THE LANGUAGE OF TECHNOLOGICAL ADVANCEMENT: A CASE STUDY OF MANDARIN AND YORÙBÁ

Olabinjo, Yewande
Department of Linguistics, African and Asian Studies
University of Lagos
Email: y.olabinjo@yahoo.com
&
Fadairo, O. Yusuf
Department of Linguistics, African and Asian Studies
University of Lagos
Email: fadairoyusuf@gmail.com

Abstract
In the world of today, for a country to thrive, it must possess the ability to maintain an equilibrium-leveled potential in its political, military, science, technological and economic development. The sustenance of these potentials in a nation does not elude the power of the language of that nation. Thus, no nation grows without the adequate capacity of its language. The paper is descriptive in nature and it focuses on the comparison between Yorùbá (a Kwa language of the South-western Nigeria) and Mandarin (a Sino-Tibetan language of the People's Republic of China (PRC)) in terms of strategies employed by both languages to localize science and technological terms in order to promote technological advancement and enable creative productivity in both countries. It has been observed that while the developmental impact of Mandarin on PRC is global, the effect of Yorùbá in respect to the development of Nigeria is dwindling. Judging from the maturity of both languages, it is shown that the word formation processes used in bringing in new words to both languages are capable of bringing about sustainable growth to Science and Technological advancement of their respective countries. The paper finalizes that a fast-paced science and technological development of Nigeria can be aided by a purposeful step of all stakeholders to bring home new words in forms which are easy for all to understand.

Keywords: Mandarin, Yorùbá Language, sustainable development, science & technology

1.0 Introduction

The discussion in this work centers on the comparison between Mandarin and Yorùbá language. How one of the languages utilizes and expands its vocabulary to enhance its science and technological advancement and the latter still struggles to effectively acquire an equilibrium in its own society. However, we are not of the opinion that one language is inferior to the other, but that maximum utilization is needed to facilitate a well-formed development. We shall, in this study, display the essence of idea localization on the basis of national growth and sustainability. The analyses provided in this study are geared towards providing answers to the following questions:

a. Does Yorùbá also attest the word formation processes attested in Mandarin?
b. What are the things to learn from Mandarin?
c. What is the implication of indigenous language utilization?

d. How can the development of Nigerian language(s) effect a national economic, science and technological growth?

The Mandarin language, also known as the Modern Chinese, is a simplified variant of the traditional Chinese. It is a dialect belonging to the Han (汉民族 / Han Mingzu) ethnic group of Beijing China, this nonetheless is considered the standard Chinese language. According to Huang (2011), Mandarin was employed to bridge the communication gap between the people of China, as there are quite a number of dialects spoken by different ethnic groups within the country. The language has approximately 1,400,000, 000 speakers all over the Globe (Li, 2002). Mandarin, aside from being the Lingua-franca of Mainland China, is equally spoken in Macau, Hong-Kong, Taiwan. Outside China, it is spoken in Singapore, Mongolia, Laos, Vietnam, amongst others.

Yorùbá language belongs to the Kwa group of the Niger-Congo family of African languages. Yorùbá is one of the three major languages in Nigeria, the other being Igbo in the East and Hausa in the Northern part of the country. It is spoken in the South-western states of Nigeria which include: Lagos, Ọ̀yọ́, Ògùn, Èkìtì, Ọ̀ṣun, Onḍó and some parts of Kogi, Kwara and Edo States. Also, the traits of Yorùbá language remain in the oral literatures of Yorùbá descendants now domiciled in Brazil, Cuba, Trinidad and Tobago and parts of West Indies (Yusuff 2014). The population of the speakers of this language could be put at thirty million (30,000,000) according to 2006 census, a number which is close to one-fifth of the population of Nigeria (Yusuff 2014).

The paper is sectionalized as follows: The second section discusses the strategies of word formation and the principles employed for domestication of new words in languages. This ushers us into the third section which dwells on the implications of language development on growth while the last section of this paper is the conclusion.

2.0 Strategies of word formation

In this section, we shall look at some word formation processes commonly employed in both Mandarin and Yorùbá languages in order to bring new words into its vocabulary. Our focus here shall be on how science and technology related words already existing in other languages, most especially English, are formulated in both languages (Mandarin & Yorùbá). Our analysis shall be based on word formation processes like compounding, coinage, conversion, and borrowing.

2.1 Compounding

There is exactly no generally acceptable definition for compounding. Toman (1992) defines it as a morphologically complex word containing at least two elements, which can otherwise occur as free forms. It is the process of putting two words together to form a new word; such words are called compounds (Bauer 1983). According to Zapata (2007), compound words can be written in three different ways which are:

a) **Open compounding**: This is a type with a space between the parts of the compound elements.
b) **Hyphenated compounding**: This is usually with a hyphen (-) separating the elements of the compound.

c) **Solid compounding:** This is type without a space or hyphen between the component elements of the compound.

The creation of complex words in Mandarin is a phenomenon which has led many linguists to regard Modern Chinese as a "language of compound words" (Arcodia, 2007:79). This is because compounding is a widely-used word formation process in the language. According to Shi (2002), compounding makes up to 80% of the vocabulary of the Chinese Language. The form of compounding noticed in the language include semantic compounds i.e. endocentric compound, exocentric compound amongst others; syntactic compound. i.e. noun-noun compound, verb-noun compound, verb-verb compound, amongst others. Below (1) is a noun-noun, (2) is a noun-verb and (3) is a verb-noun compound.

(1) 视频 电话
Shìpín diànhuà
Video telephone
"Video call"

(2) 电磁 干扰
diaǹcí gānrǎo
electric magnet interference
"electromagnetic interference"

(3) 无 线
wú xiàn
NEG wire
"wireless"

However, some kind of special syntactic compounding is observed in the language, that is compounding comprising V+ clipped noun head. Examples of this can be found in words like:

(4) 未 接 来 电
wèi jiē lái diàn
NEG receive come call
"missed calls" (telephone)

The head word which is the noun 'diàn' is a clip from the word '电话diànhuà' meaning 'call/phone'in order to retain the meaning of the alien word. " wèijiēlái" is a verb phrase consisting of two joined verbs.

In Yorùbá language, just as attested in Mandarin, compounding is equally highly productive. There are numerous combinatorial instances that include mostly Noun-Noun formations. Examples of these are displayed in (5) below:

(5) ìwé ẹ̀rí
book evidence
"certificate"

(6) iná ọba
fire king
"electricity"

(7) ìwé ọkò
book vehicle
"vehicular license"

Just as attested in (5) - (7) above, compounds in Yorùbá are mostly endocentric, in which case, they usually have a head and a modifier, then the head and modifier will undergo some morphological change process in order to form a word.

2.2 Coinage

This is a derivational process of creating new words without reference to the existing morphological resources of the language (Delahunty and Garvey 2010). In which case, it is the creation of a lexical item in a language by selecting a conceptual feature of the target item and incorporating it into the morphological system of the language (c.f. Bialystok & Frolich 1980). In Mandarin, examples (8) of coinages below, 'most near' is added to the word as a descriptive of the word *recent*. By making use of this everyday word it is easy for even the unlearned to effortlessly grasp idea behind the new word.

(8) 最 近 通 话
zuì jìn tōng huà
most near through call
"recent calls"

(9) 按 键 音
ān jiàn yīn
press key tone
"keypad tone"

Yusuff (2008) identified two types of coinage in Yorùbá as Descriptive coinages and Ideophonic coinages. Descriptive coinages are widely attested for in Yoruba language. This form of coinage occurs when the appearance or function of a target item is described to bring out its meaning. In (10) the concept of the coined for *'radio'* is subject to the concept of sounds coming out of the radio without the ability to receive an immediate response. While (11) is based on the function of the word '*internet'*

(10) Asọ̀rọ̀ má gba esì
speaker NEG receive reply
"radio"

(11) Ayé lu jára
World link connect
"Internet"

Ideophonic coinages on the other hand, focus on the sound made by the target item which is then used to bring out its meaning of the word in the target language. An Example of this can be seen in (12) and (13), they both emanated from the sound the object being coined into the vocabulary of Yoruba language, in this case '*aircraft'* and '*tractor'*.

(12) Bàálúù
"aircraft"

(13) Katakata
"tractor"

2.3 Conversion

Conversion is usually defined as a derivational process linking lexemes of the same form but belonging to different word class.[1] Conversion, however, does not lead to an increment in the vocabulary of a language but to the increment of the word class of an existing word. The presence of conversion in Chinese language has, nonetheless, been associated with the simplification of the Traditional Language to the currently used Mandarin. One simplified form corresponds to two or more traditional forms (Halpern & Jouni 1999). This implies that in the process of converting the Traditional Chinese to Mandarin some traditional characters were converted to capture one or more meanings or word class. Commonly found form of conversion in Mandarin includes Noun to Verb, Adjective to Verb, Preposition to Verb, and measure words to Nouns among others. In (14) and (15) the word 'bisai' is a noun and verb respectively.

(14) 有 比 赛
yǒu bǐ sài
have competition
"Have a competition"

(15) 我们 比赛 了。
wǒmen bǐsài le
we compete PST
"We competed."

In Yoruba, a lot of conversion exist as well. A very good example is the word *gaàrí* (cassava flakes) and also *lọ́yà* (lawyer) which are originally nouns but can also be converted to verbs as shown in the following:

(16) O kò **gaàrí** mi
You NEG care for me
You do not take care of me.

(17) Má **lọ́yà** mi
NEG question me
Do not question/nag me

In (17) above, *gaàrí* (cassava flakes), a type of staple food in Western Nigeria, is used as a verb to mean *care* while lọ́yà (lawyer) is used as verb question/nag. All of these are examples of conversion. The original meanings of these words and the converted meanings are also related.

[1] Laurie Bauer & Salvador Valera (eds), Approaches to conversion/zero-derivation. Münster: Waxmann Verlag, 2005. 175pp.

Discussed extensively on the relation between English pairs which are related by conversion.

2.4 Borrowing

Borrowing, as the name implies, is the process of bringing in words from a different language community into the vocabulary of another. Borrowed words or loan words are terms used to categorize words formed through the process of borrowing. William & Jacob (1979) are of the opinion that borrowing can only take place when two cultures and their language come in contact somehow.

In Mandarin, due to the peculiarity of the language and its writing system, the process of borrowing is more complex than other languages. The Chinese Language has four methods of borrowing into the language namely: Phonetic transcription, Half transliteration and half semantic translation, Transliteration with note and Semantic loan blends.

Phonetic transcription is a method of creating a phonetic pattern to simulate the original pronunciation. As in (18) the word is borrowed using only its phonetics property.

Half transliteration and half semantic translation is the joint use of transliteration and semantic translation. "cúnchǔ" is the semantic property of (19) while "kǎ" is a transliteration on the word formation.

Transliteration with note is a process whereby a Chinese morpheme is added to a phonetic transcription, in a way to supply additional information, usually about the semantic category of the model (Yan 2013). In (20) "Mōtuō" is the transliteration of the borrowed word, while "chē" provides its semantic details.

Semantic loan blend is a process an abbreviated word from another language is semantically loaned to the borrowing language via translation of its actual semantic meaning of the word. [2]

Few examples of borrowing in Mandarin language are shown below:

(18) 基 因
jī yīn
"gene"

(19) 存储 卡
cúnchǔ kǎ
store card
"memory-card"

(20) 摩托 车
mótuō chē
"motor cycle"

(21) 无 线 寻 呼 机
NEG xiàn xún hū jī
No wire seek call machine *(Huang 2011)*
"beeper"

Almost 70% of all the borrowed words in Yorùbá are from English. Borrowing in Yorùbá is usually a word formation process of last resort and it is attained in two different forms namely, integrated borrowing and domesticated borrowing.

[2] See Huang 2011

Borrowing is integrated when it is used in the exact sense as the source language. As seen in (22) and (23). Domesticated borrowing occurs when words are adapted to suit the form of the target language, a form which connotes a different sense from the source language. A typical example is the word "Wágùnnù" borrowed from the word "wagon" in English. The word as used in (24) denotes something completely different from the meaning of the origin word "*wagon".* This arises from the popularity and the prestigious status of the car brand in the Yoruba community. "*Wagon"* has been domesticated here to mean 'precious children'. This is a connotative meaning sometimes enjoyed by borrowed words to enhance adaptability.

(22) rélùwéè
"Railway"

(23) kọ̀mpútà
"Computer"

(24) Ilé Àjàyí kún fún àwọn *wàgùnnú* rẹ̀.
House NP full of some wagon 3sg
"Àjàyí's house is full of his precious children."

The word formation processes discussed above are guided by principles employed by languages in order to ensure the successful transitioning of new words into the target language and to augment their comprehensibility. The success of the word formation strategies is solely dependent on these principles and when explicitly considered during language engineering, the appropriateness of newly introduced ideas into a language will enhance its stable growth. Some of these principles have been adopted in the coinage of science and technological terms in other to ease the introduction of complex terms into Mandarin. It is noteworthy to state that some of these principles already exist in the Yorùbá language engineering, however, we posit that all of it should be employed for effective localization of foreign ideas. Localization of foreign ideas such as scientific and technical ideas makes certain the apprehensibility amongst natives which will in turn stimulate local development and reduce international dependency. According to Amfani, (2009) and Udoye (2016), when we create rooms for indigenous languages to grow, it is because we know that they are of great importance in teaching and learning of native intelligence and wisdom which are beneficial to future development in terms of curiosity, manipulative skills, spontaneous flexibility, initiative, and manual dexterity which fosters national pride, and identity.

In the following part, we shall discuss these principles in details. Specifically, we shall discuss the principle of economy which is the most attested in Yoruba, and others which are principle of de-technicalization and principle of simplicity. The latter two principles are more popular in the Mandarin language.

a) **Principle of economy**: This is the principle of minimization as it allows selection of only the smallest possible syllable in word formation, hence when a new word is developed, economy in terms of the number of its syllables is usually considered. Vicentini (2003) is of the opinion that this principle is a kind that gets a language to dismiss whatever is superfluous. A typical illustration of this is a situation whereby an engineered word with many syllables is replaced with another that

comprises of less number of syllables in the lexicon of a language. For example, in Yorùbá, some words borrowed from English are retained in their borrowed forms solely because they are more economical, in terms of their syllables hence serving as a replacement for ones with elaborate numbers of syllables. Some of them are shown in the table below:

English word	**Yorùbá translation**	**No of syl. Retain/retard**	**Borrowed form**	**No of syl. Retain/retard**
Radio	ẹ̀rọ-asọ̀rọ̀mágbèsì	8 syllables	rédíò	3 syllables
		Retarded		retained
Tailor	Aránṣọ	3 syllables	télọ̀	2 syllables
		Retarded		retained
Train (railway)	ọkọ̀ ojú-irin	6 syllables	rélùwéè	4 syllables
		Retarded		retained

As seen from the table above, the words with many syllables are ignored in daily communications in the Yorùbá language community, only reserved to be used in strict formal mediums with no other choice. The lack of syllabic economy has led to them being sidetracked for others that are economical in nature. As a result, language engineering embarked upon by language developers is usually with the notion of economy in mind.

b) **Principle of De-Technicalization:** This principle banks on the removal of all technicalities in words that are formed in order to facilitate comprehensibility of terms by proletariats in the society. This is a conscious effort that is portrayed in Mandarin language in the expression of new ideas, which are technical-related. This principle is carried out with the use of everyday words to reduce the technicality of the words. These can be seen in (23) and (24), the technical words have been stripped off its technicality in the target language leaving only the semantic function.

(25) 程 控 电话
chéng kōng diànhuà
process control telephone
“program-controlled telephone”

(26) 地球 模拟 器
dìqiǔ mónǐ qì
earth imitate machine
“earth simulator”

c) **Principle of simplicity**: Aside from the principles of economy and de-technicalization, it is also very important to mention the principle of simplicity as one of the principles aiding the usage and maximum functionality of a newly formed word. A newly formed word should be simple and not complex, for this, according to Plag (2002), would enhance the speech processing system of the hearer and it will also increase its (the new word) level of frequency in the lexicon of the users

of such words. This is what the Mandarin Language has been able to achieve through the use of everyday words to aid the comprehension of scientific terms that come into the language very often. For this reason, words are coined in ways they will be self-explanatory and easily comprehensible as displayed below. *'fast'* is simpler word than '*speed'*. *'Save electricity mode'* is more self-explanatory than a direct accommodating '*power saver'*.

(27) 快 速 拨 号
Kuài sù bō hào
fast speed dial number
"speed dial"

(28) 省 电 模式
shěng diàn móshì
save electricity mode
"power saver"

3.0 Implications of language on national development

Technological development cannot be over-estimated in the world of today. Science and Technology has not only taken center stage in global development but also almost solely defines the socio-economic advancement of any nation. Therefore, in the world today when discussing national socio-economic advancement based on localization of Science and Technology through language development, we cannot but mention China. According to Wayne M. Morrison (2014), the People's Republic of China, since opening up to foreign trade and investment as well as implementing free market reforms in 1979, China has been among the world's fastest-growing economies, with real annual gross domestic product (GDP) growth averaging nearly 10% through 2013. In recent years, China has emerged as a major global economic and trade power.

Creative Productivity is usually enhanced by comprehensive understanding which comes majorly through language. In recent years, electronic gadgets and components that are locally produced has been a major contribution to the economic growth of China. Between 2014 and 2015—according to China Daily—286.2 million personal computers (90.6% of the global supply), 1.77 billion phones (70.6% of global supply of smartphones) and 109 million units (80% of global supply of air conditioners) were produced. [3] How a country's socio-economic status can so swiftly rise has being an often-asked question. In Mandarin, with the word formation strategies, the simplicity in adaption and the principles of localization of new and foreign ideas, it is possible for even an unlettered individual to understand not only the science and technological-related words but also how they can be easily engineered to suit their communicative and the developmental needs as a country.

As we have seen in the above section, both languages (Mandarin and Yorùbá) employ similar word formation strategies in populating the vocabulary of their languages. It is

[3] Intrepidsourcing.com: consumer electronics report

thus clear that one language is not subservient to the other. Therefore, just like Mandarin, Yorùbá and many other Nigerian languages should have absolutely no difficulty participating in the socio-economic and technological development of Nigeria.

In Cha, the number of unlettered individuals participating in the technicalities of all societal sectors is more than the lettered. Most Chinese find it easy to read Chinese characters (but not all can write) and apply what they have read because everything is in Mandarin. Just as it is easy for many unlettered Yoruba speakers to read Yoruba newspapers and stories, if issues concerning science and technological advancement are demystified into Yoruba, there might just be a chance for Nigeria to witness an all-encompassing growth. This is because, at that level, the society is kept well informed.

Based on achievements of China with the use of her language, it is now clear that for a country to grow in the aspect of science and technology, it is paramount for the country to make a conscious effort in reducing the knowledge (of science and technology) to the level of understanding of the citizens. Doing so can, however, not be achieved with the use of an alien language but in the development of the indigenous language of that country, as it has been said that we all think and comprehend the most in languages that we speak best. More so, instead of hoping Nigeria would one day produce a person that would, with the use of English, develop a world-class technology, we should utilize our indigenous languages to do the job.

Lodhi A. Y. (1993) writes that the dominance of the metro-languages (in the case of Nigeria, English language) deprives the majority of Africans of access to knowledge, and hinders them from participating in national politics and the decision-making processes. It also slows down national integration and development of a nation-state. Going along with this submission, we believe that as long as English remains the only language of scientific and technological growth in Nigeria, a large population of Nigerians will remain disadvantaged as they do not have the communicative competence to be involved in the discourse of national growth.

Our major recommendation is that, since Nigeria has a complex language situation and choosing one Nigerian language as both the national and official language is impossible, it would be of great advantage if all the three recognized national languages (Igbo, Hausa, Yoruba) are co-developed simultaneously in order to contribute to the science and technological advancement of the nation.

We highly recommend that Nigerian government make sure that the dictates of the National Policy on Education concerning the National Policy on Language Use in the government, education etc. are followed to the letter. Government should also develop more language policies favoring indigenous languages. This, to a large extent will help the internalization of Nigerian languages in the minds of the younger generation.
We posit that the strategies involved in forming technological-related words should be in line with the principles discussed above. This would make the words to be highly functional, readily available in peoples' lexicon and naturally help in the localization of all development-related foreign ideas.

4.0 Conclusion

In this paper, we have discussed language as a common determinant of the development in the area of science and technology which in turn leads to national growth of a country. We have discussed the comparison of the strategies of word formation in both Mandain and Yorùbá and we have also highlighted and discussed the principles with which the success of these strategies can be achieved. In the case of Nigeria, we have recommended that conscious effort should be made to develop our three national languages. Not only because they belong to us; but also, because they are efficient enough to steer the course of the nation to scientifically and technologically advanced heights just like China whose development cannot sidestep the importance of the use of Mandarin. It is with all these we display the language in the development of science and technology using Mandarin and Yorùbá languages as case studies.

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