rule (15) captures 3PL forms as, e.g., *robi-a* '(they) do' and *mysli-a* '(they) think', rule (16) examples like *vraciaj-ú* '(they) return', *rozumiej-ú* '(they) understand', *odsun-ú* '(they) postpone', *ber-ú* '(they) take', *zabudn-ú* '(they) forget', *buduj-ú* '(they) build', or *píš-u* '(they) write'.[19]

6.4 Gerunds and active participles

Slovak gerunds and active participles share the same marker *-c(-)* which is, in descriptive terms, added to the present-tense 3PL form. In addition, active participles add an agreement marker that encodes person number and gender (the latter underspecified in the plural). Whereas gerunds can be of either aspect, active participles are imperfective only (see Short 1993: 559). Corresponding full word entries are given in (17) and (18), respectively.[20]

$$
(17) \quad \begin{bmatrix} /kupuju:c/_V \\ \textsc{ipfv.ger} \\ \text{`buy'} \end{bmatrix} \qquad (18) \quad \begin{bmatrix} /kupuju:ca/_A \\ \textsc{nom.sg.f} \\ \text{`buy'} \end{bmatrix}
$$

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[17]From what is said about the 3SG in fn. 16, it follows that 3PL forms are only marked with NPST.PL.

[18]The "shortening" of stem-final /i:/ in (15) is only apparent since the attachment of the 3PL marker /a/ gives rise to the diphthong /ia/ which is long by definition.

[19]The short last syllable in *píš-u* is an effect of the law of rhythmical shortening (fn. 12).

[20]Zimmermann (2019: 3) uses the following binary features for Spanish non-finite inflections: infinitive = [−GER(UND),−PART(ICIPLE)], participle = [−GER,+PART], gerund = [+GER,−PART]. Thus, infinitives are unmarked as compared to participles and gerunds which are on a par as to markedness. As to Slavic, I argue that gerunds are less marked than participles since they lack agreement. My claim is that infinitives are [−PART,−AGR], while gerunds and participles are [+PART,−AGR] and [+PART,+AGR], respectively (an additional [±PASS] serves to distinguish active from passive forms). In (17) and entries to follow later on, I use, as elsewhere in this paper, privative features, namely GER and PTCP.

Note that the active participle is an adjective, as it is restricted to attributive function in Slovak. I suggest that, as a result of the lexical-category change from verb to adjective, the forms in question are stripped of verbal features and acquire the nominal ones (case and agreement). Grammatical information such as situation reference and viewpoint aspect survive, albeit only at the level of semantics (the relevant variables are existentially bound). This situation makes it likely that learners deduce word-schemas for the formation of gerunds; see (19) for the stems-in-consonant class of verbs already known from 3PL formation above.

$$(19) \quad \begin{bmatrix} /XC/_\mathrm{V} \\ \#2 \\ \text{`}x\text{'} \end{bmatrix} \longleftrightarrow \begin{bmatrix} /XC\mathrm{u{:}c}/_\mathrm{V} \\ \text{GER} \\ \text{`}x\text{'} \end{bmatrix}$$

Note that (19) does not restrict the viewpoint aspect of the verb stem on the left, so gerunds can be formed for either aspect.

As learners observe that active participles occur only in the imperfective aspect and as attributes, they are likely to reason that these forms share their stem with the imperfective gerund but are adjectives. This can be captured by the correspondence in (20) (a conversion in derivational terms), where the schema on the right represents a stem because it contains the variable Y in phonology which stands for some suffix to be attached, and because it lacks case and agreement features (to be added by this very suffix).

$$(20) \quad \begin{bmatrix} /XC\mathrm{u{:}c}/_\mathrm{V} \\ \text{IPFV.GER} \\ \text{`}x\text{'} \end{bmatrix} \longleftrightarrow \begin{bmatrix} /XC\mathrm{{:}c}Y/_\mathrm{A} \\ \\ \text{`}x\text{'} \end{bmatrix}$$

To arrive at a full word form, the stem needs to be equipped with adjectival agreement, which learners are already well acquainted with from primary adjectives like, e.g., *dobr-á* 'good-NOM.SG.F', *krásn-a* 'beautiful-NOM.SG.F', etc.[21]

Crucially, we are now in a position to "string together" the correspondences in (16), (19), and (20) to obtain a "schema chain" that correlates the present stem of some verb with its present-tense 3PL form, gerund, and (the stem of) its active participle. One can imagine speakers going back and forth within that chain so as to relate, decompose, or access the relevant forms more efficiently than by deriving each of them in a morpheme-based fashion. Moreover, such chains intuitively depict and reconstruct the relative complexity of morphologically related verb forms as perceived by speakers.

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[21]The final syllable of *krásn-a* is short obeying the law of rhythmical shortening (fn. 12). Shortening applies consistently to agreement markers in active participles due to the length of the preceding syllable.

6.5 Infinitives

The Slovak infinitive is marked by the suffix -*ť*, irrespective of whether the infinitive stem (feature #1) ends in a vowel or a consonant (see Short 1993: 559 and the examples in Tables 5 and 6). Additionally, stem-final vowels /e/ and /u/ are long in infinitives. The respective input allows learners to formulate the correspondence in (21).

$$(21) \quad \begin{bmatrix} /X(\{e/u\})/_V \\ \#1 \\ \text{`}x\text{'} \end{bmatrix} \longleftrightarrow \begin{bmatrix} /X(\{e/u\}\text{:})t\text{'}/_V \\ \text{INF} \\ \text{`}x\text{'} \end{bmatrix}$$

Note that verbs with infinitive stems involving the sequence /Cnu/ (e.g., *zabudnúť* 'forget', *kývnuť* 'nod'), which drop the suffix -*nú*- in a subset of paradigmatic forms (see Section 6.6 and Section 6.8), retain this very suffix in the infinitive to avoid the adjacency of two consonants sharing the same manner of articulation (plosives /d/ and /t/). I suggest that this follows from general articulatory principles (pronounceability) and does therefore not require formalization.[22]

6.6 *L*-participles

Slovak *l*-participles serve to form the analytic past tense. While they do so on their own in the third person, they co-occur with clitic present-tense forms of the auxiliary *byť* 'be' elsewhere (1SG *som*, 2SG *si*, 1PL *sme*, 2PL *ste*). They consist of the infinitive stem plus -*l*-. After consonantal stems, the vowel -*o*- is inserted; e.g. *nies-o-l* '(he) carried' or *zabud-o-l*[23] '(he) forgot'; see (22).[24]

$$(22) \quad \begin{bmatrix} /X(C)/_V \\ \#1 \\ \text{`}x\text{'} \end{bmatrix} \longleftrightarrow \begin{bmatrix} /X(Co)lY/_V \\ \text{L.PTCP} \\ \text{`}x\text{'} \end{bmatrix}$$

6.7 Passive participles

Slovak passive participles show the suffixes -*n*- or -*t*- added to the infinitive stem and subsequently equipped with a number-gender agreement marker. Long

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[22]In case of *kývnuť* 'nod', stem-final /u/ is underlyingly long due to (21) but realized as a short vowel obeying the law of rhythmical shortening (fn. 12).

[23]In *zabud-o-l*, the shorter version of the infinitive stem without -*nú*- is used, which is presumably due simply to economy.

[24]Rule (22) ignores the fact that -*o*- is inserted only if -*l*- is the last suffix. There is no insertion if -*l*- precedes a vocalic agreement suffix (e.g., *nies-l-a*).

vowels within consonantal stems are realized as short ones in passive participles; e.g., *nies-ť* − *nes-en-á* 'carried'.

The suffix *-t-* is limited to monosyllabic stems ending in a vowel (e.g., *jatý* 'grasped', *krytá* 'covered') and prefixed derivates thereof (e.g., *na-jatá* 'hired', *s-krytá* 'hidden'),[25] and also to verb stems including the suffixal sequence /nu/ (e.g., *odsunutá* 'postponed', *zabudnutá* 'forgotten'). Elsewhere, *-n-* is employed.[26] If the infinitive stem ends in /i/, this vowel is replaced by /e/ before *-n-* in passive participles (e.g., *robená* 'done').

These regularities can be captured by the following correspondences. First, (23) accounts for the most frequent case, i.e., passive participles in *-n-* without any change in the preceding infinitive stem. Examples are *volaná* 'called', *rozumená* 'understood', *braná* 'taken', *budovaná* 'built', or *písaná* 'written'.[27]

$$(23) \quad \begin{bmatrix} /XV/_V \\ \#1 \\ \text{'}x\text{'} \end{bmatrix} \longleftrightarrow \begin{bmatrix} /XVnY/_V \\ \text{PASS.PTCP} \\ \text{'}x\text{'} \end{bmatrix}$$

Next, (24) captures consonantal stems with long vowels as in *niesť* 'carry' or *pásť* 'herd' which alternate with their short counterpart in passive-participle forms and require the fill vowel /e/ (hence *nesená* and *pasená* 'herded').

$$(24) \quad \begin{bmatrix} /XV{:}C/_V \\ \#1 \\ \text{'}x\text{'} \end{bmatrix} \longleftrightarrow \begin{bmatrix} /XV{:}CenY/_V \\ \text{PASS.PTCP} \\ \text{'}x\text{'} \end{bmatrix}$$

On the other hand, (25) covers infinitive stems ending in /i/. They also take *-n-* preceded by /e/, which, in this case, is not a fill vowel but a substitute for /i/.

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[25] The latter fact shows that prefixes are ignored when it comes to counting the number of syllables of stems. In derivational terms, it is strongly indicative that prefixes are added after the attachment of the participial marker.

[26] Short (1993: 560) lists some exclusions: Thus, verbs of the *brať* type show free variation between *-n-* and *-t-* (*braná*/*bratá* 'taken') and sometimes lexical variation; cf. *vydaná* 'published' vs. *vydatá* 'married' (of a woman). A possible explanation is that the relevant stems are monosyllabic, which triggers the choice of *-t-*, but at the same time end in /a/, which points to *-n-*. Cases of lexical variation require the additional assumption that idiosyncratic meanings are stored in the respective full word entries (like in case of *vydatá* 'married'), and that speakers will always choose the direct way to access them.

[27] Cf. also *prianie* '(the) wish(ing)', the verbal noun of *priať* 'wish', a verb of which the infinitive stem ends in a long vowel (/pr'a:/; see Table 6). Verbal nouns normally involve the same suffix as the passive participle. In this case, however, there is category-based variation, since the passive participle is built with *-t-*: *priaty* 'wished'. This variation is hardly surprising, as *priať* is a verb of the *brať* type (see fn. 26).

(25) $\begin{bmatrix} /X\text{i}/_\text{V} \\ \#1 \\ \text{`}x\text{'} \end{bmatrix} \longleftrightarrow \begin{bmatrix} /X\text{en}Y/_\text{V} \\ \text{PASS.PTCP} \\ \text{`}x\text{'} \end{bmatrix}$

Moreover, the correspondence in (26) accounts for vocalic monosyllabic stems. ('XV_σ' means any string of sounds that is one syllable in length and ends in a vowel; cf. Haspelmath & Sims 2010: 58).

(26) $\begin{bmatrix} /XV_\sigma/_\text{V} \\ \#1 \\ \text{`}x\text{'} \end{bmatrix} \longleftrightarrow \begin{bmatrix} /XV\text{t}Y/_\text{V} \\ \text{PASS.PTCP} \\ \text{`}x\text{'} \end{bmatrix}$

Finally, (27) captures infinitive stems in /nu/ which also take the participial marker -*t*-.[28]

(27) $\begin{bmatrix} /X\text{nu}/_\text{V} \\ \#1 \\ \text{`}x\text{'} \end{bmatrix} \longleftrightarrow \begin{bmatrix} /X\text{nut}Y/_\text{V} \\ \text{PASS.PTCP} \\ \text{`}x\text{'} \end{bmatrix}$

The last section, Section 6.8, tackles Slovak imperative verb forms.

6.8 Imperative forms

Slovak 2sɢ imperatives either end in -*i* or do not show any marking at all. In the latter case, they are identical to the consonantal present-stem variant of the verb. This formation pertains to all verbs with present stems that do not end in /iː/ or a consonantal cluster, respectively; see (28).[29],[30]

(28) $\begin{bmatrix} /X\text{C}/_\text{V} \\ \#2 \\ \text{`}x\text{'} \end{bmatrix} \longleftrightarrow \begin{bmatrix} /X\text{C}/_\text{V} \\ \text{IMP.2SG} \\ \text{`}x\text{'} \end{bmatrix}$

The schema on the right motivates as its instances such imperative forms as, for example, *volaj!* 'call!', *vracaj!* 'return!', *rozumej!* 'understand!', *odsuň!* 'postpone!',

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[28]Clearly, one might conflate several of these separate correspondences within one correspondence including alternative strings of sounds. While that would reduce the number of correspondences, it would cause a considerable decrease in readability.

[29]Palatal stem-final consonants retain their palatality in imperative forms; e.g., *odsuň!* 'postpone'. By contrast, consonants merely palatalized before front vowels do not; e.g., *rob!* 'do'.

[30]Verbs with present stems in /-ij-/ (written ⟨-yj-⟩) seem to lose the stem-final consonant /j/; e.g., *skry!* 'hide'. I take it that they comply with (28) nonetheless, the sequence /ij/ being articulated as [i], which is in turn reflected in orthography (cf. the Czech spelling *skryj!*).

ber! 'take!', *nes!* 'carry!', *buduj!* 'build!', or *píš!* 'write!'. Essentially, it states the formal identity of the consonantal present stem and the 2SG imperative form.

Verbs with present stems in /iː/ can be captured by the correspondence in (29). Thus, their imperative 2SG equals their present stem excluding its final vowel, hence *rob!* 'do' or *stoj!* 'stand'.

$$(29) \quad \begin{bmatrix} /X\text{iː}/_V \\ \#2 \\ \text{`}x\text{'} \end{bmatrix} \longleftrightarrow \begin{bmatrix} /X/_V \\ \text{IMP.2SG} \\ \text{`}x\text{'} \end{bmatrix}$$

Finally, verbs with present stems ending in a consonantal cluster show the imperative marker *-i*. Examples are *misli!* 'think!' and *zabudni!* 'forget!'.

$$(30) \quad \begin{bmatrix} /X\text{CC}/_V \\ \#2 \\ \text{`}x\text{'} \end{bmatrix} \longleftrightarrow \begin{bmatrix} /X\text{CCi}/_V \\ \text{IMP.2SG} \\ \text{`}x\text{'} \end{bmatrix}$$

1PL and 2PL imperative forms are motivated by exactly the same schemas but add *-me* and *-te*, respectively. Thus, the very simple correspondences in (31) and (32) suffice to motivate all instances.

$$(31) \quad \begin{bmatrix} /X/_V \\ \text{IMP.2SG} \\ \text{`}x\text{'} \end{bmatrix} \longleftrightarrow \begin{bmatrix} /X\text{me}/_V \\ \text{IMP.1PL} \\ \text{`}x\text{'} \end{bmatrix}$$

$$(32) \quad \begin{bmatrix} /X/_V \\ \text{IMP.2SG} \\ \text{`}x\text{'} \end{bmatrix} \longleftrightarrow \begin{bmatrix} /X\text{te}/_V \\ \text{IMP.2PL} \\ \text{`}x\text{'} \end{bmatrix}$$

7 Summary

In the spirit of Zimmermann (2019), the present paper makes a case for the declarative lexicalist approach to morphology. A crucial assumption of this framework is that, apart from storing individual forms in word entries, learners gradually make (and possibly modify) generalizations about the internal structure (decomposition) of these forms. They do so by establishing correspondences between word-schemas which capture similarity relations between specific (classes of) word forms. Both assumptions – the storage of individual word entries and the generalization through word-schemas and correspondences – allow the reconstruction of how learners store and access lexical material, and how they organize their lexicon into classes of partially similar (sets of) forms.

In other words, the declarative (word-based) model captures crucial aspects of language acquisition and linguistic competence. It should be emphasized that the present analyses build on the assumption of a "moderate word-form lexicon" (see Haspelmath & Sims 2010: 70–74). As already discussed in Section 4, this includes the acceptance of redundancy, as it "appears to have the effect of making mental computation more robust" (Libben 2007: 6). This is to say that learners may store full entries (i.e., complete word forms) side-by-side with word-schemas (i.e., stems and affixes) and/or sister-schemas (i.e., generalizations). Consequently, in the attempt to retrieve some form from the lexicon, speakers will either choose the direct or the decomposition route (see Haspelmath & Sims 2010: 72). This dual-route model is depicted in Figure 4.
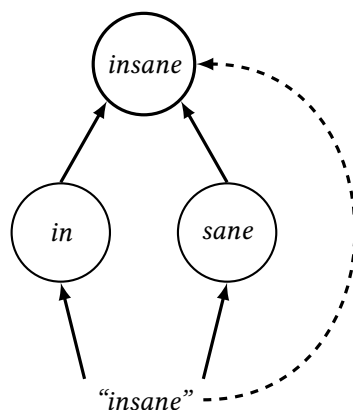

Figure 4: Dual-route model of lexical access (Hay 2001: 1045; from Haspelmath & Sims 2010: 72)

Haspelmath & Sims (2010: 73) argue that frequently used words (entries) can be accessed more quickly (have greater memory strength) than words used less frequently, and that this is indicative that in their case the direct route is more likely to be chosen. On the other hand, word forms with easily segmentable affixes seem intuitively more likely to be stored according to their morphological parts, i.e., via the decomposition route, since it is the faster method to gain the necessary information. Of course, there are more factors, with a lot of potential for controversy. Be that as it may, I agree with Haspelmath & Sims (2010: 74) in that "[w]hile a moderate word-form lexicon ist not very economical, […] it is the most cognitively realistic", for such a lexicon offers both ways of lexical access.

Zimmermann (2019) convincingly demonstrated that the declarative approach is capable to handle Spanish verbal inflections including its regularities and irreg-

ularities. In the present paper, I tried to apply the declarative approach to Slovak verbal inflection by examining the majority of regular Slovak paradigmatic verb forms as well as by formulating full word entries and correspondences. I believe to have shown that it is a plausible claim that learners of Slovak make similar generalizations.

As an additional remark, I would like to note that my lexical entries differ from Zimmermann's in that they do not require special features relating to conjugations or thematic vowels. On the other hand, I did not tackle irregular verb forms. Future research will have to fill this gap and should also show how periphrastic structures need to be represented.

Abbreviations

1	first person	L.PTCP	*l*-participle
2	second person	NPST	non-past
3	third person	PASS	passive voice
ACT	active voice	PFV	perfective aspect
F	feminine	PL	plural
GER	gerund	PST	past tense
IMP	imperative	PTCP	participle
IPFV	imperfective aspect	SG	singular
INF	infinitive		

Acknowledgements

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