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## The Ósósò Numeral System

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### ***Abstract***

*Numeral systems are fundamental aspects of human language, revealing cultural identity, cognitive processes, and mathematical thoughts of a people. While extensive research has explored decimal and vigesimal numeral systems globally, indigenous counting system of understudied languages like Ósósò have received, comparatively, less attention. This paper, therefore, examines the numeral system of Ósósò, an Edoid language spoken in Nigeria, focusing on its structural and morphological mechanisms deployed in the formation of Ósósò numerals. Ósósò utilizes a hybrid numeral framework, integrating decimal principles at the base level while adopting vigesimal strategies for larger numbers. This combination reflects both traditional influence and linguistic adaptations over time. A distinctive aspect of Ósósò numeration is the continued use of cowry-based counting system as seen in the incorporation of 'uto – cowry' within numerical expressions. Additionally, borrowed linguistic structures contribute to their modern numeration system, demonstrating the dynamic evolution of language in response to external influences. The research explores phonological and morphological mechanism deployed in the formation of Ósósò numerals. Data for the analysis comprises primary data collected from eight language consultants (aged 50 to 80) while secondary data is from a booklet written in Ósósò. The data was subjected to*

*morpheme-by-morpheme glossing to uncover structural intricacies in numeral assignments. By mapping Ósósò's numeral patterns, this paper aims to provide insight into the broader connection between language, mathematical cognition, and cultural heritage of the Ósósò people.*

## **1. Introduction**

Numbers constitute an essential part of human language, a point reinforced by Blazěk (1999) while noting the ubiquitous presence of numerals in all known languages, living or dead. Of concern to this paper is that recent observations reveal that the ability to count in indigenous languages is increasingly being confined to older generations. Atoyebi (2006:64) notes this concern earlier regarding Oko, “*The numeral system of Oko is the most endangered aspect of the language. This is so, because the act of counting in Oko has been left to older members of the community, while the younger generation prefers to express numerals in the English language during speech*’.

This trend is widespread across many African communities where an average speaker is well at home in every other aspect of his or her language but numerals, especially in villages where English is used alongside the local languages. During this study's data collection, identifying the indigenous term for *one hundred thousand (100,000)* proved difficult as these figures were not within the purview of traditional counting framework. And as for larger numbers, most rendered the words for *million and billion* as *imilionu and ibilioni*, borrowing from English with phonological modifications. This reinforces Ejeba (2023) assertion that the traditional counting systems devised to count yams in the barns, count family members or get the statistics of those who attended communal meetings now face complex financial and statistical

demands of a mega-modern economy leading to increased constraints...

Numerals are defined in various ways. Comrie (2005) says they are any sign, mark, or symbol used to represent numbers, while Obikudo (2016:27) describes them as “*specific words in a natural language that represent numbers.*” Although many cultures have developed distinct numerical systems, most of these systems evolve from traditional or basic counting techniques to embrace complex mathematical computations, including addition, subtraction, multiplication, and division. Presently, Chan’s ongoing global linguistic project on numeral systems of the world <http://lingweb.eva.mpg.de/numeral> reveals that numeral systems range from decimal, incomplete decimal, vigesimal, duodecimal, binary, quinary, ternary, and body-part tally systems, among others.

This paper examines the numeral system of Ósósò and explores the strategies employed in number assignments. Generally, existing studies on numerals have been descriptive, etymological or structural in their analyses. This study shall be descriptive while delving into structural frameworks underlying Ósósò numeration. The work delves into the morphological mechanisms deployed in numeral formation, particularly highlighting the traditionally cowry-based counting, even in modern computations. The term /uto/ (‘cowry’) remains embedded within Ósósò numerals and these cowries, strung in twenties and called ‘ifi’, form the basis of vigesimal numeral system of Ósósò as counting is done mainly in multiples of these ‘ifi’ ‘twenty’. By analyzing discernible numeral formation processes, this research aims to provide a descriptive account of Ósósò numeration. However, certain numerical complexities like fractions  $\frac{3}{4}$ ,  $\frac{1}{4}$ ,  $\frac{1}{2}$  and decimal points values like 2.5, 6.9, may extend beyond the scope of this study. Additionally, unlike some languages that differentiate between numerals counting

human and non-human entities, Ósósò rarely differentiates, it uses the same numeral forms across both categories.

## **2. The Ósósò people and their language**

Ósósò (ISO 639-3: *oso*, Glottolog: *osos1238*) is an Edoid language spoken in a scenic, hilly town also called Ósósò, located in Akoko Edo local government of Edo State, Nigeria, by over a hundred thousand indigenes (Ethnologue 2023). Ósósò is renowned for its rich cultural heritage, including traditional festivals, and initiation rites such as Itakpo for men and the Ovbiko Maiden Ceremony, which marks the transition of young women into adulthood. Despite its rich heritage, Ósósò remains under-documented, with limited written resources available.

The language is primarily oral, passed down through generations via storytelling, folklore, and communal interactions. Efforts to standardize its orthography have been proposed, but literacy in Ósósò is still often facilitated through borrowed writing systems from Yoruba, Edo, and English. While modernization has introduced external linguistic influences, the primitive counting system is still struggling with the modern economy with its multi-million-naira transactions Ósósò remains a vital marker of cultural heritage. The place, the people and the language are properly called Ósósò /ósósò/, with non-indigenes and diaspora speakers often calling it ósósò /ósósò/.

## **3. Literature review**

Numeral system varies across cultures with the variation shaped either by historical, linguistic or practical influences. However, the most common system is the *decimal system (base-10)* which some scholars have traced to humans counting on their fingers. Another counting system is the *Vigesimal (base-20)* system used by the

ancient Maya but still very present in the counting systems of languages like French, Okpella, etc.

The *Duodecimal (base-12)* system is found in historical Babylonian and Chinese systems, but the one widely used in computing (and among some indigenous languages) is the Binary (base-2) counting methods. Also, in use by the Babylonians in timekeeping (60 minutes per hour) and angular measurement is the *Sexagesimal (base-60)* system. Recently, Xu et al. (2023) introduce *zero-shot object counting*, a computational approach to counting without predefined exemplars. Among Edoid language family, languages like Bini and Esan use a mix of decimal and vigesimal counting system deploying both arithmetic and morphological strategies like compounding and reduplication to form a structurally rich counting system. It is interesting to note that traditional counting linked to cowries and trade continues to influence numerical expressions found in the Edoid languages

The earliest known compilation of numeral system is the work of Pott in 1947 but the description of the numeral systems of many languages are found in works of 20<sup>th</sup> century scholars like Trombetti (1916) who studied the similarities in numerals with a large data sample and proposed a monogenesis of all languages. Klugbe (1939, 1941) also contributed significantly by describing known numerals and analysing some, presenting invaluable insight into the study of numerals. In contemporary scholarship, Chan's ongoing project (2008 - 2025) remains the most comprehensive work on global numeral system. His project continues to expand, allowing for the addition of new linguistic data as supplied by any linguist or language enthusiast willing to further increase the data base the counting systems of the world , available open access here <http://lingweb.eva.mpg.de/numeral/>

Among the many scholars who make significant contributions to work on numeral systems is Wiese (2007), who investigates the co-evolution of number concepts and counting words, focusing on how language plays a pivotal role in the emergence of systematic numerical cognition in humans. She argues that counting sequences in natural languages function as verbal numerical tools, thus enabling the development of a unified number concept. Comparing human cognition with animal and infant numerical perception, Wiese also posits that the key features of numerical cognition in humans - recursion and discrete infinity - are made possible through linguistic structures, invariably implying that language influences the counting strategies of every community. Apart from what Welmer (1973) says about structure of numerals in Africa, Comrie (2004), conducting a typological analysis of numeral bases across languages, identifies decimal, vigesimal, and hybrid systems as the major systems of counting while in his work in *The World Atlas of Language Structures* (WALS), Dryer (2005) examines nominal order across languages, highlighting the differences in the positions numerals occupy relative to nouns.

Omachonu (2011) explores numeral derivation processes in the Igala language, highlighting addition, multiplication, and morphological strategies as key means of numeral formation. Ejeba (2023) also investigates the Igala numeral system, confirming the use of different bases - such as twenty and fifty - alongside the mathematical strategies earlier mentioned by Omachonu. Although Elugbe (201) discusses numbers as part of tone in attributive constructions, Omoregbe (2016) discusses indigenous counting systems and their adaptation to the base-10 model, applying a syntactic approach in her analysis while Legbeti (2022) lists the numerals in Ósósò. Babarinde (2013) examines the structure of Yoruba numerals, analysing phonological and morphological

processes such as deletion, assimilation, tonal changes, compounding, and reduplication. Ajiboye (2016) provides an insightful analysis of Yoruba counting strategies, noting that they include subtractive, additive, and morphological adaptations, while also exploring how numerals interact with syntax and semantics.

Adetomiwa (2023) examines the challenges and prospects of the Yoruba numeral system in the 21st century and proposes modern adaptations for expressing larger numbers. Insightful works on Igbo numerals are from Emenanjo (1978) and Mbah and Uzoigwe (2016) while Hausa numeral studies include the works of Mu'azu (1995, 2016). Oyebade (2010), for his part, offers a broad analysis of the counting systems of languages such as Esan and Izon. However, bilingualism continues to influence numeration practices, particularly in contexts where English has become highly dominant.

#### **4. Methodology**

This study gathered data from eight native speakers of Ósósò who were considered proficient in the language. Participants were selected based on having spent most of their lives in the village, ensuring a deep understanding of its linguistic nuances. Only individuals aged between 50 and 80 were included, as their speech was largely uninfluenced by Yoruba or English, as expected.

Data collection for this study involved a structured questionnaire containing both cardinal and ordinal numerals, which was orally administered to each selected consultant. The consultants were then asked to provide the corresponding equivalents in Ósósò. Their responses were meticulously documented through detailed field notes and supplemented with audio recordings, enabling precise transcription and subsequent linguistic analysis. The sample population consisted of eight indigenes - four literate and four non-literate - carefully selected to ensure a balanced representation of

differing literacy levels. In addition to the primary data, supplementary information was drawn from *Ósósò Language Book One*, a pamphlet authored by Giwa and Ukhuokhake, two language advocates committed to the documentation and revitalization of the Ósósò language.

## **5. Data analysis: structural architecture of Ósósò numeral system**

In the Ósósò language, the concept of numeration is referred to as *idóli*, meaning “to count.” The traditional Ósósò numeral system exhibits a vigesimal structure, wherein numbers are grouped, not in base of ten but in multiples of twenty or base of twenty (Armstrong 1962). This structural feature aligns Ósósò counting practices with those of languages such as Oko, Okpela and Edo. The numerals from one to ten are formed from simple, monomorphemic roots, whereas higher numerals - excluding twenty - are derived through various morphological strategies, including affixation, compounding (both simple and complex), and reduplication. According to Wiese (2007, pp. 760-761), numeral systems across languages are generally organized into three functional categories: cardinality, ordinality, and nominal numbering. In Ósósò numerals encompass cardinal, ordinal, and distributive as nominal usage, though rarer, arises when numbers are used as identifiers or label, for example, house number two ‘owa o di eva’ or festival dates like “Ósósò carnival 2025”.

### **5.1. Cardinal numerals**

Cardinal numerals function as the basic forms for counting and describing quantity (Obikudo, 2016). In numerical representation, they are regarded as the basic form or primitive forms. By basic, it means that their structure cannot be further segmented into smaller, meaningful morphemic components (Ajiboye, 2016). In Ósósò, the

form for the first ten numerals comprises of simple roots with no 8 alone showing reduplication of the ‘nyíé’ but tone variation ‘nyìè’ Presented below are the primary numerals from one to ten in Ósósò.

1.	Ósósò	phonetic form	Gloss
i.	ògwò	[ogwo]	‘1 - one’
ii.	èvá	[eva]	‘2 - two’
iii.	èsà	[esa]	‘3 - three’
iv.	ènè	[ene]	‘4 - four’
v.	ishìè	[ifìe]	‘5 - five’
vi.	èsésà	[esesa]	‘6 - six’
vii.	ìfúená	[ifuena]	‘7 - seven’
viii.	ìnyíenyiè	[ìnjènjè]	‘8 - eight’
ix.	ìsìni	[ìsini]	‘9 - nine’
x.	ìgbé	[igbe]	‘10 - ten’

Beyond these numbers one to ten (1-10), the numbers one to nine (1-9) is added to ten using the conjunctive form ‘àní’ ‘and’ to form one – nineteen (1-19). This additive method is highly deployed in the numeration system of Ósósò and will be discussed later in this work.

2.

i.	ìgbé + àní + ògwò → ìgbanògwò	‘11- eleven’
	ten and one 10+1=11	
ii.	ìgbé + àní + èvá → ìgbánèvá	‘12-twelve’
	ten and two 10+2=12	
iii.	ìgbé + àní + èsà → ìgbánèsà	‘13-thirteen’
	ten and three 10+3=13	



child,’ second born,’ or explains regnal titles such as ‘King Henry II (the second).’ In Ósósò, ordinal numerals are characteristically formed through the insertion of the infix morpheme *ó dí*, meaning ‘s/he who is (first, second, etc.).’ This morphological strategy represents the primary mechanism by which ordinal forms are derived from their corresponding cardinal bases. These ordinal expressions function syntactically as noun phrases, capable of standing independently or modifying another noun within a larger phrase. Though many of these forms have since become lexicalized, their internal structure reveals a phrasal origin. As with cardinal numerals, the complexity of derivation increases with the numerical rank. Additionally, elision is employed as a phonological strategy to resolve hiatus, whereby the vowel preceding a word boundary is typically deleted: e.g *o dì # ògwò* → *ó dògwò* and *ó dì # èvá* → *ó dèvá* and so on.

3.

- |  |   |
|--|---|
| i. <i>ó dì ògwò</i> - ‘1 <sup>st</sup> first’        | vi. <i>ó dì èsésà’</i> - ‘6 <sup>th</sup> sixth’      |
| ii. <i>ó dì èvá</i> - ‘2 <sup>nd</sup> second’       | vii. <i>ó dì ifúená</i> - ‘7 <sup>th</sup> seventh’   |
| iii. <i>ó dì èsà (àsà)</i> - ‘3 <sup>rd</sup> third’ | viii. <i>ó dì inyíenyiè</i> - ‘8 <sup>th</sup> eight’ |
| iv. <i>ó dì ènè</i> - ‘4 <sup>th</sup> fourth’       | ix. <i>ó dì isínì</i> - ‘9 <sup>th</sup> ninth’       |
| v. <i>ó dì ishìè</i> - ‘5 <sup>th</sup> fifth’       | x. <i>ó dì ìgbé</i> - ‘10 <sup>th</sup> tenth’        |

Even when ordinal numerals function as nominal modifiers, the morpheme *ó dí* remains a consistent structural element. However, in certain instances - particularly with the numeral denoting ‘first’- Ósósò speakers may omit the expected form ‘*ògwò*’, treating it either as implied within context or replacing it with a distinct lexicon. For example, in expressions such as “my first daughter,” the numeral may not explicitly appear, as the rank is presumed to be pragmatically understood or it is referred to as ‘*òkpégbé*’ in some context.

4. i. ómóshì mhẹ òkpégbé ‘my first daughter’  
 Female my first
- ii. ómóshì mhẹ ọkpà ‘my eldest daughter’  
 Female my eldest
- iii. ómóshì mhí ròrò bíá ‘the daughter I had earlier’  
 Female I earlier birth

### 5.3. Distributive numerals

Distributive numerals refer to numerical forms that convey the idea of allocation, alternation, or repetition across individuals or items - such as “two each” or “one at a time.” In Ósósò, these forms are morphologically derived from cardinal numerals, predominantly through the process of reduplication. This reduplication may be partial or total, depending on the numeral in question and the syntactic environment. The resulting expressions function to indicate systematic distribution or patterned recurrence, often within clauses that highlight shared quantities or sequential assignments.

- |       | <b>Root form</b>           | → | <b>derived form</b>             |
|-------|----------------------------|---|---------------------------------|
| 5. a. | ògwò - ògwò<br>one - one   |   | ògwògwò<br>one by one           |
| b.    | èvá - èvá<br>two - two     | → | èvèvá<br>two by two             |
| *c.   | èsà - èsà<br>three - three | → | èsèsà (àsàsà)<br>three by three |

- d. èsésà - èsésà → èsésésésà  
six - six six by six

In constructions involving distributive numerals, these categories of numbers often occur at sentence final positions:

6.

- a. tónì zé ogwogwo ‘sell it one by one’  
It sell one by one (sell one after the other)

- b. kuru ivbila ena èsésà èsésà ‘cut these yams six by six’  
Cut yams these six by six (cut these yams into six parts each)

### 5.3.3 Adjectival numerals

In Ósósò, the inclusion of the prefixal particle ‘m-’ results into the formation of adjectival numerals as found in Yoruba (Armstrong, 1962). Unlike Yoruba, however, these forms can only be used in constructions and not in isolation. In other words, in response to a question like “how many do you wish to buy?”, a Yoruba speaker can rightly reply with “meji” - ‘two’, or “meta” - ‘three’ but an Ósósò indigene cannot say “mèvá” - ‘two’ or “mèsà” - ‘three’. It is considered ill-formed, rather, the response will be without the m-prefix ‘èvá or èsà’. This restriction applies to all adjectival numerals in the language.

7. Some Yorùbá adjectival numerals

<b>Cardinal</b>	<b>adjectival</b>	<b>gloss</b>
ọkan	kan	‘1’
eji	meji	‘2’
ẹta	mẹta	‘3’
ẹrin	mẹrin	‘4’

In Ósósò, m- prefix occurs as adjectival numerals only in constructions like:

8. a. mí dé ekha mogwo “I bought one monkey”  
I buy monkey one

b. wà gbé éná mévà “they killed two goats”  
they kill goat six

## **6. Derivation of other numbers**

While numerical computation typically involves addition, subtraction, division, and multiplication, the Ósósò numeral system employs only additive and multiplicative strategies. Subtraction and division are not utilized, distinguishing Ósósò from related Edoid languages such as Edo (Omoregbe, 2016) and Yoruba (Ajiboye, 2016), both of which use subtractive mechanisms in numeral formation. In Ósósò, all numerals beyond the base forms are constructed through the addition of affixal elements, comprising both bound and free morphemes.

### **6.1 Additive method**

The additive mechanism involves combining or adding two already existing numerals within the Ósósò base 1 – 20 to form the next whole number with the conjunctive word ‘ani’ (and), serving as the connective morpheme. The operation of the additive mechanism is so predictable in the language that once a number begins to add 1, 2, 3, 4, 5, 6, 7, 8, 9, of base numbers in the language, new numbers get lexicalized as the next whole number. The set below shows the predictable operations of the additive mechanism

9. i. 11 – 19,                      ii. 21 – 29                      iii. 31 - 39  
iv. 41 - 49                      v. 51 – 59,                      vi. 61 – 69  
vii. 71 - 79                      viii. 81 – 89,                      ix. 91 – 99

- x. 101 – 109                      xi. 111 – 119,            xii. 121 – 129  
and so on

Only the derivations for numbers 11 to 19 have been presented in this work for two primary reasons. First, space constraints limit the inclusion of all possible examples, as the focus is to illustrate how the additive method operates, 11 to 19 suffices, Second, and more significantly, derivations for numbers above twenty introduce the term *útò* (cowries), whose cultural and mathematical significance warrants separate explanation

.10.	<b>i.</b>	<b>Root form</b>	<b>derivated form</b>	<b>gloss</b>
i.	ìgbé + àní + ògwò	→	ìgbánógwò	‘eleven’
	ten            and            one		10+1 =11	
ii.	ìgbé + àní + èvá	→	ìgbánèvá	‘twelve’
	ten            and            two		10+2 =12	
iii.	ìgbé + àní + èsà	→	ìgbánèsa	‘thirteen
	ten            and            three		10+3 =13	
iv.	ìgbé + àní + ènè	→	ìgbánènè	‘fourteen
	ten            and            four		10+4 =14	
v.	ìgbé + àní + ìshìè	→	ìgbánìshìè	‘fifffteen’
	ten            and            five		10+5=15	
vi.	ìgbé + àní + èsésà	→	ìgbánèsésà	‘sixteen
	ten            and            six		10+6 =16	
vii.	ìgbé + àní + ìfúénà	→	ìgbánìfúénà	‘seventeen
	ten            and            seven		10+4 =17	

- viii. ìgbé + àní + ìnyíenyiè → ìgbánìnyíenyiè ‘eighteen’  
 ten and eight 10+4 =18
- ix. ìgbé + àní + ìsínì → ìgbánèniè ‘nineteen’  
 ten and nine 10+4 =19
- x. ògwòlò 20 ‘twenty’

### 6.1.1 Cowries in counting system of Ósósò

In African culture, cowries have a rich and layered history in, and their role in counting systems is deeply symbolic and tied to economic utility as well. Cowrie shells are one of the earliest forms of money in West Africa because they were relatively consistent in shape and size, easy to count, durable, portable and difficult to counterfeit. These factors made cowries a reliable unit for economic transactions in those days and even after colonial powers introduced paper money, many communities continued using cowries in contexts such as traditional marriage ceremonies. The retention of cowries in the counting system of Ósósò is thus a reflection of its history, trade, spirituality, and cultural pride.

In traditional cowrie-based numeration, a complete string called ‘ífi’ signifies a total of twenty units, each unit known as útò. While unit one (útò) is often implied and sometimes left unmentioned in derivation, all other foundational numbers consistently appear and play active roles in the counting structure. In rapid speech, the data showed the elision of u’ in utò

- | 11. | Root form                   | by elision | derived form |
|-----|-----------------------------|------------|--------------|
| a.  | ògwòlò + àní + útò (ògwò) → | ògwòlànútò | ‘twenty one’ |
|     | twenty and 1 cowry          | (20+1 =21) |              |

- b. ògwòlò + àní + útò + èvá → ògwòlànútèvá ‘twenty two’  
 twenty and cowry two (20+2 =22)
- c. ògwòlò + àní + útò + èsà → ògwòlànútèsà ‘twenty three’  
 twenty and cowry three (20+3 =23)
- d. ògwòlò + àní + útò + ènè → ògwòlànútènè ‘twenty four’  
 twenty and cowry four (20+4 =24)
- e. ògwòlò + àní + útò + ishìè → ògwòlànútìshìè ‘twenty five’  
 twenty and cowry five (20+5 =25)
- f. ògwòlò + àní + útò + ìgbé → ògwòlànútìgbé ‘thirty’  
 twenty and cowry ten (20+10 =30)

## 6.2 Multiplication method

Even though the basic digits of one to nine (1–9) follow a decimal format in Ósósò, the multiplication method provides strong evidence for classifying Ósósò numeral system as vigesimal because the moment higher quantities are described, the system leans into base-20 deploying the morphological method of compounding. So, while the core numeral system of Ósósò appears to be base-10 or decimal, the use of ‘ífi’, which is a morpheme for a string of twenty cowries for 20 units, as a multiplicative prefix introduces a clear vigesimal element.

Although the basic digits from one to nine (1–9) in Ósósò follow a decimal structure, the multiplication method provides compelling evidence for classifying the numeral system as vigesimal because the moment higher quantities are described, the system leans into base-20 employing morphological compounding with the use of prefix ‘ífi - a morpheme representing a string of twenty cowries. While the foundational system appears decimal, the

use of ‘ífi’ as a multiplicative prefix clearly introduces a vigesimal element. This vigesimal pattern is illustrated below

12. base-20

- |    |        |   |       |                 |           |
|----|--------|---|-------|-----------------|-----------|
| a. | Ifi    | x | èvá   | (20 x 2) = 40   | ‘ifieva’  |
|    | twenty |   | two   |                 |           |
| b. | Ifi    | x | èsà   | (20 x 3) = 60   | ‘ifiesa’  |
|    | twenty |   | three |                 |           |
| c. | Ifi    | x | ènè   | (20 x 4) = 80   | ‘ifiene’  |
|    | twenty |   | four  |                 |           |
| d. | Ifi    | x | ìshìè | (20 x 5) = 100  | ‘ifishìè’ |
|    | twenty |   | five  |                 |           |
| e. | Ifi    | x | igbe  | (20 x 10) = 200 | ‘ifigbe’  |
|    | twenty |   | ten   |                 |           |

### **6.3. Forming Larger Numbers**

The replication of higher numbers can be dependent on basic ones or other word formation devices such as reduplication. Traditional counting was more than sufficient for counting yams in the barn, koalnut or cocoa harvest, numbers of indigenes. Sometimes too, large numbers in Ósósò involve lexical units followed by grammatical units with complementary semantic features to create phrases and these phrases have become lexicalized. The data below explains:

13.

- i. Ífi x ìshìè x igbé x vbí órè x ògwò = ífishigbévbórògwò  
‘1 thousand’

- Twenty x five (=100) x ten x (road of) x one       $100 \times 10 = 1,000$   
x 1
- ii.    Ífi x ishiè x ìgbé x vbí órè x èvá = ífishìgbévbórèvá  
‘2 thousand’  
Twenty x five (=100) x ten x (road of) x two       $100 \times 10 = 1,000 \times 2$
- iii.    Ífi x ishiè x ìgbé x vbí órè x èsà = ífishìgbévbórèsà  
‘3 thousand’  
Twenty x five (=100) x ten x (road of) x three       $100 \times 10 = 1,000 \times 3$
- iv.    Ífi x ishiè x ìgbé x órè x Ífishiène = ífishìgbévbórifishiène  
‘80 thousand’  
Twenty x five (=100) x ten x (road of) x 80       $100 \times 10 = 1,000 \times 80$
- v.    Ífi x ishiè x ìgbé x órè x Ífishiè = ífishìgbéórifishiè  
‘100 thousand’  
Twenty x five (=100) x ten x (road of) 100 (20x5) =  $100 \times 10 = 1,000$   
x 100
- vi.    Ífi x ishiè x ìgbé x órè x Ífishiè eva = ífishìgbéórifishièvá  
‘200 thousand’  
Twenty x five (=100) x ten x (road of) 100 (20x5) =  $100 \times 10 = 1,000$   
x 200
- vii.    Ífi x ishiè x ìgbé x órè x Ífishiè ìgbé = ífishìgbéórifishìgbé  
‘1 million’  
Twenty x five (=100) x ten x (road of) 100 x 10 =  $100 \times 10 = 1,000 \times 100 \times 10$
- viii.    Ífi x ishiè x ìgbé x órè x Ífishiè ìgbé x eva =  
ífishìgbéórifishìgbéva ‘2 million’  
Twenty x five (=100) x ten x (road of) 100 x 10 =  $100 \times 10 = 1,000 \times 100 \times 10 \times 2$

- ix. Ífishiè ìgbé x vbí órè x Ífishiè ìgbé x vbí órè x Ífishiè ìgbé=ífishìgbéórìfìshìgbéórìfìshìgbé '1billion'  
 $100 \times 10 (=1000) \times (\text{road of}) 1,000 \times (\text{road of}) 1,000 = 1,000 \times 1,000 \times 1,000 = 1,000,000,000$
- x. Ífishiè ìgbé x vbí órè x Ífishiè ìgbé x vbí órè x Ífishiè ìgbé=ífishìgbéórìfìshìgbéórìfìshìgbé èvá '2billion'  
 $100 \times 10 (=1000) \times (\text{road of}) 1,000 \times (\text{road of}) 1,000 = 1,000 \times 1,000 \times 1,000 = 2,000,000,000$

The demands of today's economy, which involve regular use of large figures like millions, billions, and trillions have led many Ósósò speakers, to modify their numeral system creatively by multiplying their indigenous numbers mathematically and lexicalizing the derived form. However, only few use this form, many, particularly the younger generation, simply adapt million' as *ìmílíónù*, 'billion' as *ìbílíónù*, and trillion as *ìtírílíónù*

#### 6.4. Numerals as Adverbs in Ósósò

In Ósósò, numeral also function as adverbs in cases where they are used to express frequency (e.g., once, twice, three times etc). This is done by prefixing the root with *òwí-* or its assimilated variant. This process mirrors English constructions like *once*, *twice*, and *ten times* with compound adverb resulting, indicating how many times an action occurs. But Ósósò applies phonological rules, particularly vowel assimilation type which often affects the initial vowel of the following numeral.

14. i.       òwáwó       once  
       ii.       òwásà       twice  
       iii.      owífúèná      seven times  
       iv.      owígbè       ten times

## **7. Phonological Processes in Ósósò numeral system**

Phonological processes are those changes which segments undergo that result in various phonetic realization. According to YI-Ifodo (2014), ‘when sounds are combined to form words or other larger units, some segments are juxtaposed within the same morpheme boundary’. To simplify the production of speech sounds, some of these juxtaposed sounds undergo various modifications. These modifications are common in language as they are motivated by a need to maintain euphony in a language or rectify violations of well-formedness (Oyebade, 2018) Phonological processes play a role in adult language adaptation, especially when dealing with borrowed words or rapid speech as they essentially help ease pronunciation, maintain rhythm and fit a word into the sound rules (phonotactics) of a given language.

### **7.1 Elision in Ósósò**

Elision refers to the phonological process where a sound - typically a vowel - is omitted to simplify pronunciation or maintain rhythmic fluency. Elision is a boundary resolution strategy and does not apply within stem. Consequently, even in Ósósò numeral construction, elision often occurs at morpheme boundaries, especially during compounding or rapid speech. Such patterns suggest that economy of articulation drives elision, especially when vowels between morphemes are similar or when tonal clarity can be preserved without redundancy. According to Legbeti (2022), In Ósósò, vowel elision is systematic and highly predictable as the vowel before boundary is usually the vowel that elides in  $V_1 + V_2$  sequence.  $V_1$  elision occurs at every instance of  $v_1 \# v_2$  across word boundary as shown in the example below:

	<b>Root form</b>	<b>by elision</b>	<b>derived form</b>
a.	ìgbé # àní # ògwò	→ ìgbØ # ànØ # ògwò	→ ìgbánógwò eleven' (gloss)
	V <sub>1</sub> # V <sub>2</sub> , V <sub>1</sub> # V <sub>2</sub>		
b.	ìgbé # àní # èvá	→ ìgbØ # ànØ # èvá	→ ìgbánèvá 'twelve' (gloss)
	V <sub>1</sub> # V <sub>2</sub> V <sub>1</sub> # V <sub>2</sub>		
c.	ìgbé # àní # èsà	→ ìgbØ # ànØ # èsà	→ ìgbánèsa 'thirteen' (gloss)
	V <sub>1</sub> # V <sub>2</sub> V <sub>1</sub> # V <sub>2</sub>		
d.	ìgbé # àní # ènè	→ ìgbØ # ànØ # ènè	→ ìgbánènè 'fourteen' (gloss)
	V <sub>1</sub> # V <sub>2</sub> V <sub>1</sub> # V <sub>2</sub>		
e.	ìgbé # àní # ìshìè	→ ìgbØ # ànØ # ìshìè	→ ìgbánishie 'fifteen' (gloss)
	V <sub>1</sub> # V <sub>2</sub>		

Sometimes, despite the highly predictable nature of elision of V<sub>1</sub> across V<sub>1</sub> # V<sub>2</sub> word boundary, 'u' in àní # útò context is perceptually elided in rapid speech, resulting in a consonant cluster but because the phonotactics of the language does not allow CC syllable structure, the vowel is still realized in derivation as shown in the example below:

	<b>Root form</b>	<b>by elision</b>	<b>derived form</b>
9. a.	ògwòlò # àní # útò	→ ògwòlØ # ànØ # uto # èvá	→ ògwòlànútèvá (20+2=22) 'twenty one'
	V <sub>1</sub> # V <sub>2</sub> , V <sub>1</sub> # V <sub>2</sub>		
b.	ògwòlò # àní # útò	→ ògwòlØ # ànØ # uto # èvá	→ ògwòlànútèsà (20+3=23) 'twenty three'
	V <sub>1</sub> # V <sub>2</sub> , V <sub>1</sub> # V <sub>2</sub>		

## **7.2 Insertion in Ósósò**

Insertion - technically referred to as ‘epenthesis’ - is a phonological process in which a sound, most often a vowel, is added to a word to ensure it adheres to the phonotactic rules of a language. It is often used when a borrowed word violates the phonotactics or permissible syllable structure of a language. In a tonal language like Ósósò, inserted syllables also carry tone, hence, the process is common in the adaptation of loanwords that originate from languages with differing syllable structures or consonant clusters. In tonal languages such as Ósósò, inserted segments not only maintain phonotactic harmony but also bear tonal values, further integrating them into the native prosodic system. Within Ósósò’s numeral system, phonological insertion occurs at both initial, intervocalic and final positions. This can be observed in the following examples:

14. i. ìmílíónù - ‘1million’
- ii. ìmílíónù évá - ‘2 million’
- iii. ìbílíónù - ‘1billion’
- iv. ìbílíónù évá - ‘2billion’
- v. ìtírílíónù - ‘1trillion’
- vi. ìtírílíónù évá - ‘2 trillion’

This shows that while it appears most indigenes borrows the terms for these large units from English, it naturalizes them, integrating global economic vocabulary into a culturally and linguistically coherent form. This strategy reflects the language’s resilience and adaptability in the face of modernity.

## **7.3 Vowel Assimilation in Ósósò**

Assimilation, according to Oyebade (2018), is a phonological process whereby two contiguous sounds - originally produced with

distinct articulatory features - become identical in some or all aspects of their production. However, these data demonstrate a non-contiguous and progressive type of assimilation, with vowel features in a prefix influencing the following vowel. This is most clearly observed in numeral adverbs formed with the prefix *owi-* ('times'), where the quality of the vowel in *owi-* adjusts to harmonize with the vowel of the numeral root. Consider the following data:

- i. òwáwó once - assimilated to match vowel features
- ii. òwàvá twice - assimilated to match vowel features
- ii. òwásà thrice - assimilated to match vowel features
- iii. òwésèsà six times - assimilates to match vowel features
- iv. òwígè ten times - when adjacent vowels are similar, *owi* is retained
- v. òwífúená seven times - when adjacent vowels are similar, *owi* is retained

## **8. Morphological Processes in Ósósò Numeral system**

Morphological processes refer to the ways in which words are formed and modified through the combination, alteration, or adaptation of morphemes - the smallest units of meaning in a language are called a morpheme. The various morphological processes reflect how speakers create new words, express grammatical relationships, and expand vocabulary within the permissible structural rules of their language. From the data so far discussed, the following processes are obvious

8.1 Compounding

8.2 Affixation

8.3 Reduplication

### 8.1 Compounding in Ósósò

Compounding in Ósósò involves the fusion of two or more morphemes to create a single lexical unit with extended meaning. This is most evident in:

**i. Vigesimal multiplication:** the moment higher quantities are described in Ósósò, the strategy employed is compounding with the use of prefix ‘ifi (standing for twenty cowries) and a decimal compounded with ifi serving as the multiplicative prefix

12. base-20

- |    |     |   |     |               |          |
|----|-----|---|-----|---------------|----------|
| a. | Ifi | x | èvá | (20 x 2) = 40 | ‘ifieva’ |
| b. | Ifi | x | èsà | (20 x 3) = 60 | ‘ifiesa’ |
| c. | Ifi | x | ènè | (20 x 4) = 80 | ‘ifiene’ |

**ii. Smaller numeral expressions** are compounding with the additive morpheme ani’ adding basic numbers 1 – 9 to base-10. This is demonstrated in the example below:

viii. ìgbé + àní + ògwò → 10+1=11 ‘11- eleven’

ix. ìgbé + àní + èvá → 10+2=12 ‘12-twelve’

x. ìgbé + àní + èsà → 10+3=13 ‘13-thirteen’

xi. ìgbé + àní + ènè → 10+4=14 ‘14- fourteen’

**iii. Large numeral expressions** also involves compounding as the native numerals for example *évà* (two) joins the adapted loanword *ìmílíónù* (‘million’) to yield two million. Other examples include *ìbílíónù esa* - ‘3 billion’, *ìtírílíónù évá* - ‘2 trillion’. These compound forms reflect a dynamic grammatical strategy that expands meaning while retaining tonal and morphological coherence.

## 8.2 Affixation

Affixation - particularly the prefixation type - is another major process in Ósósò numeral morphology. It plays a key role in both frequency marking and the adaptation of borrowed numeral terms.

**Frequency Prefixes:** The prefix *owi-* or assimilated variants like *owá-* mark repetition or frequency, as seen in forms like *òwáwó* ('once') and *owígbe* ('ten times'). There is also the inclusion of the prefixal particle 'm-' in the formation of adjectival numerals, however, it is not dynamic as it can only occur in constructions, e.g. *ò kpí èsàmà m-àvá* – he married two wives.

**Loanword Adaptation:** Foreign numerals such as million, billion, and trillion are modified with Ósósò-compatible prefixes especially the default *ì-*prefix. This is to ensure the word matches the phonotactics and tonal patterns of the language. Thus, affixation as a strategy ensures that borrowed concepts can be naturally expressed within Ósósò's grammatical framework while preserving prosodic balance.

## 8.3 Reduplication

Reduplication—where a morpheme is partially or fully repeated—is less frequent in numeral data but remains a productive process in Ósósò grammar, often employed for:

- |     |               |   |                |
|-----|---------------|---|----------------|
| a.  | ògwò - ògwò   | → | ògwògwò        |
|     | one - one     |   | one by one     |
| b.  | èvá - èvá     | → | èvèvá          |
|     | two - two     |   | two by two     |
| *c. | èsà - èsà     | → | èsèsà (àsàsà)  |
|     | three - three |   | three by three |
| d.  | èsésà - èsésà | → | èsésèsésà      |
|     | six - six     |   | six by six     |

## **9. Findings**

From all the analysis, numerals are characteristically vowel-initial in the language. The smallest numerical unit is one and there is no lexicalized form for zero in the traditional system. Higher numerals, such as those corresponding to ‘million’ or ‘billion,’ although not originally part of the traditional lexicon, are expressed through complex compound constructions. The language employs the arithmetic operation of addition and multiplication only. Instances of division and subtraction were not found in the data used for this work.

Beyond the cardinal set, numeral derivation in Ósósò regularly involves phonological processes such as assimilation, insertion, and elision with hiatus resolution typical as the first of two adjacent vowels across word boundaries elides, for example, e # a → Ø # a. Morphological processes such as affixation, reduplication and compounding have been discussed as the noticeable word formation process with the additive morpheme *ani* (‘and’) a recurring feature in complex numeral constructions. With respect to tonal patterns, the low tone (L) demonstrates broader distribution, and disyllabic numeral forms most frequently exhibit either L-H or L- L tonal configurations.

## **10. Conclusion**

This study has examined the Ósósò numeral system in detail, revealing an interplay of structure, phonology, and morphology. It posits that Ósósò numerals align with Wiese’s (2007) typology of numeral assignment with the presence of:

- i. Cardinal numerals which express quantity (how many?).

- ii. Ordinal numerals which mark rank or sequence (first, second, third).
- iii. Distributive numerals which indicate allocation (one by one, two each, three at a time).
- iv. Nominal numerals, though less frequent, but they assign identity or labels, such as house numbers (ówà ó dì èvà) or festival dates (Ósósò carnival 2025), where the number functions as a tag rather than a count.

While the data examined showed numerals one to ten maintain relatively simple root forms, the work concludes that Ósósò operates within a predominantly vigesimal framework by its grouping of quantities by multiples of twenty, a trait it shares with related Edoid languages such as Okpella and Edo.

Phonologically, processes like insertion, elision and assimilation contribute to syllabification and harmony, particularly in hiatus resolution and compound constructions. The additive morpheme *ani* (“and”) remains a vital connective device in enumerating complex values. Higher numerals, excluding twenty, are derived through processes such as compounding, affixation, and reduplication, demonstrating Ósósò’s morphological ingenuity. Tonally, Ósósò numerals favor predictable Low–High (L–H) or Low–Low (L–L) pattern in disyllabic forms which further supports the language’s rhythmic consistency and the high frequency of occurrence of the L in numeration.

Interestingly, there is a clear culturally anchored feature in the numeral system, the cowry-based counting tradition, with the continued use of *uto* (“cowry”) in numerical expressions. This not only reflects indigenous units of exchange but also underscores the

historical depth of numeration in Ósósò society. However, this vibrant numeral system faces contemporary pressures as the influence of English through bilingualism, especially in urban and economic contexts, challenges the retention of traditional counting methods. Adaptations such as *imílíónù* ('million') and *ìbílíónù* ('billion') illustrate both linguistic resilience and the need for phonotactic compliance in the face of lexical borrowing. Ultimately, mapping the Ósósò numeral system contributes meaningfully to the study of language structure, mathematical cognition, and cultural heritage. Future research may delve into fractional and decimal expressions to further uncover how Ósósò handles precision and division within its existing framework, and whether these concepts continue to evolve or remain rooted in its traditional counting system.

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