

Arabic Nonconcatenative Morphology in Construction Morphology



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Abstract This chapter examines nonconcatenative morphology of Arabic with a particular focus on its templatic nature. While much of the past research on Arabic templatic morphology has centered on the verbal system, our discussion largely takes up the nonverbal templatic morphology of Arabic including the comparative, nouns of profession, and the diminutive. In developing formal analyses of these constructions we specifically address the question of how the prosodic templates that characterize Arabic morphology are incorporated into the schema of CxM. We also briefly touch upon the implication that the construction analysis might have on two (opposing) approaches to Arabic morphology, root-based vs. word-based, given that some templatic constructions in Arabic seem to require the consonantal root as its base. The goal of this chapter, then, is not only to make known the fuller extent of Arabic templatic morphology (i.e. beyond the verbal system), but also to show advantages of approaching these prosodic issues in construction terms.

Keywords Root-based morphology · Root-and-pattern morphology · Stem modification · Templatic morphology · Word-based morphology

1 Introduction

The goal of this article is to offer an analysis and conception of Arabic nonconcatenative morphology within the framework of Construction Morphology (CxM) by focusing on Arabic templatic morphology. As discussed in Davis and Tsujimura (2014: 191), nonconcatenative morphology entails cases where morphological exponence is not (exclusively) expressed by the concatenation of additive phonemic

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content (i.e. affixes) to a base. Two types of nonconcatenative processes that are characteristic of Arabic are stem modification and templatic morphology. While there is some discussion and analysis of stem modification in CxM, templatic morphology has been little discussed (but see Inkelas and Zoll 2005 on reduplication). In stem modification, morphological marking is indicated by modification of some aspect internal to a base. Examples discussed by Booij (2010a), for one, include German plural umlaut (vowel fronting) and change of tone pattern observed with inalienable plurals in Ngiti (Central Sudanic). In templatic morphology, which is characteristic of Semitic languages and found marginally in many other languages, a morphological construction (e.g. the Arabic comparative) requires that its members have a specific prosodic shape, expressible by a template. Such prosodic templates might be composed of a specific CV pattern or a prosodic unit such as a syllable or a foot. Booij (2010a: 241) briefly mentions the English nickname formation like *Alfreda-Alf-Alfy* as an example of a templatic construction where the syllable/foot that characterizes the nickname is triggered by the construction itself.

In developing formal analyses of Arabic nonconcatenative constructions in the framework of CxM, we specifically address the question of how the prosodic templates that characterize Arabic morphology are incorporated into the schema of CxM. We also briefly touch upon the implication that the construction analysis might have on two (opposing) approaches to Arabic morphology, root-based vs. word-based, given that there are some templatic constructions in Arabic that seem to require the consonantal root as its base.

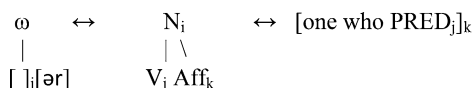
Below, we first begin in Sect. 2 by summarizing the assumptions and formalisms of CxM as developed in various works of Geert Booij exemplifying it with the English deverbal *-er* and comparative *-er* constructions. Sections 3 and 4 focus on Arabic nonconcatenative morphology. In Sect. 3 we consider verbal derivation of what is termed “Form 2” and “Form 3” in traditional grammars. Form 2 verbs often express the causative and are morphologically marked by consonant gemination. Form 3 verbs roughly correlate with reciprocal meaning and are indicated by vowel lengthening. There has been a controversy as to whether these verbal forms are templatic in nature referencing root consonants or just involve stem modification of a base verb. After briefly reviewing this controversy, we will attempt to formalize both analyses using the schemata of CxM. Section 4 will examine a variety of templatic constructions in Arabic outside of the verbal system. Dividing templatic constructions according to whether the consonantal root or a nominal word serves as a major component, we will discuss the comparative and occupational nouns as examples of the former while the diminutive and “broken” plural illustrate the latter.

2 Construction Morphology

In a series of works, Booij (2005, 2007, 2009a, b, 2010a, b, 2013 among others) has developed the detailed application of Construction Grammar to morphological analysis. This has led to the emergence of CxM as an increasingly important subfield

of Construction Grammar. The development is in line with earlier comments by researchers such as Michaelis and Lambrecht (1996) and Croft (2001) who posit that in addition to syntactic constructions, complex words also constitute constructions. Booij (2010a) develops the formal use of schemata to express generalizations about form-meaning pairings of morphological constructions. The schemata capture abstractions over related sets of words. Nevertheless, a morphological schema can be used to create new words. As detailed by Booij (2010a), a morphological schema represents three kinds of information: phonological, morpho-syntactic, and semantic. A specific example of a schema demonstrating this tripartite division is shown in (1) for English deverbal *-er*, taken from Booij (2010a: 8).

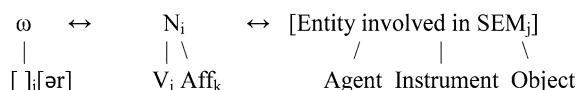
(1) The schema for deverbal *-er*



The schema in (1) specifies that there is a systematic relation between the three types of linguistic information involved, [PHON], [SYN], and [SEM]. The phonological structure [PHON] of the morphological schema is displayed to the left of the first double arrow in (1), showing that a word serves as the base for the construction. The morphosyntactic structure [SYN], shown in the middle, indicates that the suffix *-er* attaches to a verb resulting in a noun. The semantic structure [SEM] on the right expresses the meaning of the combination. The double arrow indicates correspondence between the different parts of the representation, while the co-indexing is used to specify the correspondence between the three types of information.

The operation of the [PHON] level of (1) is one of concatenative affixation: the deverbal *-er* suffix can go onto a (verb) form. The absence of phonological restriction is formally indicated by the lack of any content in the brackets that are dominated by the phonological word node, ω . The [SEM] level requires an additional analysis with subschema because the suffix leads to polysemy that includes an instrumental meaning (e.g. *opener*, *mixer*), an object meaning (e.g. *reader*) and an agentive interpretation. (2) represents the construction with the variety of semantics that *-er* denotes.

(2) The schema for deverbal *-er* with subschemas



The bound morpheme *-er* does not exist as a separate lexical entry under Booij’s conception of construction morphology (i.e. morphology is word-based), but instead, the existence and associated meaning of the affix is bound to the construction. Under this view, a morphological schema is abstract and can be used to create new words such as *skyper* from *skype*.

Independent of the deverbal *-er* in (2), a phonologically identical suffix can be attached to adjectives to yield a corresponding comparative. Despite the apparent similarity, the two constructions are very different not only in the semantic and morphosyntactic properties but also phonological restrictions imposed on them. The comparative *-er* construction requires that the base adjective be no more than two syllables, as is illustrated in (3).¹

(3)	<i>Adjective</i>	<i>Comparative</i>	
a.	smart	smarter	
	funny	funnier	
	simple	simpler	
	pretty	prettier	
b.	intelligent	*intelligenter	(more intelligent)
	hilarious	*hilariouser	(more hilarious)
	elementary	*elementrier	(more elementary)
	beautiful	*beautifuler	(more beautiful)

The prosodic requirement on the base adjective is construction-specific since the homophonous *-er* agentive construction has no such prosodic requirement (e.g. *interrogate-interrogater*). As such, the prosodic requirement is part of the [PHON] component of the comparative construction, as in (4) following Booij's (2010a).

(4) English comparative *-er* construction (A = adjective; σ = syllable)

ω	\leftrightarrow	A_i	\leftrightarrow	[more A, comparative semantics]
\wedge		\mid	\wedge	
$[\sigma(\sigma)]_j[\text{er}]$		$A_j \text{Aff}_k$		

The English *-er* comparative construction brings up the matter of how to encode phonological restrictions on morphological constructions using the schemata of Construction Grammar. The English example in (4) shows that phonological restrictions on the base can be relatively easily incorporated in the formalization of the construction. As we will demonstrate drawing on Arabic data below, somewhat more difficult cases include templatic morphology, where the output of the morphological operation must conform to a particular phonological or prosodic shape. Booij (2010a: 241) briefly deals with a similar matter in his discussion of the English nickname construction (e.g. *Alfreda-Alf*, *Elizabeth-Liz*, *Jeffrey-Jeff*, *Barbara-Barb*), which requires the nickname to consist of a single heavy syllable. His analysis is summarized as follows: "...there is a morphological construction schema for proper names in which the semantic representation is enriched with a semantic or pragmatic property, without an additional corresponding overt affix. This construction then will trigger the phonological operation of truncation, which may be modelled as the mapping of the phonological form of the input name onto

¹Individual variation on the acceptability of some two-syllable forms has been noted by Carstairs-McCarthy (1998).

a specific prosodic template, that of a heavy syllable (nickname)...” (p. 241). While this summary provides an insight at the conceptual level, the exact mechanisms incorporating templatic phonological restrictions remain to be worked out. In what follows, we shall make a modest attempt to that end.

3 Arabic Verbal Morphology: Form 2 and Form 3

As discussed in McCarthy (1979, 1981), the Classical Arabic verbal system consists of fifteen different morphological classes or “forms” as it is termed in the traditional literature on Arabic.² We focus on Forms 1–3 since they are the most widely maintained in almost all dialects. Form 1 is considered to be the basic form of a verb while the others are usually derivable from the Form 1 verb. Form 2 typically expresses causative or intensive.³ Form 3 is understood as a reciprocal, although Benmamoun (2016) argues that it more accurately reflects a case of verb plurality in that the event or state involves more than one participant. (5) demonstrates different verbs from Classical Arabic in these three forms. Each of the verbs is given in the 3rd person, masculine singular perfective active, which has no overt marking for person and number. In (5a) and (5b), the corresponding passive form is indicated in parenthesis. Glosses are provided for the perfective active forms immediately under the verb. In the transcription, a capital letter indicates a pharyngealized consonant.

(5) Arabic verbs Form 1-3 (data from Wehr 1976)

	Form 1	Form 2	Form 3
a.	katab (kutib) ‘wrote’	kattab (kuttib) ‘dictated’	kaatab (kuutib) ‘corresponded with’
b.	qatal (qutil) ‘killed’	qattal (quttil) ‘massacred’	qaatal (quutil) ‘killed one another’
c.	daras ‘studied/learned’	darras ‘taught’	daaras ‘studied together’
d.	raqaS ‘danced’	raqqaS ‘made dance’	raaqaS ‘danced (with someone)’
e.	kasar ‘broke’	kassar ‘shattered’	—————
f.	qarib ‘was near’	qarrab ‘brought close’	qaarab ‘came near’

²Ten of these classes are common (Forms 1–10), but contemporary dialects keep only a subset of them.

³See Doron (2003) for detailed discussion on the semantics of this class.

g.	salim	sallam	saalam
	‘was safe’	‘protected’	‘kept the peace’/‘made up with’
h.	kaTar	kaTTar	kaaTar
	‘was many’	‘increased’	‘outnumbered’
i.	Salah	Sallah	Saalah
	‘was good’	‘fixed’	‘made peace’/‘reconciled’
j.	faruf	————	faaraf
	‘was noble’		‘vied for nobility (with someone)’

The Form 1 verbs in Arabic are considered to be the basic verb class in that they are not derivable from other verb forms, while serving as the base for the other derived verbal classes (Forms). Form 1 also contains the largest number of verbs and includes stative verbs (5f-j). The gaps in (5e) and (5j) show that not all Form 1 verbs can be made causative (Form 2) or reciprocal (Form 3). Although there are some Form 1 verbs that cannot derive corresponding Forms 2 and 3, it is rare for a Form 2 or Form 3 verb not to have a Form 1 counterpart.

The description and analysis of the verbal forms in (5) have been the subject of a debate in Arabic linguistics since McCarthy’s seminal works (1979, 1981). McCarthy analyzes the causative (Form 2) and reciprocal (Form 3) by separating a consonantal root, a vowel pattern, and a CV prosodic template and representing each of them as a separate morpheme on independent tiers. In (5a) and (5b), for instance, the consonants *ktb* and *qtl* provide the lexical meaning *write* and *kill*, respectively. The vowel pattern involving *a*, on the other hand, provides grammatical information pertinent to tense/aspect/mood. The overall word shape CVVCVC marks ‘reciprocal’ and/or ‘verbal plurality’ (Benmamoun 2016). The exact meaning of a given verbal form, thus, is determined not only by the consonantal sequence and the vowel but also by a specific CV template to which the consonants and the vowels are linked. This can be expressed in CxM with the schema for the reciprocal exemplified in (6) where the template is incorporated.

(6) base form: katab ‘write’

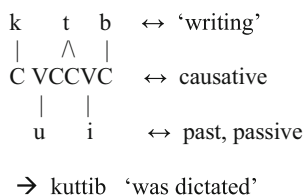
k	t	b	↔	‘writing’
C	VVCVC		↔	reciprocal
	\\ \ /			
	a		↔	past, active

→ kaatab ‘corresponded with’

The construction for the causative forms can be posited in a similar way, as in (7), which we illustrate with the passive causative *kuttib* ‘was dictated’. The base word for *kuttib* ‘was dictated’ (the past tense of Form 2) in (5a) is *katab* ‘write’, and the CVCCVC template is associated with the causative meaning. The consonantal tier consists of the root consonants of *ktb* ‘write’; the vocalic pattern *ui* (past, passive)

comprises the vocalic tier, and these tiers together lead to the passive verb of the Form 2, *kuttib* ‘was dictated’. This mechanism can be expressed in CxM terms in (7).

(7) base form: *katab* ‘write’



In (6–7), the CV tier plays an important role to give rise to the reciprocal and the causative meanings, but these meanings are not predicted from the individual parts of the CV-tier. Rather, the semantic property belongs to the template as a whole that is formed by a specific number and order of consonants and vowels.

In the literature on Arabic morphology, the approach to verb formation demonstrated above has traditionally been termed the root-and-pattern analysis, but there has been an opposing treatment that is consistent with a word-based approach. Heath (1987), Ratcliffe (1997, 2013), and Benmamoun (1999), for example, downplay the role of the consonantal root in developing a word/stem base view of Arabic morphology whereby most (verb) stems would minimally consist of the shape CCVC.⁴ Following McCarthy (1993),⁵ they analyze the causative (Form 2) and reciprocal (Form 3) verbs in (5) as the affixation of a moraic prefix to the base verb. Under this view, the gemination that indicates the Form 2 causative reflects the affixation of a consonantal mora (μ_c), while the vowel lengthening that marks the reciprocal results from the affixation of a vocalic mora (μ_v) to the base verb. This is shown in (8) for the active perfective forms that were given in (5a); it is somewhat modified from Ussishkin (2000).

- (8) Moraic affixation analysis of the causative and the reciprocal
- a. Causative (perfective) / μ_c + *katab*/ → [kattab] “dictated”
 - b. Reciprocal (perfective) / μ_v + *katab*/ → [kaatab] “corresponded with”

The moraic (consonantal) affix in (8a) that marks the causative is realized as the gemination of the medial consonant since a stem (or root) initial consonant of a verb cannot be geminated in Classical Arabic. In (8b), the affixation of the vocalic mora that marks the reciprocal results in the lengthening of the first stem vowel. Notably, it is the phonology that determines that the prefixal consonantal mora gets realized by the gemination of the medial consonant in (8a) and that the vocalic mora is realized

⁴Under this view, the CCVC does constitute a phonological word in those dialects that allow for initial consonant clusters.

⁵McCarthy (1993) is quite distinct from McCarthy (1979, 1981).

by the lengthening of the first vowel in (8b). The schematic representations in (9a) and (9b) capture the mechanism of the moraic affixation for the formation of Form 2 and Form 3.

- (9) Abstract schemata for the causative (Form 2) and the reciprocal (Form 3)
- a. $[\mu_c[x]_{vi}]_{vj} \leftrightarrow [\text{causative/intensive in SEM}_i]_j$
 - b. $[\mu_v[x]_{vi}]_{vj} \leftrightarrow [\text{reciprocal/plurality in SEM}_i]_j$

The schemata in (9) show the prefixal mora, which is subscripted as consonantal for the causative/intensive and as vocalic for the reciprocal/plurality. The variable x stands for a major lexical category indicated as verb by the subscript v , and the coindexation between the different types of information expresses the relation between the base verb and the derived verb. As noted above, the way in which the consonantal mora in (9a) and the vocalic mora in (9b) are realized as gemination and vowel lengthening, respectively, is determined by the phonology. The precise meaning of the individual word form (e.g. causative for Form 2 verbs and reciprocal Form 3) involves the semantic property of each construction, and thus reflects the holistic nature of the form-meaning correspondences in Construction Grammar.

In this section we have discussed two opposing views of the Arabic verbal forms as demonstrated by the analysis of Form 2 and Form 3 verbs. The traditional root-and-pattern analysis considers the consonantal root and prosodic templates morphological entities. The word-based approach, in contrast, allows for the affixation of an abstract mora whose realization is determined by the phonology. On the latter approach, there is no need to reference a consonantal root or a prosodic template. To the extent that both perspectives are compatible with the basic tenet of CxM, we have demonstrated how the relevant generalizations leading to appropriate verbal forms can be represented in terms of construction schemata.

4 Templates and Roots in Arabic Nonverbal Morphology

Work by John McCarthy has made known the nonconcatenative nature of the Arabic verbal system; less known is the templatic nature of its nonverbal morphology. In this section we will consider three different constructions: the comparative, nouns of profession, and the diminutive. We will start by introducing nonverbal templatic morphology as relevant background for our discussion, citing an Arabic hypocoristic (nickname) pattern as an example.

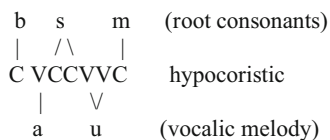
Various patterns of hypocoristics in Arabic have been described by Davis and Zawaydeh (1999) and analyzed from an optimality-theoretic perspective by Zawaydeh and Davis (1999). One common type reflects the Ammani-Jordanian dialect, as is illustrated in (10). The hypocoristic adds a sense of endearment as they are normally used among family members and intimates. (In the transcription, [y] indicates a palatal glide.)

- (10) *Full Name* *Hypocoristic*
- a. hind hannuud
 - b. baasim bassuum
 - c. saliim salluum
 - d. yaasir yassuur
 - e. widaad wadduud
 - f. salman salmuun
 - g. maryam maryuum
 - h. muusa masmuus

Regardless of the phonological shape of the full name, the hypocoristic always has the same bisyllabic templatic form where the first syllable is closed and the second syllable has a long vowel. For convenience, we represent this as $C_iVCCVVC_f$, where C_i is the initial consonant of the full name and C_f is the final consonant of the full name. The vowel of the first syllable of the hypocoristic template is specified as /a/ and that of the second syllable as /u/, which is realized as long. The data in (10a–e) show that in names with three consonants, the medial consonant of the full name is realized as a geminate in the hypocoristic. The examples in (10f–g) indicate that the hypocoristic template can accommodate names that have four consonants, while the name in (10h) shows that template can also accommodate names with only two consonants by consonantal reduplication. While we do not discuss here the specific details of the phonological issue of how the mapping is realized between the full name and the hypocoristic form, we can schematize the Ammani Jordanian Arabic hypocoristic as a morphological construction as shown by the abstract form-meaning pairing in (11) with the illustration in (12).

- (11) Ammani Jordanian Arabic hypocoristic construction
- a. Form: $C_i a C C u u C_f$
 - b. Semantics: endearment

- (12) Base name: baasim



→ bassuum

One issue that is raised by the representation in (12) is the formal status of the root consonants and the vocalic melody. Sharing the underlying concept of the word-based approach discussed in Sect. 3, an alternative analysis, proposed by Ratcliffe (2004, 2013), claims that having no formal morphological status, the root consonants are just what is left over after the vowels of the base name have been removed. If we consider the vocalic melody shown in (12) as part of the hypocoristic

template, then the formation of hypocoristic *bassuum* based on the full name *baasim* need not reference a separate consonantal root. This is shown in (13).

(13) Base name: baasim

b	a	a	i	m	(root consonants)
	/\	/\			
C	a	CC	uu	C	hypocoristic

→ bassuum

Since the vowel pattern of (13) has no independent semantics outside of the hypocoristic pattern, there is no reason to represent the vowels of the hypocoristic template on a separate tier. Consequently, as shown in (13), when the phonemes of the full name map onto the hypocoristic template, the vowels of the full name do not get realized since other vowels (*a*, *u*) are specified as part of the hypocoristic template. From this perspective, the root just constitutes the phonemes that are left over once the vowels of the base name are stripped away.

The representations in (12) and (13) can both be viewed as consistent with the form-meaning pairing in (11) with the difference being in what exactly maps onto a template, i.e. root consonants in (12) and a full base form in (13). This background regarding the morphological status of the consonantal root will serve as a focal point of the discussion of the Arabic comparative in the following subsection.⁶

4.1 Comparative Construction

The comparative in Arabic seems to be a model example of templatic morphology, but outside of recent work by Davis (2016, 2017), its templatic nature has rarely been discussed in contemporary works on Arabic morphology. In most dialects of Arabic, the morphological comparative seems to be formed by taking an adjectival word and matching it to the templatic shape aCCaC where the C-slots represent the root consonants that comprise many Arabic words.⁷ (14) illustrates the comparative in the Egyptian dialect. A possible adjectival base is shown in the lefthand column, the comparative form in the middle, and the gloss on the right. (Data are from Kamel and Hassanein 1980; Badawi and Hinds 1986; and also Davis 2016, 2017.)

⁶Whether the hypocoristic pattern illustrated in (11) supports the morphological status of the consonantal root has been the subject of a debate within the literature on Arabic linguistics with various positions taken. For more details, see, in particular, Davis and Zawaydeh (2001), Idrissi et al. (2008), and Ratcliffe (2013).

⁷Phonetically, the comparative usually begins with an initial glottal stop, but since this results from a low-level process of epenthesis, we will not indicate it in our transcription or discussion.

(14) The Arabic comparative – Egyptian dialect

	<i>Adj. (m. sg.)</i>	<i>Comparative</i>	<i>Gloss</i>
a.	kibiir	akbar	big
b.	wiḥiḥ	awḥaḥ	bad
c.	dayyaʔ	adyaʔ	narrow
d.	tixiin	atxan	fat
e.	Tawiil	aṭwal	long
f.	Saʕb	aṣʕab	difficult
g.	faʕiir	afʕar	poor
h.	biʕiid	abʕad	far
i.	laTiif	alTaf	pleasant
j.	bakkiir	abkar	early
k.	zaḥma	azḥam	crowded
l.	zaayid	azyad	excessive

(14) shows that the comparative is formed from an adjectival base by extracting the three consonants of the base and putting them into the templatic frame aCCaC. The stress is on the initial syllable of the comparative in accordance with the stress rules of Egyptian Arabic (e.g. Watson 2002). The vowel pattern and syllable structure of the base adjective in (14) is irrelevant in determining the form of the comparative. Although (14) presents a limited number of examples, it clearly establishes that Arabic has a morphological comparative that is templatic with the shape aCCaC.⁸ Moreover, the comparative form is invariant in Egyptian Arabic; that is, unlike other adjectives, it does not inflect for gender or number to agree with the subject noun phrase. Based on (14), we can posit a CxM analysis using the abstract schema in (15) that expresses the form-meaning pairing that holds for the comparative. (16) exemplifies the construction for the comparative [akbar] ‘bigger’.

(15) Egyptian Arabic comparative construction

- a. Form: aCCaC
- b. Semantics: comparative

(16) Base: kibiir

k b r	(root consonants)
aCCaC	comparative

→ akbar

Interestingly, the comparative shows allomorphy based on the nature of the root consonants: one type of allomorphy is phonological, and the other type is templatic. In the simpler case of phonologically determined allomorphy, the templatic shape

⁸Additional examples can be found in Kamel and Hassanein (1980) and Badawi and Hinds (1986).

seems to be aCCa rather than aCCaC. In all cases of the comparative with the template aCCa, the last root consonant is a glide. This is shown in (17) where we include the feminine form of the adjective in addition to the masculine since it is often the case that the final glide surfaces in the feminine but not in the masculine form.⁹

(17) Comparative of adjectives with final glides

<i>Adj. (m. sg.)</i>	<i>Adj. (f. sg.)</i>	<i>Comparative</i>	<i>Gloss</i>
a. hilw	hilw-a	aħla (*aħlaw)	sweet
b. waaTi	waTy-a	awTa (*awTay)	low
c. ʕaali	ʕaly-a	aʕla (*aʕlay)	high
d. zaki	zakiyya	azka (*azkay)	intelligent
e. haadi	hadya	ahda (*ahday)	calm
f. ʔawi	ʔawiyya	aʔwa (*aʔway)	strong

In the adjective in (17a), the final glide, [w] is present in the adjectival base, but does not surface in the comparative. In the masculine forms of the adjectival base in (17b–f), the root final glide consonant, /y/, is expected at the end of the base word but does not surface. For example, the masculine forms in (17b) and (17c) are underlyingly /waaTi/ and /ʕaaliy/, with the final glide deleting resulting in [waaTi] and [ʕaali], respectively, as is suggested by their corresponding feminine forms. The lack of the final glide in all the comparative forms in (17) (e.g. [aħla] instead of *[aħlaw] ‘sweeter’ and [awTa] instead of *[awTay] ‘lower’) is attributed to a phonological effect, since content words in Egyptian Arabic do not have vowel-glide sequences in word-final position, precluding words ending in diphthongs (Broselow 1976; Youssef 2013). As a result, comparatives of adjectives with a root-final glide consonant, as in (17), delete the final glide so that the templatic shape of the comparative appears as aCCa rather than the expected aCCaC. Thus, the comparatives of the aCCa form in (17) can be understood as displaying the same form-meaning pairing of the aCCaC template in (15). Here, no construction-specific stipulation is needed for the presence of allomorphy since it follows from a more general phonological constraint against a word ending in a final (postvocalic) glide in Egyptian Arabic.

The more complicated allomorph of the templatic comparative in Egyptian Arabic occurs when the adjectival form ends in two identical root consonants including geminates. Such roots have been analyzed as consisting of only two root consonants, rather than as comprising three root consonants where the last two are identical – a view consistent with the Obligatory Contour Principle (OCP, see McCarthy 1986). For these forms, the comparative typically takes the pattern aCaCC where the last two consonant slots comprise a geminate and word stress is on the final syllable in compliance with the regular Egyptian Arabic stress rules. Sample data are given in (18).

⁹For a more comprehensive discussion, see Davis (2017).

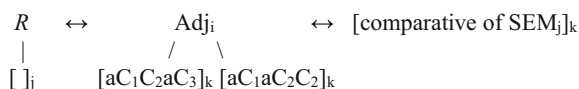
(18) Comparative of adjectives ending in two identical consonants: aC₁aC₂C₂

<i>Adj. (m. sg.)</i>	<i>Comparative</i>	<i>Gloss</i>
a. <i>ʃidiid</i>	<i>ʃadd</i>	strong
b. <i>xafiif</i>	<i>axaff</i>	light
c. <i>laziiz</i>	<i>alazz</i>	delicious
d. <i>widdi</i>	<i>awadd</i>	desirable
e. <i>tamm</i>	<i>atamm</i>	complete

The templatic shape aC₁aC₂C₂ of the comparative forms in (18) is not phonologically derivable by a regular process from the template aCCaC. This makes the allomorphy of the words in (18) quite different from the forms in (17) where the relevant pattern of aCCa is derivable from aCCaC by the regular phonology. The difference between (18) and (14) is that the base adjectives in (18) have only two root consonants. The template aC₁aC₂C₂ pertains to forms with two root consonants while the template aC₁C₂aC₃ is relevant to forms with three root consonants. The comparison of the adjective [kibiir] ‘big’ in (14a) with [ʃidiid] ‘strong’ in (18a) points to the templatic difference in the number of root consonants: these two words have identical syllable structure and vowel patterns but only differ in whether the consonantal root is trilateral (*kbr*) in (14a) or biliteral (*ʃd*) in (18a).

The issue of templatic allomorphy of the Arabic comparative poses an interesting challenge for the schematic representation in CxM. In order to show the specific details of our suggested analysis, we will make use of the schema that displays the detailed tripartite structure of the components [PHON], [SYN], and [SEM] as discussed by Booij (2010a, b) and exemplified in Sect. 2 above. The generalization that emerges from the above discussion of the Arabic comparative is that the construction seems to embed a mechanism that allows for a mapping of root consonants onto a template, but precisely where in a constructional schema would these be indicated? In (19), we show our posited abstract schema for the comparative where the form-meaning pairing displays the tripartite structure of the components [PHON], [SYN], and [SEM].

(19) The schema for the Arabic comparative construction with subschema (*R* = root consonants)



In (19) we indicate the root consonants as phonologically accessible and thus can be referenced in the [PHON] component of the construction. The templatic allomorphy that differentiates between forms with two or three root consonants is indicated by subschemas – [aC₁C₂aC₃]_k for a trilateral root and [aC₁aC₂C₂]_k for a biliteral root – as part of the [SYN] component, which represents the comparative

template as a morphosyntactic construct.¹⁰ The indication of root consonants in the [PHON] component of the construction seems to assume that root consonants are listed in the mental lexicon and that the comparative construction is indeed root-based, not word-based. We briefly turn to these issues by providing further evidence for the root-based nature of the comparative construction and offering a novel conception of the Arabic consonantal root.

Although we have indicated in (19) that the comparative form of the adjective is based on the consonantal root, we earlier referenced an adjectival base (i.e. the positive form of the adjective) in our initial data presentation of (14). Based on arguments in Davis (2016, 2017), we further explain that the comparative indeed reflects the consonantal root as base rather than an adjectival word. The distinction that we have shown between the template aCCaC for comparatives with three root consonants (14) and the template aCaCC for those with two root consonants (18), in fact, supports the root as a base. That is, as demonstrated by *kibiir-akbar* ‘big/bigger’ in (14a) and *fidiid-afadd* ‘strong/stronger’ in (18a), the specific nature of the comparative template is based on the number of root consonants and not on the syllable structure or other phonological characteristics of an adjectival base word. Below we provide additional evidence for the root-base approach.

Our data presentation thus far has been limited to comparatives where the corresponding adjectives do not have affixal consonants. The data from the Egyptian dialect in (20), however, demonstrate comparatives whose (assumed) adjectival base contains affixal consonants.

- (20) Comparatives of adjectives with affixal consonants (affixal consonants are underlined)

	<i>Adj. (m. sg.)</i>	<i>Comparative</i>	<i>Gloss</i>
a.	<u>mu</u> -naasib	ansab	appropriate
b.	<u>mu</u> -himm	ahamm	important
c.	<u>ma</u> -gnuun	agann	crazy
d.	kasla <u>an</u>	aksal	lazy
e.	taʕba <u>an</u>	atʕab	tired
f.	rufa <u>yya</u> ʕ	arfaʕ	thin

¹⁰The choice for a trilateral root to map onto the aCCaC template and for a biliteral one onto the aCaCC template is determined by the interface module between morphology and phonology in a way consistent with Booiĵ’s (2010a: 8–9, 239–241) discussion of this module. That is, in the interface module, an assigned word feature (here the feature [comparative]) triggers the application of specific phonological processes unique for words with that feature. Such processes are not general ones in the phonology. We discuss the role of this interface module further at the end of Sect. 4.3.1 on the diminutive. The issue of the formal status of root consonants is discussed at the end of this section.

- g. ʔuSayyar aʔSar short
- i. ʔurayyib aʔrab near
- j. ʔulayyil aʔall few
- k. hinayyin aʔhann kind/affectionate

The adjectives in (20a–c) have a derivational prefix while the adjectives in (20d–e) have a final derivational suffix. The adjectival base in (20f–k) arguably has the shape of a templatic diminutive that is characterized by the infixal geminate glide [-yy-] between the second and third root consonants. These affixal consonants are invisible in the formation of the comparative. Thus, we see from the middle column of (20) that the comparative template (aCCaC/aCaCC) takes only the root consonants as the base with absolutely no reference to the affixal ones. This is consistent with the view that only the consonantal root is essential to the comparative construction.

Further, there are comparatives that do not seem to find their corresponding base adjectival form. Three examples from Egyptian Arabic are given in (21) with an explanation as to why it does not seem to have an adjectival base.

(21) Comparatives without corresponding base adjectival forms (Egyptian dialect)

- a. [azwaʔ] ‘more polite’
 The base might be [zooʔ], but [zooʔ] is a noun rather than an adjective
- b. [anwar] ‘more luminous’
 The base is not clear. It could be [nuur] ‘light’ or [minawwar] ‘luminous’.
- c. [aʔhaʔʔ] ‘more entitled’
 The base is not clear. One possible base is the adjective [haʔiiʔi] ‘truthful’ but the meaning of the comparative does not match the meaning of the possible base.

Native speakers of Egyptian Arabic that we consulted are unsure of or disagree on what exactly the positive form of the adjective is for the comparatives in (21). Given a certain degree of ambivalence on the speakers’ judgments concerning the origin of the alleged corresponding adjective, the meaning of the comparative is always consistent with the semantics encompassed by the root but not necessarily with an adjective deriving from it. For example, [aʔhaʔʔ] and [haʔiiʔi] in (21c) share the root /hʔʔ/, which encompasses the meaning roughly corresponding to English ‘truth’ and ‘right’. One might suggest that [haʔiiʔi] ‘truthful’ could serve as the adjectival base for the comparative [aʔhaʔʔ]. However, this adjectival meaning is nongradable, and Davis (2017) shows that nongradable adjectives lack a templatic comparative form. It follows then that these two words could in no way be derivationally related to each other. Instead, the semantics of the comparative is more in line with the meaning

of ‘right’ borne by the root /ħʔʔ/. This is how the meaning of ‘more entitled’ is assigned to [aħaʔʔ]; it follows from the holistic nature of the construction.¹¹

In our formalization of the comparative construction in (19), we have indicated that the consonantal root can be referenced by the PHON component of the constructional schema. The accessibility of the Arabic consonantal root finds its support in the psycholinguistics literature. The priming experiments of Boudelaa and Marslen-Wilson (2001, 2005) show that Arabic speakers are aware of relationships between words that share the same root. It is shown in their experiments that the root as a phonological construct is more important than the actual semantic relatedness of word forms that share the same root. Thus, as noted by Ratcliffe (2013), a lexeme like *kitaab* ‘book’ can prime a lexeme such as *katiiba* ‘regiment’ even though their meanings are quite unrelated. Based on this and other similar experimental findings, Boudelaa and Marslen-Wilson propose that the root consonant is a lexically listed morphemic unit. Here we give their proposal a somewhat different interpretation, maintaining that root consonants are akin to a label for a word family or family of lexemes in the sense of Haspelmath and Sims (2013). For example, if one considers lexemes with the root *ktb*, then *kitaab* ‘book’ and its inflected forms would comprise a lexeme; *katiiba* ‘regiment’ and its inflected forms would comprise another lexeme; and *katab* ‘he wrote’ and its inflectional paradigm forms would constitute a third lexeme. There are other lexemes of the *ktb* family as well (such as *maktab* ‘office’). A consonantal root then can be better understood as a label for a family of lexemes, and (native) Arabic speakers have access to this label so that a consonantal root can then be accessed as part of the [PHON] component of a morphological construction.^{12, 13}

¹¹Grano and Davis (2018) discuss the typological implications of the comparative in Arabic since it instantiates a language that has a morphological comparative that is not based on a corresponding positive form.

¹²Lahrouchi (2010: 259), in comparing the nature of the consonantal root in Classical Arabic with Tashlhiyt Berber, refers to the root as an abstract morpheme in Arabic but as a surface-true morpheme in Tashlhiyt Berber. This is because in Berber, which allows for vowelless words, the consonantal root can comprise an unaffixed word form, as in the example [nkr] ‘stand up (aorist)’. Nonetheless, we would suggest that in Berber, just as in Arabic, the root consonants can also be considered a label of a family of lexemes.

¹³The notion that a consonantal root is akin to a label for a family of lexemes as we have posited is different from the suggestion in Ryding (2005) that an Arabic consonantal root can be thought of as representing a semantic field. Moreover, we believe our view is consistent with that of Bybee (2001: 32), who considers schemas to be formed at many different levels of generality where schemas are generalizations over numerous instances of usage. The Arabic consonantal root then can be understood as a type of schema within the model developed by Bybee (2001).

4.2 Occupation Nouns

In the previous section we offered a detailed examination of the Arabic comparative in the framework of CxM. A consequence is that the construction approach in turn provides evidence for the root-based approach to templatic allomorphy. In this section we discuss one other root-based templatic construction in Arabic, namely the class of occupation nouns. These nouns are common across Arabic dialects, although rarely discussed in the contemporary linguistics literature on the language. Our discussion below is based on occupational nouns in Damascus Arabic.

Ferguson and Ali (1961: 229) describe various ways that occupational nouns are formed in Damascus Arabic: “The commonest type of occupation noun is characterized by the pattern $C_1aC_2C_2aaC_3$, i.e. with double second consonant and long *-aa-* between the second and third consonants of the root.” The structure is templatic and the consonants that fill the template always are root consonants. In their examples of occupation nouns, Ferguson and Ali do not indicate any related word but just assume that the occupation noun references the root directly. (22) presents the data on occupation nouns.

(22) Occupation nouns (Damascus dialect)

	<i>Root</i>	<i>Occupational Noun</i>	<i>Gloss</i>
a.	xbz	xabbaaz	baker
b.	xyT	xayyaaT	tailor
c.	xdm	xaddaam	servant
d.	smk	sammaak	fish seller
e.	nZr	naZZaar	carpenter
f.	Tbx	Tabbaax	cook
g.	Tyr	Tayyaar	pilot
h.	bwb	bawwaab	doorkeeper
i.	lhm	lahhaam	butcher
j.	zyt	zayyaat	oil seller
k.	hlʔ	hallaaʔ	barber
l.	hTb	haTTaab	firewood cutter/seller
m.	ʔTʕ	ʔaTTaaʕ	bandit
n.	dl	dallaal	one who shows things (e.g. real estate agent)
o.	ʔS	ʔaSSaaS-a	beautician (f.)
p.	xT	xaTTaaT	calligrapher

The occupational nouns in Damascus Arabic in (22) invariably fit the templatic schema $C_1aC_2C_2aaC_3$. These nouns only contain root consonants. It is not clear whether any of these nouns have a specific base word from which they are derived. Even if the occupational noun could be related to a base word, any affixal consonants of such a base would not have any realization in the template $C_1aC_2C_2aaC_3$ of the occupation noun. Consequently, the occupation noun reflects only consonants that comprise the consonantal root. Furthermore, unlike the comparative, the template

for the occupation noun is exactly the same for roots containing two consonants as seen by the data in (22n–p). For example, the root in (22p), *xT*, consists of two consonants while the template requires three, C_1 , C_2 , and C_3 . To compensate for the gap in the number of consonants, the second consonant, *T*, appears both as C_2 , and C_3 .¹⁴

We can posit the tripartite structure for the occupational noun construction in (23) consisting of the components [PHON], [SYN], and [SEM].

- (23) The schema for the Arabic occupation noun construction (R = root consonants)

$$\begin{array}{ccc} R & \leftrightarrow & N_i & \leftrightarrow & [\text{occupation of SEM}]_k \\ | & & | & & \\ []_j & & [C_1aC_2C_2aaC_3]_k & & \end{array}$$

In (23) we indicate the phonological form of root consonants (viewed as a label on a family of lexemes) is accessible in the [PHON] component of the construction, whereas the template is specified in the [SYN] component. The constructional schema captures that the structural, meaning, and functional properties of occupation nouns are represented as being a holistic property of the construction as a whole.

Although the occupation noun construction does not display templatic allomorphy, it does exhibit phonological allomorphy when the last root consonant is a glide. This relates to the observation made earlier that Arabic content words do not end in a sequence of a vowel followed by a glide. Consider the examples of the occupation nouns in (24) that have a final root glide.

- (24) a. *hky* *ħakka* (**ħakkaay*) speaker
 b. *kwy* *kawwa* (**kawwaay*) presser of clothes
 c. *ʃry* *ʃarra* (**ʃarraay*) buyer

Similar to the comparative forms in (17) (e.g. *awTa* ‘lower’ vs. **awTay*), the word-final glide, which would correspond to C_3 , deletes in the occupation noun forms in (24). As discussed by Broselow (1976) and Youssef (2013), the deletion of a final glide in this context can be viewed as phonological. Notice also that the occupation nouns in (24) demonstrate a further complication vis-à-vis the expected templatic representation of $C_1aC_2C_2aaC_3$: if these nouns simply involved the deletion of the word-final glide, then we expect the final vowel to be long, yielding **ħakkaa*, for example. While leaving open the question of whether the shortening of the final vowel can be viewed as purely phonological or construction specific, we note that a final long vowel in many Arabic dialects marks an inflectional category.

¹⁴We suggest that this association of the second root consonant to the final slot of the template with biliteral roots reflects autosegmental principles of phonology, as discussed, for example, by McCarthy (1986).

Consequently, there may be some motivation for the unexpected shortening of the final vowel in (24).

4.3 Word-Based Templatic Constructions

In Sects. 4.1 and 4.2 we have exemplified root-based templatic constructions in Arabic drawing on the data from the comparative and occupation nouns. The diminutive in Arabic, to which we turn now, instantiates a word-based templatic construction. We will also briefly discuss the “broken” plural. In both constructions, the noun serves as the base word.¹⁵

4.3.1 The Diminutive

The diminutive in Classical Arabic displays a variety of subpatterns that are completely predictable from the prosodic structure of the base noun.¹⁶ Sample data showing most of the diminutive subpatterns are provided in (25). (A period indicates syllable boundary, and a hyphen represents a morpheme boundary.)

(25) Arabic diminutive (data are mainly from McCarthy and Prince 1990; Watson 2006)

	<i>Base noun</i>	<i>Diminutive</i>	<i>Gloss</i>
a.	dam	dumay	blood
b.	ħukm	ħu.kaym	judgment
c.	ʕi.nab	ʕu.nayb	grape
d.	ma.lik	mu.layk	king
e.	ʕun.dub	ʕu.nay.dib	locust
f.	ma-k.tab	mu.kay.tib	office
g.	sul.Taan	su.lay.Tiin	sultan
h.	mi-f.taah	mu.fay.tiih	key
i.	ki.taab	ku.tay.yib	book
j.	ʕa.ziir-a	ʕu.zay.yir	island
k.	xaa.tam	xu.way.tim	signet ring
l.	qaa.muus	qu.way.miis	dictionary
m.	baab	bu.wayb	door

¹⁵We offer a construction morphology analysis of the diminutive, but because of the complexities of the broken plural, a detailed account will be left for future research.

¹⁶The analysis of the Classical Arabic diminutive in the framework of Prosodic Morphology can be found in McCarthy and Prince (1990) and from an optimality-theoretic perspective in Watson (2006).

The data in (25) are divided into six groups depending on the prosodic structure of the base noun. (25a–b) are monosyllabic nouns; (25c–d) are bisyllabic, the first syllable being light; (25e–f) are bisyllabic nouns with a closed first syllable and a short vowel in the second; (25g–h) and (25i–j) both have a long vowel in the second syllable but differ in whether the first syllable is closed or open; and in the last group of (25k–m), the base noun contains a long vowel in the first syllable. This brief description indicates that while the diminutive forms display a range of patterns, the specific shape that the diminutive takes is dependent on the prosodic characteristics of the base noun, thus making it quite different from the comparative in Sect. 4.1. The commonality of all the diminutive word forms is that they begin with the same sequence: Cu.Cay where the C slots represent the first two consonants of the base noun, unless the first syllable of the base has a long vowel, in which case, the second C-slot of Cu.Cay is realized as [w], as in (25k–m). Following McCarthy and Prince (1990), the initial Cu.Cay part of the diminutive is characterized as comprising an iambic template since the first syllable is light and the second syllable is heavy. The remainder of the diminutive word form incorporates the other consonants of the base noun.¹⁷ In those rare Arabic nouns such as [dam] ‘blood’ in (25a) that have the CVC pattern, the diminutive form is simply what matches the Cu.Cay template, as seen by [du.may] in (25a).¹⁸ Thus, despite a wide variety of subpatterns, the specific subpattern is always predictable from the prosodic characteristics of the base noun.

The range of subpatterns of diminutive forms exemplified in (25) can be generalized into the construction schema of (26).

(26) The schema for the Arabic diminutive

$$\begin{array}{ccc} \omega & \leftrightarrow & N_i & \leftrightarrow & [\text{diminutive SEM}]_k \\ | & & | & & \\ [j] & & [\text{CuCayX}]_k & & \end{array}$$

In (26) we capture the generalization that for the diminutive, the base noun (without phonological restriction) maps onto the template CuCayX.¹⁹ Specifically, the diminutive construction itself triggers the mapping of the phonological form of the input noun onto the template. Regarding the CuCayX template in (26), Cu.Cay is the part of the template that characterizes what all diminutives share; X indicates

¹⁷When necessary, a high front vowel is added between the last two consonants of the diminutive word form (e.g. 25e–l) for phonotactic reason; the added high vowel may be long if the final vowel of the noun base is long.

¹⁸That the final glide does not delete in this word reflects that the /y/ is part of the diminutive template and not a root consonant. See the discussion of (17) where a final root glide of the comparative undergoes deletion after a vowel.

¹⁹It is worth noting that a broken plural as in (27) can never serve as a base for a diminutive. We do not think this is accidental. That is, because the broken plural reflects a word-based templatic construction, it cannot be unified with another word-based templatic construction.

the remainder of the diminutive word, the realization of which is predictable given the phonological nature of the base noun. In those rare nouns of the form CVC such as *dam* ‘blood’ in (25a), X would have no content. In (25b–e), X would be a single consonant as exemplified in (25d) by the pair *malik-mulayk* ‘king’, where the /k/ of the base does not map on the Cu.Cay part of the template but surfaces in the diminutive word immediately after Cu.Cay. In base words having more complex prosodic structure due to the presence of a long vowel, X is an entire syllable as in the example in (25l) *qaamuus – quwaymiis* ‘dictionary’.

We suggest that the precise nature of the phonological mapping between the base noun and the diminutive template CuCayX is determined by the interface module between morphology and phonology in a way consistent with Booij’s (2010a: 8–9, 239–241) discussion of this module whereby an assigned word feature such as [plural] triggers the application of specific phonological processes unique for words with that feature. These processes are not general ones in the phonology. For the diminutive forms in (25), the interface module would specify a mapping relationship between the base noun, and the diminutive word that would include several formalized statements (rules) relating aspects of the phonological form of the base to its effect on how the templatic diminutive is realized. For example, there would be a statement indicating that the second consonant of a diminutive is [w] if the first syllable of the base noun has a long vowel, as in (25k–m). The reference to an interface module between the morphology and phonology involving fairly complex statements seems to be characteristic of Arabic word-based templatic morphology, given that similar statements would be needed to account for the details of the broken plural subpatterns in (27). In contrast, the content of the interface module between the morphology and phonology in the root-based templatic morphology discussed in Sects. 4.1 and 4.2 would be quite minimal. For example, for the templatic allomorphy shown in the schema for the root-based comparative construction in (19), we suggest that there would be a statement in the interface module that a base with three root consonants takes the templatic structure $[aC_1C_2aC_3]_k$ and those with two root consonants take the base $[aC_1aC_2C_2]_k$. The exact nature of the interface module between morphology and phonology is left for future research. Nonetheless, we see that the constructional schema in (26) captures that the structural, meaning, and functional characteristics of the diminutive can only be attributed to the property that belongs to the construction as a whole. Similar to the comparative and occupational nouns analyzed in Sect. 4.2, the template is part of the SYN component of the construction.

4.3.2 The Broken Plural

As a final example of a templatic word-based construction in Arabic, we briefly mention the “broken” plural, but because of its complexity we do not formalize its constructional schema. The “broken” plural is ubiquitous in Classical Arabic and all modern dialects. The broken plural is related to the nominal singular base by specific changes in the vowel pattern and syllable structure; there is no prefixation

or suffixation involved.²⁰ The word-internal changes that accompany the broken plural are not predictable for any given noun, and there are many subpatterns. A small sample that testifies to the variety of subpatterns is given in (27).

(27) Arabic broken plural (data taken from Wehr 1976; McCarthy and Prince 1990)

	<i>singular</i>	<i>plural</i>	<i>gloss</i>
a.	nafs	nu.fuus	soul
b.	ra.ḏʒul	ri.ḏʒaal	man
c.	ʔasad	ʔu.suud	lion
d.	ta-q.diir	ta.qaa.diir	calculation
e.	ma-k.tab	ma.kaa.tib	office
f.	mi-f.taah	ma.faa.tiih	key
g.	xaa.tim	xa.waa.tim	signet-ring
h.	ḏʒaa.muus	ḏʒa.waa.miis	(water) buffalo
i.	kitaab	ku.tub	book
j.	kaafil	kuf.fal	breadwinner
k.	Dilaʕ	ʔaD.luʕ	rib

The data in (27) illustrate the problem that confronts any analysis of the broken plural, especially considering that there are even more subpatterns in addition to those shown. Based on McCarthy and Prince (1990), the following two observations can be made: (i) most of the broken plural subpatterns are expressible by a single template; (ii) the precise mechanism that leads to actual forms depends, to an extent, on the phonological characteristics of the base noun. Regarding the first observation, the majority of broken plurals, as reflected by (27a–h), have a syllable structure pattern of the first syllable being light and the second being heavy with a long vowel. This sequencing of a light syllable followed by a heavy one is consistent with an iambic foot structure. From such a perspective, it is the iambic template that is the exponent of the broken plural. For (27a–h), the plural template would consist of the form CV.CVV and is aligned to the left edge of the word. The second observation on the precise realization can be illustrated by (27d, f–h). If the last syllable of the base noun contains a long vowel, as in (27d, f, h), the last syllable of the plural will always have a long vowel. Moreover, as shown in (27g–h), if the first syllable of the base noun has a long vowel, then the second consonant of the plural is [w]. Finally, as shown in (27d–f), a prefixal consonant in the singular also occurs in the plural. This makes the broken plural quite different from the comparative data discussed in Sect. 4.1 where only root consonants can occur in the comparative template.

Analyses of the broken plural are very complex. While forms like (27a–h) indicate that many of the subpatterns have an iambic template, there are complications that include the unpredictability of the vowel patterns (although there are certain

²⁰Arabic also has a suffixal plural referred to as the “sound” plural in traditional studies on Arabic. The suffix marks the plural for certain noun classes and for most borrowed words.

tendencies) and complications entailing the subpatterns in (27i–k) that do not seem to have an iambic structure in the plural. Detailed analyses of the broken plural are lengthy (e.g. McCarthy and Prince 1990; Ratcliffe 1998). From the perspective of CxM, an analysis of the broken plural would need to incorporate a large number of subschema. Given the complexities of such an analysis, we leave the details of this for future research.

5 Conclusion

In this article we have made an initial attempt at accounting for Arabic nonconcatenative morphology in the framework of CxM centering on templatic morphology. Our major focus has been on addressing the question of how the prosodic templates that characterize Arabic morphology are incorporated into the schema of CxM. We also briefly touched upon the implication that the construction analysis might have on two (opposing) approaches to Arabic morphology, root-based vs. word-based, given that there are some templatic constructions in Arabic that seem to require the consonantal root as its base. We have maintained that the Arabic prosodic template is formally part of the SYN component of a construction, which is consistent with its morphosyntactic nature. We have also suggested that Arabic root consonants do not comprise a lexically listed morpheme with its own semantics (as in Boudelaa and Marslen-Wilson 2001, 2005), but can be conceptualized as a label to a family of lexemes that is accessible to a construction. Their precise meaning is determined in its realization in a morphological construction. That is, the specific meaning of a word form in a root-based construction – such as the comparative and occupational nouns – is captured as coming from the construction itself. In this way, both root-based templatic morphology and word-based templatic morphology share the notion of a prosodic template as part of the SYN component of the morphological construction. Nevertheless, they differ in the nature of the base, with its consequential ramifications for how the template is phonologically realized. Our analysis is consistent with an emerging consensus that Arabic morphology can be both root-based and word-based.²¹ While the account presented here of the application of construction morphology to Arabic is far from definitive and sufficient, our aim is to initiate the discussion on how Arabic templatic and root-based morphology can be conceptualized within the framework of CxM.

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²¹See, in particular, Watson (2006), Idrissi et al. (2008), and Benmamoun (2016).

References

- Badawi, E.-S., and M. Hinds. 1986. *A dictionary of Egyptian Arabic*. Beirut: Librairie Du Liban.
- Benmamoun, E. 1999. Arabic morphology: The central role of the imperfective. *Lingua* 108: 175–201.
- . 2016. Verbal and nominal plurals and the syntax-morphology interface. In *Perspectives on Arabic linguistics XXVII*, ed. S. Davis and U. Soltan, 59–74. Amsterdam: John Benjamins.
- Booij, G. 2005. Compounding and derivation: Evidence for construction morphology. In *Morphology and its demarcations*, ed. W.U. Dressler, D. Kastovsky, O. Pfeiffer, and F. Rainer, 109–132. Amsterdam: John Benjamins.
- . 2007. Construction morphology and the lexicon. In *Selected proceedings of the 5th déceμβrettes: Morphology in Toulouse*, ed. F. Montermini, G. Boyé, and N. Hathout, 34–44. Somerville: Cascadilla Press.
- . 2009a. Constructions and lexical units: An analysis of Dutch numerals. *Linguistische Berichte Sonderheft* 19: 1–14.
- . 2009b. Compounding and construction morphology. In *The Oxford handbook of compounding*, ed. R. Lieber and P. Štekauer, 201–216. Oxford: Oxford University Press.
- . 2010a. *Construction morphology*. Oxford: Oxford University Press.
- . 2010b. Construction morphology. *Language and Linguistic Compass* 3 (1): 1–13.
- . 2013. Morphology in CxG. In *The Oxford handbook of construction grammar*, ed. Th. Hoffmann and G. Trousdale, 255–273. Oxford: Oxford University Press.
- Boudelaa, S., and W. Marslen-Wilson. 2001. Morphological units in the Arabic mental lexicon. *Cognition* 81: 65–92.
- Boudelaa, S., and W. Marslen-Wilson. 2005. Discontinuous morphology in time: Incremental masked priming in Arabic. *Language and Cognitive Processes* 20: 207–260.
- Broselow, E. 1976. *The phonology of Egyptian Arabic*. PhD dissertation. University of Massachusetts.
- Bybee, J. 2001. *Phonology and language use*. Cambridge: Cambridge University Press.
- Carstairs-McCarthy, A. 1998. Phonological constraints on morphological rules. In *The handbook of morphology*, ed. A. Spencer and A. Zwicky, 144–148. Oxford: Blackwell.
- Croft, W. 2001. *Radical construction grammar*. Oxford: Oxford University Press.
- Davis, S. 2016. The Arabic comparative and the nature of templatic mapping in Arabic. In *Word-formation across languages*, ed. L. Körtvélyessy, P. Štekauer, and S. Valera, 73–90. Newcastle: Cambridge Scholars Press.
- . 2017. Some issues for an analysis of the templatic comparative in Arabic with a focus on the Egyptian dialect. In *Perspectives on Arabic linguistics XXIX*, ed. H. Ouali, 129–150. Amsterdam: John Benjamins.
- Davis, S., and N. Tsujimura. 2014. Non-concatenative derivation: Other processes. In *The Oxford handbook of derivational morphology*, ed. R. Lieber and P. Štekauer, 190–218. Oxford: Oxford University Press.
- Davis, S., and B. Zawaydeh. 1999. A descriptive analysis of hypocoristics in colloquial Arabic. *Language and Linguistics* 3: 83–98.
- . 2001. Arabic hypocoristics and the status of the consonantal root. *Linguistic Inquiry* 32: 512–520.
- Doron, E. 2003. Agency and voice: The semantics of the Semitic templates. *Natural Language Semantics* 11: 1–67.
- Ferguson, Ch., and M. Ali. 1961. *Damascus Arabic*. Washington, DC: Center for Applied Linguistics.
- Grano, Th., and S. Davis 2018. Universal markedness in gradable adjectives revisited: The morpho-semantics of the positive form in Arabic. *Natural Language and Linguistic Theory* (36):131–147.
- Haspelmath, M., and A. Sims. 2013. *Understanding morphology*. 2nd ed. London: Routledge.

- Heath, J. 1987. *Ablaut and ambiguity: Phonology of a Moroccan Arabic dialect*. Albany: State University of New York Press.
- Idrissi, A., J.-F. Prunet, and R. Béland. 2008. On the mental representation of Arabic roots. *Linguistic Inquiry* 39: 221–259.
- Inkelas, S., and Ch. Zoll. 2005. *Reduplication: Doubling in morphology*. Cambridge: Cambridge University Press.
- Kamel, M., and A. Hassanein. 1980. *Yalla ndardish sawa*. Cairo: Arabic Language Unit, American University in Cairo.
- Lahrouchi, M. 2010. On the internal structure of Tashlhiyt Berber triconsonantal roots. *Linguistic Inquiry* 41: 255–285.
- McCarthy, J. 1979. *Formal problems in Semitic phonology and morphology*. PhD dissertation. MIT.
- . 1981. A prosodic theory of nonconcatenative morphology. *Linguistic Inquiry* 12: 373–418.
- . 1986. OCP effects: Gemination and antigemination. *Linguistic Inquiry* 17: 207–263.
- . 1993. Templatic form in prosodic morphology. *Proceedings of the Formal Linguistics Society of Mid-America* 3: 187–218.
- McCarthy, J., and A. Prince. 1990. Foot and word in prosodic morphology: The Arabic broken plurals. *Natural Language and Linguistic Theory* 8: 209–282.
- Michaelis, L., and K. Lambrecht. 1996. Toward a construction-based theory of language functions: The case of nominal extraposition. *Language* 72: 215–247.
- Ratcliffe, R. 1997. Prosodic templates in a word based morphological analysis of Arabic. In *Perspectives on Arabic linguistics X*, ed. M. Eid and R. Ratcliffe, 147–171. Amsterdam: John Benjamins.
- . 1998. *The “broken” plural problem in Arabic and comparative Semitic: Allomorphy and analogy in non-concatenative morphology*. Amsterdam: John Benjamins.
- . 2004. Sonority-based parsing at the margins of Arabic morphology. *Al-Arabiyya* 37: 53–75.
- . 2013. Morphology. In *The Oxford handbook of Arabic linguistics*, ed. J. Owens, 71–91. Oxford: Oxford University Press.
- Ryding, K. 2005. *A reference grammar of Modern Standard Arabic*. Cambridge: Cambridge University Press.
- Ussishkin, A. 2000. *The emergence of fixed prosody*. PhD dissertation. University of California Santa Cruz.
- Watson, J. 2002. *The phonology and morphology of Arabic*. Oxford: Oxford University Press.
- . 2006. Arabic morphology: Diminutive verbs and diminutive nouns in San’ani Arabic. *Morphology* 16: 189–204.
- Wehr, H. 1976. In *Arabic-English dictionary*, ed. J.M. Cowan. Ithaca, NY: Spoken Language Services.
- Youssef, I. 2013. *Place assimilation in Arabic: Contrasts, features, and constraints*. Ph.D dissertation. University of Tromsø.
- Zawaydeh, B., and S. Davis. 1999. Hypocoristic formation in Ammani-Jordanian Arabic. In *Perspectives on Arabic linguistics XII*, ed. E. Benmamoun, 113–139. Amsterdam: John Benjamins.