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The Morphosemantics of Complex Numbers

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Keywords

Complex numbers; compositionality; compounding; desentencialisation; Ẹdo language

Abstract

This paper discusses the morphology and semantics of numeral expressions in Ẹdo – a language spoken in Nigeria. Previous studies outlined the mathematical principles which underlie the numeral system of this language. However, those studies have long lists of numeral expressions; usually, these studies spread the lists of expressions across different volumes of a textbook. The present study was, therefore, designed to find more concise ways of describing the numeral system of the language. This is significant because the study attempts to capture the same generalisations using inferences from linguistics. Its findings can be applied in translation practice and the development of materials for language teaching and learning. The research used both descriptive and theory-based analyses. Descriptive analyses rely on theory-neutral terms commonly employed in language studies. The theoretical framework adopted was the Principle of Compositionality. This principle implies that the relation between form and meaning is not arbitrary. It states that the meanings of complex words come from their structure, as well as a combination of the lexical and grammatical meanings of constituents in such words. Data was collected through interviews, participant observation, and content analyses of existing studies. The analysis revealed that the language derives complex numerals via compounding and desentencialisation. Compounding is a morphological process that combines two free word forms to create a new word; the output word may/may not have the same meaning as the input forms. Desentencialisation is a process that joins all the words in a sentence. The proposition remains the same, but the constituents in the sentence lose their independent status and function as one word. In terms of their semantics, the data showed the meanings of complex numerals are composed of the meanings of their constituents. This study contributes to linguistic theory as the analysis affirms the precepts of semantic composition and its usefulness in morphosemantic analyses. Although the principle behind meaning composition has been widely criticised, this study finds it is correct. The principle applies when there is a direct relationship between complex words and the meaning of their constituent parts.

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Mots clés

Nombres complexes ; Compositionnalité ; composition ; Désentencialisation ; la langue Ẹdo

Résumé

Cet article décrit la morphologie et la sémantique des expressions numériques en Ẹdo, une langue parlée au Nigeria. Des études antérieures ont souligné les principes mathématiques qui sous-tendent le système numéral de cette langue. Toutefois, ces études contiennent de longues listes de chiffres répartis dans différents volumes de textes. Cette recherche a donc été conçue pour trouver des moyens succincts de décrire le système numéral du Ẹdo. L'étude est importante car ses conclusions s'appliquent à la traduction et à l'enseignement des langues. La collecte des données s'est faite par le biais d'entretiens, d'observations participantes et d'analyses de contenu. L'analyse des données a été à la fois descriptive et théorique. Le cadre adopté est le principe de compositionnalité. Ce principe stipule que les mots complexes tirent leur signification de leur structure et des significations de leurs parties. Les analyses ont révélé que la langue dérivait des chiffres complexes par le biais de la composition et de la désentencialisation. La composition est un processus morphologique qui combine deux mots libres pour en créer un nouveau ; le résultat peut ne pas avoir le même sens que les formes d'entrée. La désentencialisation est un processus qui réunit tous les mots d'une phrase. La proposition reste la même, mais les mots perdent leur statut indépendant et fonctionnent ensemble comme un seul. En termes de sémantique, l'étude a révélé que les significations des chiffres complexes sont composées à partir des significations des mots qui constituent ces chiffres. Cela confirme la composition sémantique et montre son utilité dans les analyses morphosémantiques. Alors que le principe de compositionnalité a été largement critiqué, cette étude montre qu'il est correct. Il s'applique lorsqu'il existe une relation directe entre les mots complexes et le sens de leurs éléments constitutifs.

1. Introduction

This paper discusses numerals in Ẹdo, a language which belongs to the Edoid group (Elugbe, 1979) under the Kwa branch of the NIGER-CONGO family (Greenberg, 1966). The Ẹdo language is spoken in Nigeria. Its ethnologue identification number is 639-3. Following Eberhard et al. (2022), the population of speakers in the country is 2, 030, 000. The appendix section contains a map illustrating the regions where the language is spoken. The language has three lexically distinct tones: High, Low, and Down-stepped High. It also has a rising tone, which only contrasts the low tone in monosyllabic verbs (Omozuwa, 2013). The basic order of constituents in a sentence is Subject-Verb-Object. Ẹdo has a standard orthography approved by the Bendel State Ministry of Education in 1974 (Agheyisi, 1986, p. xii). It is taught as a subject at primary, secondary and tertiary levels of education.

A numeral is any word that indicates the number (i.e. quantity) of an entity or its relative position. All natural languages have a system of graphemes or symbols which encode numerals in a consistent manner. Such systems comprise two major categories: cardinal and ordinal numbers. Cardinal numbers denote quantity and include numbers

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such as one, two, and three. Ordinal numbers show the position of persons, things, or events in a sequence, for example, first, second, third, etc. Besides the distinction between cardinal and ordinal numbers, numerals can also sub-categorised in terms of their internal structure. From this perspective, numerals are divided into simple and complex types. A simple numeral contains only one numeral root. Complex numerals consist of two or more numeral roots (Zoha et al., 2022, p. 200). Examples of simple numerals include expressions like two, three, four, twenty etc. Complex numerals include twenty-two, thirty-three, four hundred etc.

Extant works on the Ẹdo numeral system include long lists of number symbols and their equivalent expressions in the language. As Hurford (2011) observes "the systematic characteristics in natural language numeral systems project the existence of infinite sets of names. Therefore, we need "some device which can specify the entire set of number names in a language without actually listing them" (p. 4). In contrast to earlier works which try to itemise all numeral names, this paper focuses on complex cardinal numbers. It describes the morphological processes through which the language derives them, and the semantics which underlie the derivations. Besides its scope, the current study also differs from previous works in terms of its objectives.

The aim of the study is to investigate the structure and interpretation of Ẹdo numerals. To accomplish this, the research set two objectives. One is to identify word-formation processes in the numeral system; the other objective explores the manner in which these processes relate to meaning composition. The study addresses both objectives in the following research questions:

- Which morphological processes are evident in complex Ẹdo numerals?
- How are the meanings of these complex numerals derived?

2. Literature Review

2.1 Previous studies on Ẹdo numerals

There are no prior studies which focus on the morphology or semantics of Ẹdo numerals, but there are several textbooks which either list the number-names or describe the arithmetic operations that apply during numeration. Omoregie (1983), for example, explains the numeral system has a basic set of expressions for 1—14, 20, 30, 200, 200,000 and 200,000 000. This paper lists the terms and corresponding Arabic numbers below.

Ẹdo	gloss	Arabic numerals
Òwó/Ọ́kpá	'one'	1
Èvá	'two'	2
Èhá	'three'	3
Èné	'four'	4
Ìsẹ́n	'five'	5

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Éhàn	'six'	6
Ìhínrọ̀n	'seven'	7
Èrẹ̀nrẹ́n	'eight'	8
Ìhìnrín	'nine'	9
Ìgbé	'ten'	10
Òwọ̀ǫ́rọ̀	'eleven'	11
Ìwèévà	'twelve'	12
Ìwèéhà	'thirteen'	13
Ìwèénẹ̀	'fourteen'	14
Ùgìé / Ìyí	'twenty'	20
Ǫ́gbàn	'thirty'	30
Ùrí/ Àrríá	'two hundred'	200
Ẹ́bò	'two hundred thousand'	200, 000
Ùyè	'two hundred million'	200, 000 000

There is one basic numeral excluded from the list above – Ìkíọkhọ̀ which means one hundred and forty. This expression is in Melzian (1937, p. 91) and Aghẹyisi (1986, p. 70). Omoregie (1983, p.104) and Imasuẹn (1996, p. 66) note that Ìkíọkhọ̀ differs from other basic numerals because it can also be expressed using the term Ìyí -Ìhínrọ̀n. The reader would have noticed that unlike other numbers with alternate expressions, the synonym for Ìkíọkhọ̀ combines two basic numerals Ìyí and Ìhínrọ̀n.

To create terms for other cardinal numbers, the language uses three arithmetic operations: addition, subtraction and multiplication, as well as six of the numbers listed above. These numeral expressions, also referred to as "milestones comprise Ìsẹ́n, Ìgbé, Ùgìé or Ìyí, Ùrí or Àrríá, Ẹ́bò, and Ùyè" (Omoregie, 1983, p. 103).

In the Ẹdo numeral system, addition expresses values higher than ìgbé, ùgìé, ùrí, ẹ́bò, and ùyè. There are two morphemes for this purpose: a coordinating conjunction vbé and a verb nyàá which literally means "to exceed". When used in the formation of numeral expressions, nyàá is interpreted as an instruction to add the number which occurs before the verb to the one which comes after it. The verb expresses additions to ìgbé "ten", ùgìé "twenty" and their multiples up to one hundred and ninety (190) and one hundred and eighty (180) respectively. The conjunction is used to express additions to ùrí "two hundred", ẹ́bò "two hundred thousand" and ùyè "two hundred million" as shown in the following examples.

1. Èvá nyàá ùgìé

Èvá # nyàá # ùgìé

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Two added_to twenty
"Two plus twenty"
'Twenty-two (22)'

2. Èhá nyàá ọ́gbàn
Èhá # nyàá # ọ́gbàn
Three added_to thirty
"Three plus thirty"
'Thirty-three (33)'

3. Ùrí vbé èrẹ̀nrẹ́n
Ùrí # vbé # èrẹ̀nrẹ́n
Two hundred and eight
"Two hundred plus eight"
'Two hundred and eight (208)'

4. Ẹ́bò vbé ùgìé nyàá ùrí
Ẹ́bò # vbé # ùgìé # nyàá # ùrí
Two hundred thousand and twenty added_to two hundred
"Two hundred thousand plus twenty plus two hundred"
'Two hundred thousand, two hundred and twenty (200, 220)'

Subtraction is used to derive words for numerical values less than ùgìé, ùrí, ẹ́bò, and ùyè. It has three operands: Èkésẹ̀, Èkígbésẹ̀ and Irrọ́ọ̀vbè. All of them are sentences which have undergone a loss of internal structure. In the numeral system, they are appositive to cardinal numbers or sandwiched between such numbers. Consider the following examples.

5. Èkésùgìé
Èkésẹ̀ # ùgìé
Five less than # twenty
"Twenty minus five"
'Fifteen (15)'

6. Èkígbésùrí
Èkìgbésẹ̀ # ùrí
Ten less than # two hundred
"Two hundred minus ten"
'One hundred and ninety (190)'

7. Èvá írrọ́ọ̀vbè ùrí
Èvá # írrọ́ọ̀vbè # ùrí
Two # is not in # two hundred
"Two hundred minus two"
'One hundred and ninety-eight (198)'

8. Ọ́kpá írrọ́ọ̀vbè ẹ́bó
Ọ́kpá # írrọ́ọ̀vbè # ẹ́bó

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One # is not in # two hundred thousand
"Two hundred thousand minus one"
'One hundred and ninety-nine thousand, nine hundred and ninety-nine (199,999)'

The third arithmetic operation creates terms for multiples of ìyí, àrríá, ẹ́bò, and ùyè. Unlike addition and subtraction, multiplication has no overt operants. What obtains is the juxtaposition of milestones and other basic expressions, as in the following examples.

9. Ìyí-ìhínrọ̀n
Ìyí # ìhínrọ̀n
Twenty seven
"Seven twenty"
'One hundred and forty (140)'
10. Àrríá-èhá
Àrríá # èhá
Two hundred three
"Six two hundred multiplied"
'Six hundred (600)'
11. Ẹ́bò-ìsẹ́n
Ẹ́bò # ìsẹ́n
Two hundred thousand five
"Five two hundred thousand"
'One million (1 000 000)'
12. Ùyè-ọ́gbàn
Ùyè # ọ́gbàn
Two hundred million thirty
"Thirty two hundred million"
'Six billion (6 000 000 000)'

Another publication which provides details on Ẹdo numbers is Amayo (1992). The book is a compilation of technical terminology. Its section on mathematics has seven pages on numerals which show addition, subtraction and multiplication as outlined in Omoregie's textbook. An in-depth discussion of how these operations derive complex numerals is Imasuẹn (1996). The book explains that the language uses three methods to express numbers fifteen (15) to nineteen (19). The first method uses ten as the base to which other numbers are added. The second method adds to fifteen, and the third subtracts from twenty.

The most recent publication is a book chapter (Omoregbe, 2013) which investigates the derivation, agreement patterns, as well as morphological and semantic properties that were not considered in previous works. The study employed the computational system of analysis. This system works with a Lexicon from which units for larger constructions are

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drawn. The units are organized in a working area using three syntactic operations: select, merge, and move. There is also feature checking and the use of economy principles, which act on the derivations to produce interpretable structures. The study states Ẹdo cardinal and ordinal numerals function as nominal modifiers, and concludes the internal structure of these numbers is complex.

2.2. Theoretical Framework

The discussions in this paper are based on descriptions of morphological processes and the principle of compositionality. Generally, compositionality "refers to any theoretical framework which derives the meaning of larger expressions from smaller ones" Cann (1993, p. 3). The principle states that "the meaning of a syntactically complex word results from the meanings of its constituents and the manner in which they were combined" (Pelletier, 1994, p. 11). This principle is renowned and considered fundamental in formal semantics (Heim & Kratzer, 1998, p. 2).

However, there are different views on the idea embodied in this principle. Pelletier (1994) notes over three hundred arguments against it, and less than a dozen to support it. Fábregas and Scalise (2012, pp. 152-181) sift through these arguments noting how they affect the use of compositionality as a tool for mapping out lexical meanings. The book confirms there are opposing views on the use of this principle; it points out the opposition is not simply two-way. On the one hand, studies like Fodor and Lepore (1998) out-rightly reject the principle. On the other are publications like Hale and Keyser (1993) and Harley and Noyer (2000) which uphold the principle, but from different theoretical perspectives.

Despite the arguments against compositionality, this paper adopted it as a guide in its analyses. This is because the Ẹdo numeral system shows that semantic interpretations mirror stages involved in the derivation of complex numbers. Figure 1 below illustrates the process.

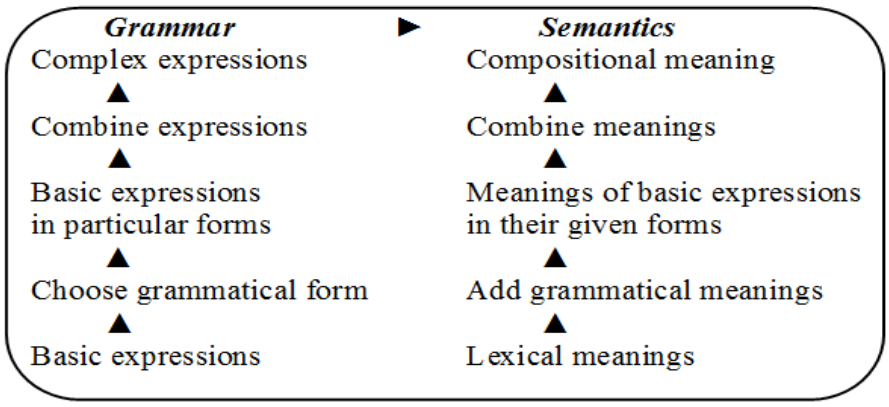


Figure 1: The process of composition (adapted from Lobner, 2002, p. 5)

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Grammar is a "system of rules which guides the arrangement of words to form acceptable units such as phrases, clauses and sentences" (Olatunji & Robbin, 2022, p. 66). This system of rules comprises morphology and syntax. Morphology is where one gets the basic expressions; syntax determines the grammatical forms of such expressions. Semantics is for interpretation. As shown in Fig. 1, compositionality entails computing the meanings of complex words using some kind of recursive procedure. It assumes that each lexical item (basic expressions) in the complex expression has an explicit interpretation (lexical and grammatical meaning). Merging these bits of meaning will ultimately derive the meaning of the complex form of which the basic expressions constitute a part.

3. Methodology

This research adopted qualitative research methods. Qualitative researches are concerned with structures and patterns; and how a phenomenon exists. It involves "studying things in their natural settings, and employs a variety of empirical materials from multiple methods including case study, introspection, interviews, observation and visual texts" (Denzin & Lincoln, 2005, p. 2). The study opted for a qualitative approach because it is well suited to the objectives of this study. The choice was also influenced by the fact that qualitative research allows one to combine data elicitation techniques. This enabled the study triangulate its sources of data; Salkind (2010, p. 1539) states this is a practice which "enhances credibility of research findings".

3.1 Research Design

The data for the study consists of all complex numbers in Èdó language. This corpus constitutes a single group with an infinite number of items. To get its sample, the study purposively selected numeral roots and the expressions which refer to the arithmetic operations through which the language derives complex numerals.

3.2 Data collection and Analysis

This study collected data from key informant interviews, participant observation, and content analyses of extant studies. The data was transcribed and coded in the standard orthography of the language. Presently, the orthography does not include tone marks; following common practices in linguistic research, the data presented here is tone-marked. The study adopted the Leipzig Conventions for interlinear morpheme-by-morpheme glossing. Data analysis was done in two parts: a basic description of the internal structure of complex numbers and an explanation of the relationship between their morphological derivation and semantic interpretations. The explanations were based on the principle of compositionality.

4. Results and Discussion

The purpose of this study was to investigate complex numeral words in the Ẹdo

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language. The discussions in the following sub-sections focus on morphological processes which derive complex numerals and the semantic composition of these words.

4.1. Morphological processes

The first research question this paper sought to address was "Which morphological processes are evident in complex Ẹdo numerals?" This involved determining word-formation strategies that can account for derived number expressions. Data analyses showed two morphological processes: compounding and desentencialization.

One may describe compounding as a process which joins free morphemes to produce larger forms referred to as compound words. Abdelhadi (2021, p. 253) describes compounding as "a combination of two independent lexical categories such as adjectives, nouns, verbs or prepositions with the purpose of constructing a single meaningful unit". The derivation of compound words always involves the combination of at least two independent wwords; however, the combined words may /may not belong to different categories. Hence, Fabb (2001, p. 66) defined compound words as "words which contain two or more words" as in the following examples.

13. Ùrí vbé òwọ̀ọ́rò

Ùrí	#	vbé	#	òwọ̀ọ́rò
Two hundred	#	and	#	eleven

"Two hundred plus eleven"

'Two hundred and eleven (211)'

14. Ùyè – ìsẹ́n

Ùyè	#	ìsẹ́n
Two hundred million	#	five

"Five two hundred million"

'One billion (1 000000000)

15. Àrríá – èvá

Àrríá	#	èvá
Two hundred	#	two

"Two two hundred"

'Four hundred (400)'

16. Ìyí – ìsẹ́n – èhá vbé ọ́kpá

Ìyí	#	ìsẹ́n	#	èhá	#	vbé	#	ọ́kpá
Twenty	#	five	#	three	#	and	#	one

"Five twenty three plus one"

'Three hundred and one (301)"

Addition applies when there are two number-names and a conjunction as example 13 illustrates. If there are two numbers without a conjunction, one multiplies as in examples 14 and 15. Where there is a string of number names as in example 16, the first number in the sequence or the product of the first two numbers serves as the multiplicand.

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These examples show that numerals formed via addition contain two conjoined nouns, while those formed via multiplication comprise two or more nouns and an optional coordinating conjunction.

Apart from producing numbers which are neither basic expressions nor milestones, the application of these arithmetic operations give rise to two types of compounds: copulative and exocentric. Copulative compounds are words whose meanings combine the meanings of their constituent parts; all numerals formed via addition (example 13) exemplify this kind of compound. Exocentric compounds are words whose meanings are not directly mapped to those of their constituents; examples are numerals formed via multiplication (examples 14 and 15) or a combination of operations (example 16).

The second morphological process identified in the analysis was desentencialization. It results in expressions where all constituents in a sentence function as a single word. The process is productive in Ẹdo language, but the resultant words are usually personal or place names derived from declarative and negative sentences. This study observed that the numeral system adopts this process using four sentence frames.

Sentence frame 1

number	í	#	rrọ́ọ̀	#	vbè	number
number	NEG		be_available		in	number

“number is not in number”

17. Énẹ̀ - írrọ́ọ̀vbè – ùgìé

énẹ̀	#	í	#	rrọ́ọ̀	#	vbè	#	ùgìé
Four		not		be		in		twenty

“Four is not in twenty”

‘Sixteen (16)’

18. Èhá – írrọ́ọ̀vbè – ùgìé

Èhá	#	í	#	rrọ́ọ̀	#	vbè	#	ùgìé
Three		not		be		in		twenty

“Three is not in twenty”

‘Seventeen (17)’

Sentence frame 2

Èké	#	ìsẹ́n	#	sẹ̀	number
Place		five		reach	number

“Five less than number”

19. Èké – ìsẹ́n – sẹ̀ - ùgìé

Èké	#	ìsẹ́n	#	sẹ̀	ùgìé
Place		five		reach	twenty

“Five places before reaching twenty”

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'Fifteen (15)'

20. Èké – ìsẹ́n – sẹ̀ - ùrí

Èké	#	ìsẹ́n	#	sẹ̀	ùrí
Place		five		reach	two hundred

"Five places before reaching two hundred"

'One hundred and ninety-five (195)'

Sentence frame 3

Èké	#	ìgbé	#	sẹ̀	#	number
Place		ten		reach		number

"Ten less than number"

21. Èké – ìgbé – sẹ̀ - ìyí-èhá

Èké	#	ìgbé	#	sẹ̀	#	ìyí	#	èhá
Place		ten		reach		twenty	#	three

"Ten places before reaching sixty"

'Fifty (50)'

22. Èké – ìgbé – sẹ̀ - ìyí-ènẹ́

Èké	#	ìgbé	#	sẹ̀	#	ìyí	#	ènẹ́
Place		ten		reach		twenty	#	four

"Ten places before reaching eighty"

'Seventy (70)'

Sentence frame 4

number	#	nyàá	#	number
number		added_to		number

"number added_to number"

23. Ìhìnrín – nyàá – ùgìé

Ìhìnrín	#	nyàá	#	ùgìé
nine		added_to		twenty

"Nine plus twenty"

'Twenty-nine (29)'

24. Ọ́kpá – nyàá – ọ́gbàn

Ọ́kpá	#	nyàá	#	ọ́gbàn
One		added_to		thirty

"One plus thirty"

'Thirty-one (31)'

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Desentencialization instantiates two arithmetic operations; subtraction as examples 17 – 22 illustrate and addition as shown in examples 23 and 24. Subtraction applies in first three sentence frames. The difference between them is the number that can be subtracted. Sentence frame 1 subtracts numbers other than five and ten; while sentence frames 2 and 3 deduct five and ten respectively.

This discussion of morphological processes has implications for linguistic theory. For example, the internal structure of the numerals which result from desentencialization contradicts the universal nominal feature specification [+N, -V] which stipulates that nouns do not have any verbal features (Chomsky, 1970). As examples 17 – 24 show Ẹdo number names comprise words with verbs; such words also contain the features of those verbs.

Another implication is that these numerals show a lack of distinction between lexical and phrasal categories. Baker & Croft (2017) describe lexical categories as units of words and phrasal categories as structural combinations of word units. The morphological processes discussed here allow phrasal units act as words. Compounding, for example, strings together as many as four units of numbers and a conjunction. The language obliterates an even greater degree of this differentiation when one considers numerals formed via desentencialization.

4.2. Semantic interpretation of complex numbers

The second research question this study tried to address was meaning composition. To answer the question "How are the meanings of these complex numerals derived?", the study applied the principle of compositionality to complex numerals such as the following example.

25. Àrríá -ìwèévà vbé èhá nyàá ìyí-ìhínrọ̀n

Àrríá	#	ìwèévà	#	vbé	#	èhá	#
Two hundred	#	twelve	#	and	#	three	#
nyàá	#	ìyí	#	ìhínrọ̀n			
added_to	#	twenty	#	seven			

"Two hundred twelve plus three plus twenty seven"

'Two thousand five hundred and forty-three (2543)'

Example 25 contains both simple and complex numerals. From the internal structure, one can identify two forms derived via compounding: àrriá-ìwèévà and ìyí-ìhínrọ̀n, as well as the desentential form – èhá nyàá ìyí-ìhínrọ̀n. The words vbé and nyàá are additive operands. To derive the complex number, combine the forms and meanings of àrriá and ìwèévà. Combining the forms yields an exocentric compound, which implies that the meaning of the output word is neither àrriá "two hundred" nor ìwèévà "twelve" as shown in figure 2.

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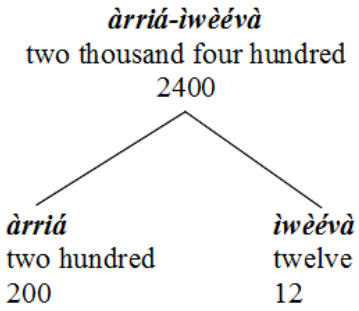


Figure 2: Composition of two thousand four hundred

Derivation and meaning composition continues with merge of the structure and meaning of àrriá-ìwèévà "two thousand four hundred" in Fig 2 with the number three. The output is the complex numeral illustrated in below.

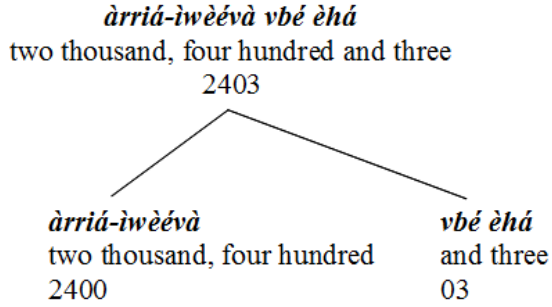


Figure 3: Composition of two thousand four hundred and three

To get the expression for 2543, one needs to merge the output in Fig. 3 with nyàá ìyí-ìhínrọ̀n "added_to one hundred and forty" as shown in figure 4. The number-name for 140 i.e. ìyí-ìhínrọ̀n is an exocentric compound word. Its semantic interpretation comes from multiplying the values of ìyí "twenty" and ìhínrọ̀n "seven".

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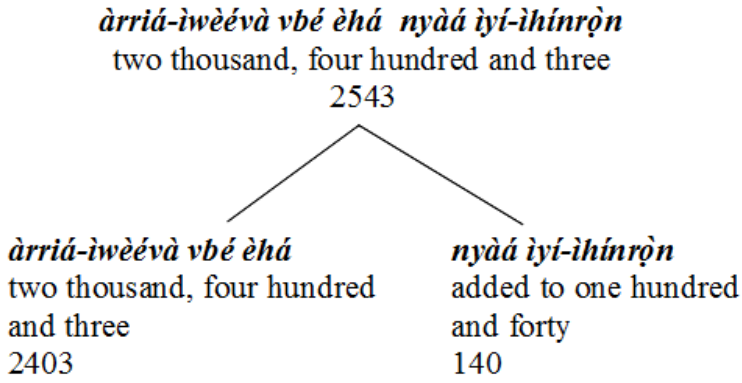


Figure 4: Composition of two thousand five hundred and forty-three

The structural representations in Figs. 2 – 4 show that the semantic composition of complex numerals follows the order of constituents. To accurately interpret these numerals, one needs to compose the meanings of compound words which are juxtaposed numbers like àrriá-ìwèévà and ìyí-ìhínrọ̀n. After composition, add their meaning to that of constituents like èhá which is a simple numeral. The example presented here uses addition; one can also derive complex numerals via subtraction. The choice depends on the meaning of the operands (i.e. non-numeral constituents) in the expression.

5. Conclusion and Recommendations

This paper discussed the morphology and semantics of complex numbers. The aim was to describe word-formation processes and provide a succinct linguistic account of the semantic interpretation of number expressions in the Ẹdo language. On the morphology of numbers, this paper established that the language creates complex numbers via compounding and desentencialization. Contrary to the perception of compound words being the results of combining two or more free morphemes, compound words in the numeral system contain structures which are larger than the word. Complex numerals formed via desentencialization have similar internal structure; the only difference is that desentencialization merges all the constituents which make up a clause. These processes provide evidence of phrasal compounding in the language.

Regarding their semantics, the study found that meaning composition and interpretation of internally complex numerals follow the same steps as their morphological derivation. The importance of this finding is the possibility of utilising a few rules to specify the entire set of number-names in Ẹdo. This is particularly relevant to the development of materials for teaching and learning the language. The paper concludes that the principle of compositionality proves itself

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useful where there is a direct correspondence between linguistic units and the meanings associated with such units.

Future research works can reconsider complex Ẹdo numbers using other word-formation processes. This study did not differentiate between free and bound roots. So, it recommends affixation; the process can provide an alternative account of bound numeral roots. Other areas which this study recommends are lexical categorization and word class features in the language. The results presented here show that complex numerals contain both lexical and functional morphemes. Prospective studies can investigate the morphosyntax of such words and describe what happens to the features of their internal constituents.

References

[1] Abdelhadi, A. (2021). Analysis of word formation processes during the Algerian Hirak. *Afkar wa Affak* 9(4), 247-263

[2] Agheyisi, R.N. (1986). *An Ẹdo-English dictionary*. Ethiope Publishing Corporation.

[3] Amayo, A. (Ed.) (1982). *Technical terminology in Ẹdo.* National Language Centre.

[4] Baker, M. and Croft, W. (2017). Lexical categories: Legacy, lacuna, and opportunity for functionalists and formalists. *Annual Review of Linguistics,* 3(1), 179-197. https://doi.org/10.1146/annurev-linguistics-011516-034134

[5] Cann, R. (1993). *Formal semantics: An introduction.*. Cambridge University Press https://doi.org/10.1017/CBO9781139166317

[6] Chomsky, N. (1970). Remarks on nominalization. In R. Jacobs and P. Rosenbaum (Eds.) *Readings in English transformational grammar* (pp. 184-221). Ginn.

[7] Denzin, N. K. & Lincoln, Y.S. (2005). The discipline and practice of qualitative research. In N.K. Denzin and Y.S. Lincoln (Eds.) *The Sage handbook of qualitative research* (pp. 1-32). SAGE Publications

[8] Eberhard, D.M., Simons, G. F., and Fennig, C.D. (Eds.). (2022). *Ethnologue: Languages of the world*. Dallas, Texas: SIL International. http://www. Ethnologue.com

[9] Elugbe, B.O. (1979). Some tentative historical inferences from comparative Edoid studies. *KIABARA: Journal of Humanities*. 2(2), 82-101

[10] Fabb, N. (2001). Compounding. In A. Spencer and A. Zwicky (Eds.) *The handbook of morphology* (pp 66-83). Blackwell Publishers Ltd. https://doi.org/10.1111/b.9780631226949.2001.00006.x

[11] Fabregas, A. & Scalise, S. (2012). *Morphology: from data to theories*. Edinburgh University Press https://doi.org/10.1515/9780748656264

[12] Fodor, J. A. & Lepore, E. (1998). The emptiness of the lexicon: Critical reflections on James Pustejovsky's 'the generative lexicon' *Linguistic Inquiry*, 29, 269-288. https://doi.org/10.1162/002438998553743

[13] Greenberg, J. H. 1966. *The languages of Africa.* Indiana University Press.

This work is licensed under Creative Commons Attribution-NonCommercial 4.0 International License

Available online online at https://www.asjp.cerist.dz/en/Articles/155

[14] Hale, K. & Keyser, S.J. (1993). On argument structure and the lexical expression of syntactic relations. In K. Hale and S.J. Keyser (Eds.) *The view from building 20* (pp. 53-109). MIT Press.
[15] Harley, H. & Noyer, R. (2000). Licensing in the non-lexicalist lexicon. In B.Peeters (Ed.), *The lexicon/encyclopaedia interface* (pp. 349-374). Elseiver.
[16] Heim, I. and Kratzer, A. (1998). *Semantics in generative grammar*. Blackwell.
[17] Hurford, J. R. (2011). *The linguistic theory of numerals*. Cambridge University Press.
[18] Imasuẹn, E (1996). *Ẹdo course for schools and colleges book one* (2nd ed.). Aisiẹn Publishers.
[19] Lobner, S. (2002). *Understanding semantics.* Hodder Arnold
[20] Melzian, H. (1937). *A concise dictionary of the Bini language of Southern Nigeria*. Kegan Paul.
[21] Olatunji, S. O. & Robbin, A. A. (2022). Grammatical exclusivity in English
the case of adjective « only » misplaced as adverb. *Journal of Languages & Translation*, 2(2), 65-80
[22] Omoregie, O.S.B. (1983). *Ẹdo grammar for schools and colleges.* Thomas Nelson (Nigeria) Limited
[23] Omoregbe, E.M. (2013). The system of numeration in Ẹdo. In O-M. Ndimele & E. S. L.Chan (Eds.) *The numeral system of Nigerian languages* (pp 109-118). M&J Grand Orbit. https://doi.org/10.2307/j.ctvh8qznv.12
[24] Omozuwa, V. E., (2013). *Ẹdo phonetics and phonology*. AMBIK Press.
[25] Pelletier, F.J. (1994). The principle of semantic compositionality *TOPOI* 13, 11-24. https://doi.org/10.1007/BF00763644
[26] Salkind, N. J. (2010). *Encyclopedia of research design.* SAGE Publications
[27] Zoha, L., Wagiel, M. & Caha, P. (2022). The morphology of complex numerals: A crosslinguistic study. *Linguistics Beyond and Within* 8, 200-217 https://doi.org/10.31743/lingbaw.14966

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Appendix



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