NCDC
NATIONAL CURRICULUM DEVELOPMENT CENTRE

TERMINOLOGY DEVELOPMENT IN UGANDAN LANGUAGES

A HANDBOOK ON KNOWLEDGE FRAMEWORKS, PRINCIPLES AND METHODS

2023

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TABLE OF CONTENTS

FOREWORD ..... **v**
ACKNOWLEDGEMENTS ..... **vi**
LIST OF ABBREVIATIONS, SYMBOLS AND ACRONYMS ..... **vii**
ACRONYMS AND ABBREVIATIONS ..... **viii**
1.0 Background 1
2.0 General Objective 4
2.1 Specific objectives 4
3.0 The Language Situation in Uganda 4
3.1 Introduction 4
3.2 Legal status 5
3.3 Socioeconomic status 6
3.4 Education status 7
3.5 Terminology and standardisation (regulatory bodies) 8
3.6 Training 11
4.0 Definition of Key Terms 13
5.0 Introduction to Terminology Development 15
6.0 The Need for Terminology Development in Ugandan Languages 24
7.0 Knowledge Frameworks for Terminology Development 25
8.0 Proposed NCDC Terminology Development and Management Model 31
8.1.1 NCDC Terminology Management Model 31
8.1.2 Terminology development processes 32
9.0 Terminology Work Tools 34
10.0 Steps in Terminology Development and Stages in Term Use 36
10.1 Steps in terminology formation 36
10.2 Stages in term use 38
11.0 Principles of Term Formation 41
11.1 General principles of terminology development 42
11.2 Definition of the term “term” 44
11.3 Exemplification of the sub-criteria of PEGITOSCA 44
11.4 Conceptual analysis 47
11.5 A table of conceptual predicates 47
11.5.1 Expressional extrapolation of Luganda 51
11.6 Extrapolated lexeme formation rules 53
11.7 Expressing fundamental concepts 57
11.7.1 Gradation 57
11.7.2 Order 58
11.7.3 Direction 59
11.8 Tangible results 62
11.8.1 Some prototypical terminological systems 63
11.8.2 Rendition of X•illion into Luganda 63
11.8.3 Rendition of Système International (SI) prefixes into Luganda18 64
11.8.4 Gandisation of some international chemical affixes and combining forms19 65
11.8.5 Zoological taxonomy 66
11.8.6 Taxonomy of the dog21 67

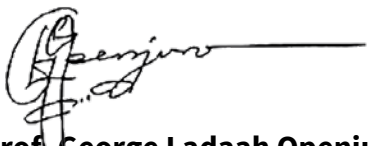
11.8.7 Taxonomy of the human 68
11.8.8 Classification of numbers 69
11.8.9 Hierarchy of anatomical structure 69
11.9 Conclusion 70
12.0 Methods of Term Formation 70
12.1 Composition 71
12.1.1 Compounding 71
12.1.2 Combining 72
12.1.3 Derivation 72
12.1.4 Blending 74
12.1.5 Acronymisation 75
12.1.6 Initialisation 77
12.2 Morphophonemic change 78
12.2.1 Front-clipping (fore-clipping) 78
12.2.2 Back-clipping (hind-clipping) 79
12.2.3 Middle-clipping (combined clipping) 79
13.0 Semantic change formation processes 80
14.0 Adoption 80
15.0 Semantic expansion 80
16.0 Metaphor 82
17.0 Eponymy 82
18.0 Induction antonomasia 84
19.0 Neologising and borrowing 84
20.0 Neologism 85
21.0 Borrowing 85
22.0 Functional change 86
23.0 Miscellaneous 87
24.0 Etymologising 87
25.0 Loan translation 87
26.0 Anagramming 87
27.0 Concatenation 88
28.0 Back-formation 88
29.0 Circumlocution 89
30.0 Conclusions 90
References 91
APPENDICES 101

FOREWORD

This Terminology Development Handbook has been developed by the Terminology Unit in the Department of Literature Bureau. The handbook provides standards for terminology development in Ugandan languages. It is aimed at improving learning outcomes/achievements by developing new terms, using existing terms or alternative vocabulary for educational concepts in children's familiar languages. Using concepts that learners know and are familiar with increases chances of concept retention and assimilation, classroom interaction and better instruction. The use of familiar concepts in local languages can potentially help key stakeholders like parents to get involved in children's education.

This handbook will help stakeholders appreciate the role of terminology development as a discipline and the need for its integration into education and national development. The handbook is also aimed at inspiring dictionary writing and grammar books development in Ugandan languages as well as streamlining terminological usages across curricula. It is hoped that through a clear understanding of the knowledge frameworks, principles and methods on terminology development, the handbook can propel start-up terminology projects in various disciplines across different indigenous languages in Uganda.

The handbook is a critical resource for teachers and students of local languages at various levels of learning. It will help them to translate, coin or borrow terms into the local languages. Practitioners involved in Bible, specialised and general-purpose translations in various local languages in Uganda will also find this handbook very important.
The Local Language Boards, policymakers and subject experts in every field are also invited to take an interest in this handbook. To support its implementation, this handbook will be accompanied by a training manual that will contain several practical sessions in terminology development.
FOR GOD AND MY COUNTRY.



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Special thanks go to all individual writers who may not be personally named in this handbook. NCDC appreciates your invaluable inputs and time spent in writing this handbook. You have demonstrated exceptional abilities from the conception to the development of this terminology handbook.
On a special note, the Senior Quality Officer of the Literature Bureau has been outstanding in his leadership of the Bureau and spearheading the development of this terminology handbook.

Overall, NCDC is grateful to the Top Management, Academic Steering Board and the Governing Council for their intellectual input and allocating the necessary resources to the development of this terminology handbook.

NCDC takes responsibility for any shortcomings that might be found in the book. The comments and suggestions may be communicated to NCDC through P. O. Box 7002 Kampala or email admin@ncdc.go.ug.

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LIST OF ABBREVIATIONS, SYMBOLS AND ACRONYMS

( ) occasionality/optionality brackets
/ alternative
: "is fulfilled/realised/ represented by"
[ ] block brackets
< from
• agglutinational boundary (in Luganda); syllable boundary (in English)
Adl adverbial
C complement
F prefix
F^+ nominal prefix with initial vowel
F_+ prefix in plural
H suffix
L postsuffix
O object
R verb root, simple or extended
S nominal stem
S subject
S' subordinating clause
S" sentence
V predicator
W" phrase
X word or word-segment in English

Contextualised (Localised) Symbols and Abbreviations

• agglutination boundary (in Luganda)
F prefix
F^+ nominal prefix with initial vowel
F_+ prefix in plural
H suffix
L post suffix such that L = •a/wa/ (y)e// e/ u// i/ o
oku• prefix of verb in citation form
S_{num} numeral stem
Z word in Luganda

ACRONYMS AND ABBREVIATIONS

AIDS: Acquired Immune Deficiency Syndrome
ASB: Academic Steering Board
COVID: Corona Virus Disease
EPA:
EPRC: Education Policy Review Commission
ETT: Extended Theory of Terminology
GTT: General Theory of Terminology
ICT: Information and Communication Technology
ISO: International Standards Organisations
NCDC: National Curriculum Development Centre
NLS: National Language Service
PEGITOSC: Precision, Economy, Generativity, Internationality, Transparency, Objectivity, Systemicity and Consistency.
SGDs: Sustainable Development Goals
TD: Terminology Division
UNITE: Uganda National Institute for Teacher Education

1.0 Background

Communication involves the interaction or passing of messages between the sender and recipient with the sole purpose of creating understanding between interlocutors. One big barrier to communication is the choice of a language. Language barrier is not only a challenge in everyday communication but also in curriculum development and implementation. Since the introduction of formal education in Africa, one of the biggest barriers to development and educational attainment continues to be the choice of medium of instruction (Bishop, 1985; Makoe, 2022; UNESCO, 2023).

In the developing world, only 10–12% of the population in such countries are literate in the official languages, often the language of the coloniser (Prah, 2023). The Education Policy Review Commission (1992) observed that the empowerment of indigenous languages as means of intellectual discourses would enable 'a rapid achievement of permanent developmental and functional literacy and intellectualisation of all people' (EPRC, 1992, p. 16).

The Education Policy Review Commission (EPRC 1987) declared that indigenous languages be used as mediums of instruction in early childhood and primary education and subsequently studied as subjects both in upper primary and post-primary education in Uganda. As a result, the National Curriculum Development Centre introduced the Thematic Curriculum in 2007. Notwithstanding its success, the biggest challenge to the Thematic Curriculum is language barrier (Oketcho, 2014; Twaweza, 2017; Ghunu, 2022). Teachers do not have the most appropriate vocabulary or the right terms to enable the transfer and acquisition of content (knowledge, skills and values) by the learners (Ibid).

Teachers are expected to communicate concepts of science, arithmetic, health, social life and religion through local languages. However, without a corpus of terms representing concepts and/or vocabulary in the local languages, this task is more or less impossible.

It is argued here that curriculum development in Uganda and the colonised world continues to be an exogenous process, at least linguistically.

While content has been 'domesticated' to address specific national developmental challenges, there continues to be linguistic alienation in curriculum development and implementation. Curriculum conceptualisation, writing and communication (instruction and implementation) continue to be conducted in English to only 10 – 12% of Ugandans (Prah, 2011, 2023; Oketcho, 2014; Benson, 2021).

Riding on the Thematic Curriculum and the teaching of indigenous languages at both upper primary and post-primary education levels, the National Curriculum Development Centre continues to develop Early Grade Reading materials, primers, orthographies, syllabuses, learners' and teachers' books, albeit without systematically well-developed terms for all subjects, especially in the indigenous languages of Uganda. As alluded to in the preceding paragraph, the Learning Framework (2005) for Early Childhood, the Thematic Curriculum as well as the Local Language Framework for P4-P7 are all written in the English language. In addition, curricula for all subjects at secondary level, including the Local Language Frameworks for 'O' and 'A' Levels, are all written in the English language medium. Furthermore, across the educational levels (except for thematic classes), teaching-learning continues to be done in the English medium. This scenario spills over into the thematic classes where instruction ought to be done in the familiar languages. Two reasons could be advanced for this scenario: terminological deficiency in the respective languages and linguistic multiplicity.

Whereas the above monolingual approach caters for the multiplicity of languages, there is need for a deliberate effort to derive a comprehensive corpus of terms covering all subjects in the curriculum. The term bank must then be rendered in all indigenous languages of Uganda using appropriate methods and principles. It is needless to say that the classroom context provides us with the most critical communication space that requires appropriate diction, register or terms. Attracting public participation into mainstream academic discourse may require the rendition of basic or specialised terms used in academia into the language of the masses.

It should be noted that developed economies of the world today have achieved scientific and technological progress only through the languages of the masses. Examples include Japan, China, India and the Global North (Kwameh, 2023; Marsh, 2018; UNESCO, 2010; European Commission, 2017).

Sustainable Development Goal 4 (SDG4) advocates 'inclusive and equitable quality education and promotes lifelong learning opportunities for all' (United Nations, 2015, p. 19). As reiterated by the Government White Paper on Education (1992), local languages have a very strong bearing on the achievement of the educational aims and objectives, especially at lower primary. They are a vehicle of culture and posterity of social group identities, and are key in championing a sense of patriotism (NCDC, 2016; Nahabwe, 2017; Mugisha, 2017; Otwani, 2018). As advocated by the Constitution (Government of Uganda, 2006, p. 50), all Ugandan languages deserve a right to be developed both as mediums of instruction and subjects in the curriculum for Uganda to achieve 'inclusive and equitable education'. Inclusivity and equity in education may mean literacy and numeracy for everyone and terminology development plays a central role in improving literacy and numeracy attainments.

To transform Uganda's economy from a peasant to a modern and prosperous country…' (Uganda Vision 2040), there is a need for deliberate attempts to move the masses from the periphery to the centre of learning in Uganda's education system. Opportunities in 'oil and gas, tourism, minerals, ICT business, abundant labour force, geographical location, trade, water resources, and industrialisation…' (ibid.) require appropriate terminologies in local languages for effective communication.

Notably, the Government of Uganda has made considerable investments in education, science and technology, the oil and gas sector, including a substantial salary increment to scientists at all levels of learning. Investments of such magnitude require that the country is equally repositioned by bridging the gap between the public and academia.

Debates and discussions on matters of national interest and the processes and outcomes of national research projects will result in meaningful, impactful and sustainable economic transformation through the development of appropriate terms understandable and acceptable by the target users.

It is against this background that NCDC as the premier institution for early childhood, basic education and material production in Uganda is unapologetically drawn onto the centre stage of terminology development.

2.0 General Objective

This handbook aims at providing guidance on how terms can be coined in a manner that fulfils the principles of term formation.

2.1 Specific objectives

The NCDC Terminology Development Handbook aims to:

(a) enable readers to understand knowledge frameworks, principles and methods of terminology development.

(b) guide field specialists to develop terms in different indigenous languages of Uganda.

3.0 The Language Situation in Uganda

3.1 Introduction

Any discussion of the 'language situation' in Uganda remains fluid, because of the challenges of definition of scope and sources of information. Because of the difficulty in determining the scope, this section focuses on the number of indigenous languages in Uganda and attempts to map out their levels of development in three main areas: social and economic aspects, education and the constitution.

Uganda is a multilingual country which has four major language groups: the Bantu, the Nilotics, the Central Sudanic and Kuliak. While these groupings can be easily stated (Ladefoged, Glick, & Criper, 1972; Ethnologue, 2024), the exact number of indigenous languages in Uganda remains elusive.

For this reason, the number of Ugandan indigenous languages is ever fluctuating.

The Constitution of the Republic of Uganda (1995, pp. 189–191) recognises 56 indigenous communities (Appendix I) who were in Uganda in 1962, but it is silent on the number of languages itself.

The same constitution (amended in 2006, pp. 212–213) recognises 65 indigenous communities (Appendix II), but again does not state the number of indigenous languages. A language mapping by the Makerere University Institute of Languages (2008) indicates that there are 39 indigenous languages in Uganda (Appendix III) and 16 minority groups (Appendix IV) while the Summer Institute of Linguistics (Ethnologue, 2024) puts the number at 41 (Appendix V).

3.2 Legal status

As mentioned in the previous sub-section, the Constitution of the Republic of Uganda (1995, amended 2006) does not provide details on the number of indigenous languages in Uganda. Whether there is a direct correspondence between the number of indigenous communities and the indigenous languages is an unanswered question.

The Constitution of the Republic of Uganda (1995, 2006) is also explicit about the status of English and Kiswahili and, to some extent, all indigenous languages in Uganda. English is the official language of Uganda and Kiswahili is the second official language. The Constitution (1995, p. 13) also grants any 'other language' – which may mean a Ugandan or foreign language – the privilege to be used as a medium of instruction, as well as 'legislative, administrative or judicial purposes as may be prescribed by the law'. This constitutional phraseology is so broad that it leaves out focus on any clear roles or legal status of indigenous languages in Uganda.

Article 37 of the Ugandan Constitution (1995, p.31) states:

> *Every person has a right as applicable, to belong to, enjoy, practise, profess, maintain and promote any culture, cultural institution, language, tradition, creed or religion in community with others.*

This liberty to '… promote, practise, maintain…' is, however, not protected by well-laid-out policy instruments. Whereas some supportive instruments such as the Thematic Curriculum and the EPRC report (1987) are in place, necessary structures, implementation strategies and facilitations (funding) are either lacking or scanty. In effect, this legal empowerment is weak in itself.

In terminology development, what is critical is the empowerment of this 'any other language'. The main purpose here is to empower 'any other language' to develop the vocabulary needed for everyday communication. The handbook is also to help the users develop vocabulary in a variety of areas: legal, medical, physics, chemistry and other scientific and humanities areas. This is crucial because the laws of Uganda are written in English, which may cater for less than 10% of the population. In a landmark judicial review process in South Africa, for instance, indigenous languages were given constitutional space to become languages of record for judicial proceedings in courts of law. This was purposefully done to allow access to justice to marginalised communities (Ntlama-Makhanya, 2021). In Uganda, the Ministry of Justice and Constitutional Affairs has completed the translation of the Constitution of the Republic of Uganda into ten minority languages: Kakwa, Lugungu, Lukenyi, Ethur, Kuku, Lusongora, Kebu, Lendu, Lubwisi and Nubi (www.ulrc.go.ug/). The interest to transfer legal knowledge into local languages requires adequate preparation of receptor languages to communicate exact equivalents in their local languages.

3.3 Socioeconomic status

Socioeconomic status here refers to how language is used in daily life for social interaction and economic purposes. One of the essential roles of any language is for socialisation, a key function that is met by all languages. Bourdieu (Bourdieu, 1986) argues that language functions as *capital.* It provides its users with social, economic as well as symbolic capital (Pillar, 2020; Chik & Benson, 2021; Brut-Griffler & Hawkins, 2021). Nsibambi (Nsibambi, 1971, pp. 62–65) observes that Uganda's language debate has openly played out in the media.

By independence, there were hegemonic tendencies by Lugbarati in West Nile, Luganda in central Uganda, Runyoro-Rutooro in the west, Ateso in the east and 'Lwo' languages in the north to gain media dominance over other indigenous languages (Runyambo, 2021; Islam, 2023).

There is unwavering interest from the Government of Uganda, local organisations and individual players to write different genres of literature in various indigenous languages. Creative children's stories, diverse oral narratives, proverbs, idioms, similes, tongue twisters, dictionaries, grammar books, phonetics and phonology books, poetry, novels, plays as well as books on different historical and cultural aspects have been written in various Ugandan languages. Though not well-documented, there have been attempts to write or translate discipline-related literature such as geography, chemistry and physics, among others, in the local languages. These developments are hampered by limited terminology in the native languages.

3.4 Education status

The place and role of indigenous languages in education have drawn mixed feelings among different stakeholders in Uganda. During colonial times, indigenous languages were integrated into the mainstream education system both through policy and practice, with several interventions put in place to support teaching and learning. The Thematic Curriculum, introduced in 2007, has helped to enhance literacy among pupils but, most importantly, it has also opened up opportunities for the growth of local languages. It has facilitated the development of textbooks, teacher's guides, resource books, dictionaries, grammar books, reading charts, alphabet charts and orthographies through different interventions (NCDC, 2023; http://labeuganda.org/web/). These materials have benefited a varied array of stakeholders: learners, teachers, parents and the general public. Alongside literature development, communities have also been facilitated to form Language Boards, which are a big factor in the development and promotion of native languages.

As of now (2024), ten local languages have been integrated into the secondary school education curricula at Ordinary and Advanced levels. These include Ateso, Dhopadhola, Leb-Lango, Lebacoli, Luganda, Lugbarati, Lumasaaba, Lusoga, Runyankore-Rukiga and Runyoro-Rutooro.

The Local Language Frameworks (best known as *syllabi*) have been developed for both levels and related Learner's Books and Teacher's Guides. The aforementioned languages are also examined as Principal Subjects at the Uganda Certificate of Education and Uganda Advanced Certificate of Education.

Primary Teachers' Colleges and National Teachers' Colleges have also had syllabi developed to teach native languages. The Uganda National Institute for Teacher Education (UNITE) has written programmes for native languages at both diploma and degree programme levels (https://unite.ac.ug/). Currently, Kabale University offers certificate, diploma and degree programmes in Runyankore-Rukiga; Makerere University offers degree programmes in Luganda, Lwo and Runyakitara, while several universities and language training centres in Central Uganda offer certificate, diploma and degree programmes in Luganda.

With the above upward trends in the growth and development of local languages in education in Uganda, it is pertinent that emphasis be put on terminology development in order for learning to become impactful.

3.5 Terminology and standardisation (regulatory bodies)

According to Kingscott (1998) and Protopopescu (2013), Eugene Wüster, who is considered the founding father of modern terminology development, had three main objectives: a) to eliminate ambiguity from technical languages; b) to convince all users of technical languages of the benefits of standardisation, and c) to establish terminology as a discipline for all practical purposes and to give it the status of a science. Terminology standardisation among users is an integral part of communication.

With reference to Luganda, Namyalo (2019, p. xi) notes that the terms developed in Luganda previously were "illogical, unsystematic and inconsistent." In this respect, at the time of Namyalo's publication, Luganda was in great need of improvement. Most probably, this problem could have been due to the lack of a regulatory body to monitor and authenticate terms developed earlier.

Marietta (2000) observes that prior to 1998, there were two bodies spearheading terminology development in South Africa. These were later merged into one, which became known as the National Language Service (NLS), with a Terminology Division responsible for providing all terminology-related information to the South African Government. The Terminology Division (TD) "documents, develops, standardises and publishes term lists covering various registers." The core aim is to "reduce ambiguity and misunderstanding, and thereby improving on the exactness of scientific and technical communication in the working environment" (Marietta , 2000, p. 235). In the end, duplication is avoided and standardisation upheld.

Progress in science, technology, and the economy heavily depends on communication of information. However, this is strongly impeded by ambiguous terminologies. Unambiguous communication is only possible if the concepts, the elements of thinking, have the same meaning for all who participate in the communication process (March, 1985). However, for any standard to be recognised, it must be under a regulatory body which is nationally or internationally recognised. The International Organization for Standardisation (ISO) defines standardisation as:

> *The process of formulating and applying rules for an orderly approach to a specific activity for the benefit and with the cooperation of all concerned, and in particular for the promotion of optimum overall economy taking due account of functional conditions and safety requirements* (Cabré, 1999, p. 210)

According to Rondeau (Rondeau, 1983), quoted in Cabré (Rondeau, 1999, p. 53), standardisation is based on a series of principles that must be followed and these include simplification, consensus building, applicability, stability (durability) and economy. Standardisation must aim at simplification to reduce variety and increase uniformity by choosing one alternative over others. It is a group activity that must be achieved via consensus, not by imposition. The role of teamwork is to ensure that the terms are applicable in real-life situations. It is an act that can be revised but should be stable enough so that those who have to comply with it do so with full knowledge. And, the decisions taken must consider economic implications (Cabré, 1999, p. 196).

As observed by Namyalo (2019), there seems to have been no regulatory body in place, or if it was there, it was not equipped enough to handle the technicalities of standardising Luganda terms.

A standardisation body ought to be manned by experts who are trained terminologists or subject/field specialists. Uganda has language boards which are found in many linguistic communities in the country, and one of the crucial roles of these boards is to check the authenticity of any developed term for effectiveness and compliance.

Currently, the boards have not yet taken up this role. NCDC field experience shows that many linguistic communities do not have expertise to handle this process, which partly limits the effectiveness of language boards.

Whereas there is internal willingness to boost their own capacities, the boards are financially incapacitated (NCDC internal field reports on Ik, Kuku, Nubi and Lunyole language boards, 2022–2023).

Now that writing in local languages in Uganda is evolving fast, the effort will be to build on the existing terms and generate more. It makes sense to mention that while most of the terms exist in local languages, they have only been stored and used orally.

Documentation through writing dictionaries, word lists or signing provides users with an avenue to explore, develop and use them effectively. With the advent of science and technology, local languages need to rediscover the words used to label specific objects, activities and places considered scientific and technological.

That said, however, we note that since there has been no corporate body, government institution, academic think tank or otherwise that has been the reservoir of terms to provide term equivalents across the local languages in Uganda, the initiative by the Literature Bureau at NCDC deserves unprecedented support.

3.6 Training

In Uganda, terminology development and terminology training are relatively new fields of knowledge production. Terminology is a highly technical field with limited expertise.

As is the case in South Africa (Alberts, 2017; Marietta, 2000), higher institutions of learning are often seen as bodies that equip people with relevant skills and knowledge for personal as well as national development. To date, the few known experts and courses in terminology development may be found at the Makerere University School of Languages, Literature and Communication (https://llc.mak.ac.ug/). A few graduates and scholars from the department are also spread across the country and globally.

Like in other fields of specialisation, a terminologist or a terminology developer is considered to be a person who has undertaken professional training in the field of terminology development (Cabré, 1999; Kageura & Temmerman, 2024). Further, terminology development is a field driven by specific social needs. Boulanger and Augur (1987) and EPA (2014) argue that the terminology process must be based on real situations; driven by an ideology that is not only political but also scientific in nature; involve both theory and practice; be treated as a distinct discipline that cannot be improvised; and practitioners must mix both theory and practice to produce lasting results. Whereas translators, documentation specialists and subject field specialists are all crucial to the terminology process and can be trained to intervene at specific points in a research programme, the writing of terminology should be guided by professionals (terminologists) (Cabré, 1999).

As Kiingi (2021) observes, terminology development is an integrated process involving subject specialists, language-specific experts and 'ordinary' users who will eventually use the terms developed in everyday life situations.

As already pointed out, terminology development is a multidisciplinary process. As such, programmes for training terminologists should include elements from linguistics, particularly lexicology and lexical semantics, logic and classification theory, special subject fields, documentation, sociolinguistics, pragmatics and computer science, in addition to all the knowledge a specific social situation may require (Sageder, 2010; ISO 704, 1987).

Besides the training of terminologists, there is need to consider the training of translators, interpreters and technical writers, scientists and technicians, information and documentation specialists, language planners, and computer scientists specialising in artificial intelligence applied to language (Valero-Garcés, 2005; McDonald, 2020).

Khumalo (2017) notes that the University of KwaZulu Natal has developed terminology through intellectualisation. The process of intellectualisation involves a carefully planned means of hastening the cultivation and growth of indigenous languages so that they can effectively function in all domains as languages of teaching and learning, research, science and technology. The University of KwaZulu Natal, he argues, has laid out clear processes of IsiZulu terminology harvesting and authentication for Administration, Architecture, Anatomy, Computer Science, Environmental Science, Law, Physics, Psychology, and Nursing disciplines. He argues that intellectualisation is a clear process of functionally cultivating, developing, elaborating and modernising a language so that the terminology of the language can carry the full weight of scientific rigour and precision, and that its sentences can accurately express logical judgements resulting in a language that has capacity to function in all domains.

The need for training in terminology is further enhanced by the need in fields inescapable in daily life. Madzimbamuto (2012) observes that from the medical perspective, patients prefer information in their own language and yet in Africa, the development of such technical vocabulary in indigenous languages has been neglected. In Zimbabwe, for example, clinical information in chiShona is shrouded by inexact terminology, switching languages during speech and code-switching and inaccurate examples. On the contrary, English information given is as specific and detailed as the patient wants and understands. Madzimbamuto (2012) regrets that while most professionals use English, they lack terminology in their own African languages for the information being delivered, mainly because technical knowledge develops through the formal school system in English rather than through the home African languages.

While terminology development ought to be one of the key concerns for universities and other institutions of higher learning, in Uganda it has attracted less attention. This has led to scarcity of terms disseminated across disciplines. There is, therefore, urgent need for harvesting and developing terminology in the medical field as in any other fields, such as legal language, in the indigenous African languages (Marietta, 2014). This urgent need can only be addressed through the involvement of institutions of the calibre of universities in Uganda to support NCDC in providing training to would-be terminologists.

4.0 Definition of Key Terms

The following terms have been defined or explained to give meaning as used in this handbook.

Local language: a language spoken in a defined locality such as a village, parish, sub-county, county or district.

Indigenous language: a language whose users are believed to originate from or designated by law or any other means to belong to a particular locality or country.

Familiar Language: a language that can be used and understood by majority of people (such as learners) in a defined area for communication.

Minority language: a language with a relatively smaller number of users (population) in a country compared to other languages.

Concept: a mental representation of an object denoted by a term.

Corpus: a collection or body of written or spoken texts in a language.

Cultivation: refining or improving a term or language by making gradual improvements.

Eclecticism: a practice of borrowing and combining ideas from different theories.

Intellectualisation: the process of empowering a term or language to communicate academic ideas or expressions.

Lexicography: the art of dictionary making.

Linguistic community: a group of people who use a common language.

Linguistics: the scientific study of language.

Onomasiology: the study of vocabulary and their representations.

Orthography: refers to the rules of writing a particular language.

Standardisation: the process of applying conventions and style to the terms in a language of use.

Terminology: the body of terms used in a particular subject or field.

Monosemy: the quality of having only one meaning.

Synonymy: the quality of having same or similar meanings.

Polysemy: the quality of a term having more than one meaning.

Semiotics: a study of the theory of signs and their representations.

Epistemology: a study of knowledge and its categorisations.

Terminologist: a person who possesses the necessary knowledge and skills, studies and creates specialised terms.

Subject Specialist: a person with the training and necessary skills in a specific field of study.

Linguist: a person trained in and possesses knowledge of the science of language.

5.0 Introduction to Terminology Development

The 21st century has seen rapid developments in science and technology as well as socioeconomic and political advancements globally. This has led to an enormous increase in the amount of knowledge available.

It has also influenced jargons and subject-specific (academic) dictions used in day-to-day communication. Besides, the inter-generational knowledge gap has widened due to the emergent terms used. Most importantly, it is worth noting that some languages have acted as the *originators, suppliers* or *source* languages of terminology development while others are *recipients* in global linguistic practice.

To date, most African languages have played the role of recipients in knowledge production and dissemination. Specialised knowledge imparted today in most African languages involves inexact, 'awkward' terminologies when rendered in receptor, [African] languages.

This inexactness and awkwardness robs African languages of their explanatory power that would otherwise enable African learners or users to comprehend terms in contexts.

This is because most terms are characterised by source language linguistic traits that shroud their development or origination such as those in English, French, German or Arabic. This scenario hinders the development of African languages in specialised domains. Faced with the global exchange of knowledge, there is a need, therefore, to bridge the gap between *source* and *receptor* languages. A wide knowledge gap between source and target (recipient) languages is an indicator of widening developmental gaps, which is capable of creating socioeconomic and political dichotomies such as North-South, poor-rich and developed-underdeveloped. This divide can be mitigated through deliberate terminological development.

As part of the many growing disciplines in knowledge production and dissemination, terminology development must be treated as a crucial element of language policy and language planning in any country. As global knowledge increases day by day in every domain of learning, Africa must not be seen to lag behind in two areas: contribution and participation.

African languages must contribute to the global corpora of new terms but, also, access or be able to communicate new terms from non-African languages to academia and the general public. In other words, whereas it is proper for African languages to embrace new terms from non-African languages, non-African languages must also receive and assimilate new terms from African languages.

It is needless to say that terminology as a discipline is essential for the 'intellectualisation' of languages, that is, the 'development and refinement' of terms used in academia. It is critical for translation, interpretation and the teaching of indigenous language in multilingual contexts. Terminology development also allows for the "cultivation and growth of indigenous official African languages so that they effectively function in all higher domains as languages of teaching and learning, research, science and technology" (Khumalo, 2017, p. 252). In other words, if African languages do not constructively participate in global terminology development, they face the danger (and actually, Africans face the danger) of being relegated to the periphery or become outliers in knowledge production.

The promotion of terminology development is also key in scaling up retention in Africa education systems (Khumalo, 2017, p. 253). This is because terms developed in indigenous languages are enabling factors in mother tongue education as envisaged in such policies like the Government White Paper on Education (1992) and interventions such as the Thematic Curriculum.

As a discipline, terminology development is characterised by the spectacular use of field-specific diction (Alcina, 2024; Byrman & Nord, 2024). Thus, in order to appreciate the distinctiveness in the field of terminology, it is imperative to understand the key vocabulary applied. Such diction may include, but is not limited to, *terminology, term, terminography, lexicography, standardisation, intellectualisation* and *cultivation.* According to the International Standard Organisation (ISO), *terminology* 'is a set of designations of a particular subject field' such as astrology (ISO, 2009, p. v). As a field of knowledge production and dissemination, terminology centrally deals with the 'description, ordering and transfer of knowledge' (ISO, 2009, p. v). Further, *terminology* is considered a totality of activities related to the 'collection, recording/documentation, description, processing, systematising, standardising, presentation and dissemination of terms' (Mabena, 2020, p. 15). Terminology also includes the processes, theories and methods involved in the study and the nature of terms (Cluver, 1996; Hage & Schreiber, 2011). It involves the study of 'concepts and their representation in special language and general usage' (ISO, 2009, p. v).

The term 'term' denotes vocabulary or groups of words used in relation to a specific subject field or domain (Mabena, 2020; Sager, 1990). *Lexicography* refers to all processes and activities involved in dictionary development in a particular language. *Terminography* meanwhile is a branch of lexicography and involves the 'documentation of terminologies from different subject fields' (Alberts, 2017, p. 68). The interdependence and interrelationship between and among the above terms is high. Some of them involve formal processes, while others involve informal processes or both. In informal processes, social groups observe a phenomenon such as a pandemic or disease and coin, derive or adapt a term for it.

For example, during the outbreak of the AIDS pandemic in the 1980s, several communities used the term *silim* as a root with several affixes. In Dhopadhola, it is called *silim* or *two twilo.* In Ateso, it is *esilim* or *eiseny.* In Lumasaaba it is called *siliimu.* In these three cases, the terms refer to a disease that makes you become *slim, small, slender.* As demonstrated in the foregoing two languages, the processes, theories and methods of terminology development remain abstractly informal (though linguistically explainable), with the language users. On the other hand, the development of dictionaries in a language, for instance, would involve very formal processes, methods and theories evidenced by sound linguistic principles. It is thus the role of terminologists to formalise non-formal ways of term development into mainstream academia.

As in the case of *silim* and *two twilo*, a *term* may comprise 'one or more words representing a general concept in a special language in a subject field' (ISO, 2009, p. 34).

Terms may also be simple or complex, consisting of one or more root words. It is further obvious that terms are inextricably represented through language, human or artificial. This may be through words, appellations, definitions, symbols, codes or formulas, icons, pictures, diagrams, or graphics (ISO, 2009, p. 3). A term may be broken down into four key levels: *object, concept, designations* and *definitions.* An *object* – concrete or abstract– refers to things, animate or inanimate. *Concepts,* which may be treated in part or whole, but related to objects, are 'mental representations of objects'. Concepts are represented through *designation(s),* which are 'terms, appellations or symbols'. Furthermore, concepts ought to be defined. *Definitions* describe or represent concepts (ISO, 2009, p. 2).

Terms adopted in any given field are critical for both 'vertical' and 'horizontal' communication, that is, the dissemination of specialised bodies of knowledge to field/subject experts (peer-to-peer) and non-field specialists or ordinary term users. Contemporary terminology development is believed to have had its roots among the Prague School linguists who emphasised the process of 'intellectualisation' and 'standard language'.

Intellectualisation is a deliberate process of purposefully 'cultivating, developing, elaborating and modernising language' (Khumalo, 2017, p. 254). Its ultimate aim is to enable the language in question to bear the full burden of 'scientific rigour and precision' so as to 'express logical judgements' in specific subject fields. In the end, intellectualisation should cultivate in speakers/users the confidence, pride and endowment with the new reality of being able to engage in and translate 'complex academic' discourse as though it were a simple, everyday conversation (Khumalo, 2017, p. 254).

Standardisation is the ability of language (term) to break geographical limitations or social class boundaries and reach out to the entire linguistic community thereby 'fulfilling the greatest cultural and civilization needs' (Nekvapil, 2010, p. 252). In this respect, Nekvapil (2010, p. 252) argues that terminology development often has two key aims: the 'non-linguistic aims of society such as political or cultural independence' and the 'effectiveness of language itself as a tool of communication'.

The implementation of the Thematic Curriculum and the promotion of the teaching and learning of local languages at primary, secondary and tertiary institutions in Uganda are a good example of the second scenario. Havranek (2017) also contends that the terms developed should be able to 'express continuity and complexity of thought' and these thoughts must be orally expressible in the form of speech as well as in writing. This means that the terms developed must be easily expressed or palatable in everyday conversation and also in writing.

Another critical concept in terminology development is the idea of *cultivation.* **'**Language cultivation' involves refining or improving language by 'small changes'. These changes may be orthographic, lexical such as 'introducing an appropriate term for a new phenomenon' or simplifying certain expressions (Nekvapil, 2010, p. 251). Language cultivation assumes the existence of proto-forms from which the cultivation or improvement takes place. It entails two critical stages, *status planning,* that is, deciding which language should (or should not) be used in the community; and *corpus planning* (ibid., p. 251). *Cultivation* also involves the popularisation or customisation of new terms (Havranek, 2017; Khumalo, 2017). Terms which are completely new (also called *neo-terms)* (ISO, 2009, p. 34) must be given time to grow and become familiar to users, writers and speakers of the language. This may take different forms such as publishing sample texts, stories, academic and non-academic texts and deliberate introduction of neoterms in mainstream academic discourse, for instance, from kindergarten to university in the language in question to help disseminate the use of new terms. It may also involve gradual use, adaptation and adoption in the media. In the end, there should be 'order in subject vocabularies and concepts' and 'flexible' stability in meaning and uniformity in their application (Felber, 2016; Nekvapil, 2010, pp. 253–254).

Terminology development may include, but is not limited to, the usage of existing (indigenous) words, the creation of new words in the language, coinages or borrowing from other languages.

At times it involves a purposeful identification and extension of the semantic functionality of language (especially lexicon), whose purpose may be to promote specialised knowledge within a community of practice or advance knowledge for general/public usage (Antia & Ianna, 2016). This development may take different lexico-semantic transformations like deletions, affixations, additions, redefinitions and reorganisations, creations, translations, borrowings, reduplication, functional shift, and blending, among others.

For this reason, terminology development should be seen as both an endogenous and exogenous process. It involves intra-language, inter-language and extra-language processes. Intra-language processes involve internal analyses and harnessing of a language's existing vocabulary. In every language there exists a stock of terms that are used to refer to specific fields of life that may possibly not exist in other languages. And such terms or vocabularies might only be known to and used by a limited social class or professional category such as astronomers, religious leaders, artisans, nomads, fishermen etc. Such language may not be accessible to all speakers or users of the language. In this case, terminology development would involve the collection, definition and application of specialised indigenous words (vocabulary) for general or specific use. The intra-language level also involves *semantic shifts* and *expansion,* where a language may drop the meanings of certain words or words may acquire totally new meanings.

The inter-language context involves a bilingual relationship between the languages in question. This is an attempt to find an exact, suitable or approximate expression of concepts between two languages. In this case, linguistic isomorphism becomes a critical issue to be addressed; this refers to the existence of unequal formedness between languages. At this level, borrowing is an imperative. The extra-language context refers to the exploitation of concepts external to the languages in question. This may involve coinage of new terms to express existential realities. Whatever the linguistic strategy employed, knowledge of the phonotactic and general structure of the language must be observed.

Term cultivation and standardisation involve many processes and stakeholders. Once the terms are developed, they must be disseminated and accepted by stakeholders, some of whom are experts in the subject area, linguists who understand language processes, and other practitioners who will apply them in day-to-day life.

Therefore, terms and terminology development should be concerned about, in *structuralists'* language, the *part* and the *whole.* The term must be considered for what purpose it has developed *itself* and, secondly, for what part it plays *in the whole subject* or *topical* area. That is, when put in a *systemic* form, what contribution it makes to the entire topic or subject as a whole rather than taking its own individual sense (Havranek, 1932, pp. iii–viii). Additionally, a term may play a dual role – a *practical function* (utilitarian, communicative) or an *aesthetic function.*

This means the ability to elicit a response, an understanding or meaning in the entire communicative process in which it is used, or completely attract an independent meaning or function away from the context or body or topic in which it is used.

These two meanings are alternatively referred to as *automatisation* and *foregrounding. Automatisation* refers to the situation where the meaning of a term is naturally known or implied in the first instance of use. *Foregrounding,* on the other hand, is the non-culturally expected response or meaning (strange, secondary) of a term. It is the ability of the term to generate new meanings on its own, a kind of charting of new pathways for a term to have access and success in society. Both meanings are desired in term development (Havranek, 1932, pp. viii–ix; Faber & Leon, 2012).

Terminology is not a standalone, but rather a multidisciplinary field. It borrows from the humanities and social sciences as well as natural sciences. However, as ISO (2009, p. v) points out, 'logic, philosophy of science, linguistics, translation studies, information science and cognitive science' are critical to terminology development. According to Felber (1982, p. 2), terminology development involves five core activities undertaken: collection and recording; creation; standardisation; description; and data recording.

In South Africa, Khumalo (2017, p. 257) identified four key processes in terminology development: term harvesting; terminology description and translation; terminology consultation workshops; and terminology authentication or standardisation. Therefore, terminologists in Ugandan local languages should borrow carefully when going through the process of developing terminology.

As a process, terminology development must be read in the context of Saussure's (1959) triadic theory of signs. There must be a clear and consistent relationship between the sign, signifier and signified. The theory of signs is often bound by a sort of *social contract,* what language users agree or not agree to (Saussure, 1959). According to Nekvapil (2010, p. 254), the terms developed in a language must be 'codified', that is, 'should be officially stated which linguistic means are correct and/or approdication' and particularly reflected in 'dictionaries, grammars and style manuals'. Codification must undergo three critical validation steps: (1) compliance with conventions of the language in question (social acceptability); (2) adequate functionality (suitability of the lexical form); and (3) systematism, that is, structurally sound. These processes must be girded by the principles of transparency, consistency, appropriateness, linguistic economy, derivability and compoundability (generativity), linguistic correctness, internationality, objectivity, systematicity, acceptability, and preference for native language (ISO, 2009, pp. 38–39; Kiingi, 2023).

Today, the above process activities have eluded most Ugandan languages. Not many have collected, recorded, created, described or standardised vocabularies in different fields. Furthermore, there are no official records of such activities undertaken. However, what is important is that all languages possess corpora, written or spoken. This provides leeway to all extant languages to conduct terminology development. The most important resource for a terminology development project in any language is the availability of its human resource, the speakers or users.

This terminology manual is, therefore, premised on the belief that most of Uganda's indigenous languages have a scarcity of terms required for specific academic disciplines. They are, therefore, in their current state, not capable of conducting scientific and technological discourses and are in urgent need of terminological development to enable them to function optimally in this fast-changing world.

While the aforementioned need is very apparent, there are key processes, methods, principles and resources necessary to be considered for conducting and implementing terminology development in any language. In this handbook, NCDC attempts to problematise the terminology question, sets objectives for the NCDC terminology project, explore theories and stages of term formation and examine the methods and principles for terminology development. Lessons are drawn especially from English, Luganda and South African languages with the intention to extrapolate best practices to the rest of Ugandan languages (www.luganda.com; Kiingi, 1989; Namyalo, 2010; Kiyinikibi, 2011; Sager, 1997; and Picht, 1985).

6.0 The Need for Terminology Development in Ugandan Languages

Whereas there is a dire need today for education in Uganda to cause scientific, technological and socio-economic transformation, this transformation cannot be realised as long as academic language continues to be inconsistent with the societal lexicon. This linguistic inconsistency is witnessed in the content of curricula and instructional materials, classroom instruction and day-to-day interactions between academia, curriculum developers and the public. The choice, structure and diction in academic language used in curricula, instructional materials and classroom instruction are opaque to both society and learners due to the varying or blurred terminologies employed across disciplines. This opaqueness and vagueness in language (terminologies) not only limit educational attainment but also create a boundary between society and academia, which should not be the case.

It is, therefore, important to create (coin) and regularise terms used in different academic fields in the language of the masses (local languages). This harmonisation will enable the communication of academic knowledge to the masses so as to achieve the intended socioeconomic, scientific and technological transformation for national development.

7.0 Knowledge Frameworks for Terminology Development

Temmerman (2000) observes that apart from Wüster's General Theory of Terminology (GTT), other theories that followed are simply its offshoots. Wüster's GTT concerned itself more with assigning a new term to a new concept that appeared in a language (Cabré, 1999). The theory emphasises clarity and standardisation of terms, which makes it a relevant approach for Ugandan languages today. Nevertheless, Wüster was criticised for being simply prescriptive by only relying on his limited section of technical languages over agreed equivalents about a previously unified concept (Protopopescu, 2013, p. 3).

The first theory that arose out of Wüster's ground-breaking theory is the Extended Theory of Terminology (ETT). Myking (2001, p. 61) cited in Protopopescu (2013) summarises ETT as a theoretical platform characterised by eclecticism. It is a set of epistemological tenets or independent concepts, hence terminology development in this theory depends on belief and truth. In the end, this leads to an idiosyncratic representation of terms in a specific language or field. Those who do not subscribe to some concepts may not be able to coin terms for a specific need. Another tenet depicting this principle is that it is an operational method based on onomasiology. This, in essence, means that the naming of concepts is determined by the needs of those using the language. Hence a term will be coined in a native language if there is a need for it. The theory further posits that there should exist a defined set of problems to be addressed by terminology. It goes without saying that most native Ugandan languages are terminologically deficient in communicating meaning in modern fields like education, science and technology, and religion.

While there is huge interest in indigenous education, especially through translation and transcreation, there is even a bigger need to bridge the gap between the target and source language text vocabularies. This should aim at disambiguation through common formulae.

In relation to the preceding viewpoint, Cabré in Protopopescu (2013, p. 3) observes that some principles of GTT were modified in response to the criticisms of the theory. For instance, in order to validate the objective of international standardisation, it was suggested that terminology development should be considered as part of language planning. This desire necessitated the realignment of terminology as an important aspect of how language is to be used and this observation on terminology development is in tandem with the general operations of local languages in Uganda. Cabré further observe that controlled synonymy is acceptable, that is, terms that represent the same concepts in different contexts should be used to a lesser extent. The use of synonyms in term coinage should be specific to some concepts and where the local language has exhausted the avenues for alternative terms. However, the proponents of the ETT, in their effort to salvage the GTT, did not attend to the blurriness of some of the principles of the theory: for instance, priority of the concept over the designation or naming needed modification, hence the local language terminologist may not be saved from the confusion between concept and its naming. The semiotic conception of designation and linguistic relationships needed to be simplified so as to guide the terminologist in meaningful naming of signs to make terminology in any language communicative.

In reaction to the above shortcomings in ETT, another theory was propounded by Gaudin (2003), who considered the study of terms in the linguistic, pragmatic, social and historical contexts in which they appear. He called it the socio-terminology approach (Perez, 2016). As a reactionary theory, Campo (2012, p. 142 in Brenes, 2019) argued that concepts are not static because theories related to them also change and social and historical variables do affect the concepts during discourse.

Besides, specialised fields cannot be defined because nearly each of them involves interdisciplinary knowledge; analysis of terms is done from a linguistic perspective in a social interaction (communication situation); and polysemy and synonymy belong to the nature of language, hence cannot miss in specialised discourse. Further, terminology cannot overlook its diachronic nature because history, polysemy, synonymy and language are linguistically related. Socio-terminologists thus contend that the GTT failed to recognise the cognitive and social functions of terminology. To this end, GTT looked at terms as isolated and independent units, which do not have any relationship with other units of language (Campo, 2012).

Cabré (2003) incisively proposed that terminology needed to be addressed through the communicative theory (Schmidt, 2008). This theory makes two key arguments; first that terminology is "a set of needs, and set of practices to resolve these needs in a unified field of knowledge" (Cabré-Castellvi, 2003, p. 182); and, secondly, that terminology operates with terminological units which are multi-dimensional and which are, simultaneously, units of knowledge, units of language and units of communication. Protopopescu (2013, p. 8) contends that:

The description of these "terminological units" should cover the concept, the term and the situation components. This is what differentiates them from other units of language with the same structural features, i.e. words, and from the units that also express specialised knowledge, i.e. specialised, morphological and phraseological units.

To combine all strands of terminology, Cabré (2003) introduces a model which she calls the 'theory of doors'. The model represents the plural, but not simultaneous, access to the object in a way that directly addresses the central object – the terminological unit, whether starting from the concept, term or situation.

According to Brenes' (2019, p. 8) terminology, Cabré's (2003) theory of "the door of entry" aims to

… describe and explain terminological units [and] is conditioned by the adaptation of a theory suitable for its door of entry, i.e. a theory that does not deny the multi-dimensionality of the object. Such an approach allows the description of the real data in all their complexity.

The theory of communication takes into account the complexity and diversity of specialised units in a communication environment. The framework of specialised communication transfers specialised knowledge; it covers, for example, the communication among specialists, between specialists and semi-specialists, and between specialists and learners (Cabré-Castellvi, 2003, p. 152; Sageder, 2010).

Slightly different, but related to socio-terminology and communicative terminology theories, is the socio-cognitive terminology approach, by Rita Temmerman (Faber, 2009; Temmerman, 1998), which emphasises the conceptual organisation and category structure.

It is premised on the GTT conceptual system, which focuses on terms as either type of or part of conceptual relations. The socio-terminology theory and the communicative theory converge at the point of the diachronicity of terms, i.e. that terms bear a historical inclination.

Arms and Faber (2009) advanced the cognitive approach to terminology development. This theory argues that the best way to study specialised knowledge units is by studying their behaviour in texts. In local languages this relationship exists between words as they are used, that the knowledge natives have about those words and where they use those words.

Arms and Faber (Arms & Pamela, 2009; Faber, 2009) further contend that repetition of terms in the form of nouns, phrases, sentences and paragraphs happens at different parts of the text. This means, to determine the monosemy, polysemy or synonymy of the term, as well as its behaviour in relation to the other units of understanding, requires attention, both linguistically and situationally (Brenes, 2019; 2013).

It is at this stage that the concept is brought to the fore of consideration during term development. In reference to the preceding argument, it should be added that this theory counters the principles of monosemy and univocity propounded by the first theory.

The cultural approach to terminology, as propounded by Diki-Kidiri (2008), postulates that it is culture that conditions the way man perceives and conceives the world, and that man is the only one with access to the real world through mentally and culturally conditioned representations (Campo, 2012, p. 160). This preceding tenet leads us to believe that terms in local languages can easily be formed and developed in view of the cultural aspects since language is an embodiment of culture. In this respect, Temmerman (2000, p. 8) agrees with Diki-Kidiri that the creation of neologisms or coining of new words or phrases should take into account domain knowledge (subject field), linguistic knowledge or understanding of aspects of language and cultural knowledge or understanding of different aspects of one's culture in relation to language. The theory, however, stops short of guiding the terminologist on how to navigate through the forest of linguistic units.

Despite the above shortcoming, the cultural theory positions native languages as the best vehicles to employ while developing terms in specialised fields since we perceive and conceive the world using our native tongues or first languages. A native user of a language will represent his understanding of a concept using a term coined in his local language and communicate or express it more easily.

Therefore, a terminologist in a Ugandan language should strive to understand the interplay between specific field knowledge where the term under coinage is expected to be used, the aspects of his language and the cultural concordance in respect to many parts of his culture. A terminologist in the local language who is ignorant of the details of his/her culture is incapacitated in coining terms for use in specific fields in his native language.

A more recent attempt by Bourigault and Slodzian (1998/1999) in Brenes (2019) advances the textual approach to terminology. This theory is largely methodological in nature. The textualists argue that the terminologist should first create a corpus of terms from which the terminologist later selects the most suitable to the subject field (Brenes, 2013).

The terminologist then studies the texts in the form of words or vocabulary (corpora) to find out how or whether to admit them in the family of terms (terminological acquisition). After the selection, the terminologist explores the corpora to find relations between the different terminological units, i.e. knowledge, language and communication. Selected terms should also be validated pending acquisition, which process should follow and relations between the candidate terms with the help of subject-field experts and exploration of corpora to detect multilingual equivalents in target languages, and validation of these proposals by experts.

This approach, however, is considered as a shortcut, and may not allow a thorough description of the relationship between concepts and terms, and other linguistic units and their communicative role in a cultural context. The proponents of this approach do not provide guidance on the sequence of steps proposed.

However, this approach allows languages which are still at basic development stages, such as indigenous languages in Uganda, to grow their term bases by first making a collection of existing vocabulary in their specific languages, then analysing them to find out how this vocabulary can be reoriented for specialised communication.

To this end, it can be argued and attested that the communicative theory is open enough to accommodate the concepts as well as terminological units in plurality and linguistic units. Its descriptive approach clearly provides for inclusivity in term development. It leads to specialised understanding (Cabré,1999, p.52).

To terminologists who are well-intentioned about developing Ugandan languages, adopting a theory that integrates the triangular relations of a concept, a term and the situation in which the term occurs allows them to achieve the end goal of developing a body of terms in specialised fields in local languages in Uganda. Precisely, terminology development in local languages in Uganda should be anchored in the understanding of the different aspects of language.

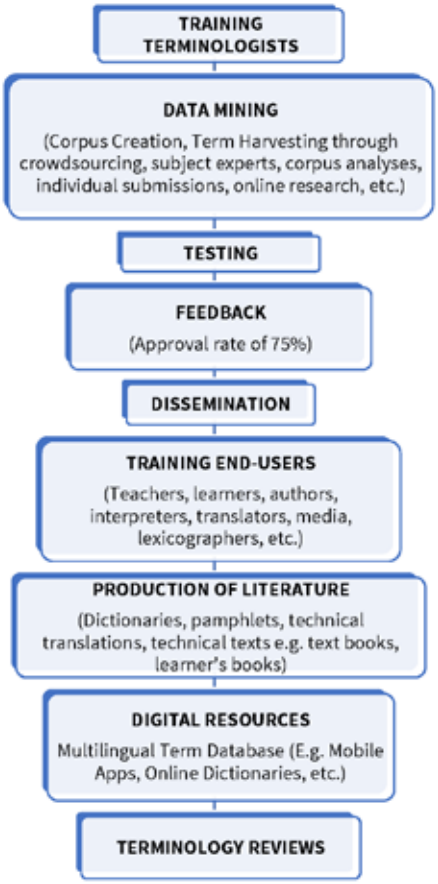
8.0 Proposed NCDC Terminology Development and Management Model

The NCDC Terminology Development and Management Model has been thought out in depth in line with the existing structure of NCDC.

8.1.1 NCDC Terminology Management Model

The above model shows the suggested administration of terminology projects. The projects shall be initiated by the Literature Bureau Department. The concepts or working documents will be subjected to discussions with the subject specialists, from both within and outside NCDC. After the subject specialists' stage, the draft concepts will be subjected to vetting by the Advisory Committee of the Literature Bureau, which has oversight over the Bureau's activities. The Advisory Committee shall make recommendations of the projects for upward submission to the Top Management of NCDC. Upon the recommendations of Top Management, projects shall be sent to the Quality Assurance Department in preparation for submission to the Academic Steering Board (ASB) and the Governing Council. The Governing Council shall approve all terminology projects.

8.1.2 Terminology development processes



Once a terminology project has been approved, there will be a need to identify and train existing and prospective terminologists. As mentioned in the Preface, this handbook will be broken into smaller training packages to equip users with the knowledge and practical skills in terminology development. After the training, terminologists will be deployed to collect and process data for the various projects. Data extraction activities may include corpus creation, term harvesting through methods such as crowdsourcing, corpus analyses, subject experts or key informant submissions, individual submissions or online research. Collected data will thereafter be tested for the PEGITOSC criteria: precision, economy, generativity, internationality, transparency, objectivity, systemicity and consistency.

Test feedback will be very crucial for any terminology project. Data reliability and validity of at least a 60% approval rate will be considered sufficient for the data to be shared (disseminated) with key stakeholders prior to the engagement of end-users. A 60% approval rate is justifiable because most Ugandan languages have no databases and, therefore, it could be used as a starting point. Further to that, new terms will always have a low approval rate just because they are new and most users probably do not know about them. Most terms gain agency when used over time.

Once terms have passed the PEGITOSC criteria, end-users will be trained on critical aspects of the terms, which may include, but will not be limited to, structure (morphological formation), meaning(s), class category and usage(s). Expected end-users may include teachers, learners/students, authors, interpreters, translators, media practitioners and lexicographers. For terms to gain wider usage, there will be a need to use them in various literature. Production of dictionaries, pamphlets, technical translations and specialised texts such as subject textbooks are critical in popularising new terms. New terms can also be disseminated through the creation of digital resources such as multilingual or monolingual term databases such as mobile apps and online dictionaries. In the end, it is recommended that different aspects of the terms be reviewed.

9.0 Terminology Work Tools

A terminologist should be armed with a number of tools to use in the process of collecting, extracting, recording, storing and managing of term data (Brenes, 2013, pp.1-9). In relation to the development of terminologies in Ugandan languages, it is recommended to use the following resources: dictionaries, glossaries, libraries, computer-assisted tools, online search services, documentary data banks, newspapers, religious texts, dictionary software and corpus software.

A local language terminologist will require dictionaries as sources of reference and cross-reference during term search, extraction and collection. It is preferable to have both monolingual and bilingual dictionaries. Besides dictionaries, a terminologist will need to study glossaries and wordlists of terms in the language in question to support the choices made in building semantic relationships across terms. Today's technology is also available to the terminologist with dictionary software. This software may be accessed online or installed on personal devices such as mobile phones and computers to be accessed offline.

Libraries, physical or electronic, can provide term developers with opportunities to verify relationships between the terms (Pavel & Diane, 2001, p. 61). Documentary search tools such as library catalogues, periodicals and bibliographies for specialised fields can be used to obtain information about terms. Documentary data banks are also very useful since they cover several subject fields (ibid., p. 62).

The advent of computers and technology presents an opportunity for terminologists in local languages in Uganda to utilise the online search services through search engines such as Google to search for terms in specialised fields (Brenes, 2013, p.1). Today there are very many electronic databases which term developers can use to extract, build and validate corpora.

These include 2lingual (https://2lingual.com/), AntConc (https://www.laurenceanthony.net/software/antconc/), Corpus Analysis (https://corpus-analysis.com/tag/word%20clouds), EuroTermBank (https://www.eurotermbank.com/) and TshwaneLex (https://tshwanedje.com/terminology/. A more comprehensive list can be found at https://inmyownterms.com/wp-content/uploads/2022/02/Terminology-Search-Tools-for-IMOT.pdf.

Spell-checkers such as Grammarly (https://grammarly.com) and QuillBot (https://quillbot.com) are word processing packages that help in proofreading of assembled terms. They rely mainly on dictionary records to locate the terms. The terminologist should establish the availability of such packages to assist in terminology work. Electronic publishing tools may also be useful in storing electronic glossaries and vocabularies. Closely related would be the use of terminology data storage software, which can help in the creation and updating of terminology databases in multiple languages (Pavel & Diane, 2001, pp. 79–90; ISO 12620, 2019).

As local languages advance, terminologists will need to use the multilingual data management systems, for instance, Termbase (Pavel & Diane, 2001, p. 80), which allows the creation of records of terms, their extraction, exchange and updating the term data during the process of terminology development (Rogers, 2010; Francois, 2015). A local language terminologist will find online user networks and discussion groups manageable across platforms such as WhatsApp, Academia and LinkedIn very handy in collecting and validating terms in a particular field in a local language. Medical terminology developers suggest the use of terminology browsers, terminology editors and terminology servers which provide a variety of options and searches to enable navigation through medical terms (Cimino, 2001, p. 298). In conclusion, each of the aforementioned tools may not independently yield super results, hence there is need to use a combination of tools.

10.0 Steps in Terminology Development and Stages in Term Use

10.1 Steps in terminology formation

Borrowing from the EPA manual (2014, pp. 13–24), the following steps can be followed closely or reviewed to fit in the terminology development work depending on the requirements of the specialised field at hand in the context of a terminology development project.

i) **Needs analysis**

At this level, terminology developers endeavour to determine why terms are needed. Muwanga (2016) suggests that to analyse the needs, one may as well use the four Ws: what, why, who, and when. This step helps determine the terms needed to satisfy the differing needs like business, scientific, legal, linguistic needs and so on. What is to be communicated needs to be identified to inform the process of terminology development.

ii) **Gathering of subject /discipline specific terms/concepts**

The terminologist engages in collecting terms that reflect the concepts of interest, scope, purpose and audience identified in needs analysis. The terms can be obtained from: terminology services, published materials such as journals, white papers, technical reports, curriculum materials, textbooks, web pages, strategic plans, research reports etc., and other terminology resources. Manual methods or specialised software may be applied to text parsing and extracting terms when dealing with large corpora. These include TshwaneLex (https://tshwanedje.com/tshwanelex/), AntConc (https://www.laurenceanthony.net/software/antconc/) and other corpus analysis tools (https://corpus-analysis.com/tag/word%20clouds) and ISO recommended applications found at https://termcoord.eu/terminology-iso-standards/.

iii) **Term selection**

Once terms have been collected, appropriate terms should be selected to represent target concepts. The terminologist includes terms that are important to the audience, that occur in the content and those that are unique by avoiding polysemous ones. The above steps (i–ii) together represent development stages of the terms. In many African countries, researchers and the general public operate as users of secondary terms. This means that terms are already existing. At this stage, the terminology team compiles the terms and assigns them to existing concepts.

iv) **Standardisation**

After identifying the terms and assigning them the concepts they represent, terms are then grouped into their conceptual systems. It is then possible to map out the expressional elements that are peculiar to the discipline, for example, target language affixes needed in creating the terms. The choice of the right tool is critical here. According to EPA (2014) and Cabré (1999, p.10), standardisation is the application of conventions about the style of such a term in the language of use.

v) **Stakeholders' identification and consultation**

This step guides the terminologist not to place the process of terminology development in a vacuum. Strategic groups which may include native linguists, language teachers, boards of governors, cultural institutions and targeted individual language enthusiasts are important to the process of developing a term. Broadly, the audience and purpose of the term to be developed will impact the subject, geographic or activity of terms collected and further developed to standardisation. Consultation with stakeholders determines the degree of synonymity as well as other relationships to be considered and leads to acceptance of the terms so developed. For large-scale projects, funders or sponsors and other interested partners may impact the resources available and dictate on the needs or governance structures to be considered. This forms the consumer stage of the term development process.

vi) **Testing**

Term development is not complete without testing. Terms are validated for PEGITOSC compliance, i.e. precision, economy, generativity, internationality, transparency, objectivity, systematicity and consistency (Kiingi, 2021; ISO 704, 1987; ISO, 2009) (*also see Section 11 of this handbook on principles of term formation)*. Term testing is done to evaluate their effectiveness, acceptability and usability. The target audience serves as the sounding board. The intention is to establish if the target user understands the term and can use it in different contexts. Testing the terms for usability during term development assures and gives direction for the completion of the whole process. Reviewing and testing from early stages help to confirm that the terms selected are in common usage by the user group. It also helps establish the relationships of broader and narrow terms. A terminologist can use index cards or sticky notes containing the terms. In this case, users are asked to sort the cards in the order that makes sense. The user is then allowed to give his/her reason for the order.

vii) **Publishing terms**

This step may include, but is not limited to, modifying, printing and distributing documents containing the terms developed for both general and specialised use.

10.2 Stages in term use

Terminology development is a process around the concept, object and intra- and inter-linguistic aspects, which navigates through a number of stages to create the final product called a term. Helge Niska (2002, p. 39) fronts four stages which she sometimes calls levels. She anchors her argument in the assertion that terminology is done by different groups of people at both theoretical and practical levels of language. The coinage of many words into terms happens unconsciously or even informally but intentionally among the indigenous people in Uganda to complete communication in different specific contexts.

When a new phenomenon, idea or discovery is made, within a scientific discipline, it is classified as being in the *scientific stage*. The understanding here is that science is punctuated by discovery and invention. At this point, various concepts are named for the benefit of the scientific community. Once the subject experts agree to it, it is then communicated or disseminated to non-subject experts. The mode of communication or naming of any discovery or invention is often done in language. So, linguists have a key role to play in unravelling the sense in the new term and find the best way possible, in collaboration with native speakers, to disseminate it. In day-to-day life, a new phenomenon is often given a name in the local language even without making it known to scientists, in the case of a scientific discovery or invention. However, local language terminologists should be aware that at the initial stage the term is still evolving and may attract varying meanings with time. Terms take time to stabilise in their meanings and use. The growing use of terms, especially in specialised fields like health, should be put under serious scrutiny in naming cases like COVID-19. Local language terminology developers should coin new terms in their native languages to get new meanings that mirror new discoveries and theoretical changes taking place in terminology development.

The second stage is called the *educational stage*. This stage is characterised by the use of new terms in universities and other learning institutions and disseminated to the public through mass media. Terminology becomes fixed or stable in specific subject fields of science, art, technology, medicine, religion and so on. It is at this stage that standardisation of the term is effected. For instance, if in English the term 'syllabic consonant' is created in the *scientific/discovery stage* (first stage), at the educational stage it will be included in various texts, manuals, journals and reports and presented to institutions of higher learning to be validated. It will be fixed in the field of language as a candidate term. Once the meaning of the concept it represents is plurally conceived, then it will gain acceptance. The term will be tested for monosemy, univocity or polysemy in the specific field of expertise.

Once the term has passed the educational level, it finds its place in real-life situations. This is referred to as the *application stage* of the terminology discovered in stage one. The terms are applied in the industry or institutions of production and services. At this stage, standardisation may be inconsequential to users since they prefer locally generated or coined terminology because of its near-familiarity and contextual closeness. For instance, the term 'syllabic consonant' from the previous stage will now find its niche in the application stage within the writing and publishing industry, where educational materials dealing with the alphabet will be produced using it.

According to Niska (2002), the fourth stage is characterised by either effectiveness or ineffectiveness of the term. It is called the *consumer stage*, where the potency of the term in instruction, medical prescription, institutional or day-to-day discourse may affect the terminologist's ability to communicate. Terminology is highly needed at this stage because different professionals, for instance, translators, interpreters and technical writers, operate at this stage. Therefore, at this stage the terminology developer has to be patient with consumers and admit the disaffection from them to help in further research and standardisation of the terms advanced.

Niska (2002) points out that terminology work is done by people active in related professions, mainly as part-time work. Some are never conscious of terminology activities; for example, journalists may translate terms without being conscious that they are dealing with terminology. In an ideal situation, therefore, terminology should be developed by subject experts, terminologists, native speakers and linguists. The immediate users in a specific field are the key determinants of how far the term will be usefully applied to a specific field.

11.0 Principles of Term Formation

In a seminal paper on terminology development in Kiswahili, Tumbo (1982, p.87) reports:

[In] 1968 it was proclaimed that Kiswahili should slowly replace English as a medium of instruction in the educational system [of Tanzania] up to the university level.

However, in 2023, formal sciences (logic and mathematics), natural sciences (physics, chemistry, botany and zoology), and applied sciences (informatics, technology, agriculture, and medicine) were still being taught in English at Tanzanian universities. One would be motivated to ask what has gone wrong in the process of terminological modernisation of Kiswahili over the years. Tumbo (1982, p.89) made the following recommendations with regard to terminology development in Kiswahili:

i) Splitting all human knowledge into specialised fields.
ii) Conceptual analysis by subject field specialists.
iii) Training subject field specialists in the principles of terminology.
iv) Cooperation of subject field specialists with linguists to coin specialised terms.

In response to the above recommendations, Kiingi (2023) argues that it is the very involvement of linguists in the actual coining of terms in Kiswahili that led to the lack of progress. This observation is critical to understanding the role of different experts or stakeholders at the different stages of terminology development.

This section deliberately begins by a general discussion of the principles of term formation. It then provides a more formulaic definition of the term 'term' and relates this definition to the discussion of the PEGITOSC criteria in term development and testing. Afterwards, it proposes a conceptual analytical method and prototypical terminological systems for Ugandan languages. While examples have been drawn from other Ugandan languages (where possible), Luganda has been widely used because of the wide research already conducted in the field of terminology development with respect to it (www.luganda.com).

It is expected that the use of examples in Luganda and a few other local languages will make it easier and/or inspire terminology development in most Ugandan languages, a core objective of this handbook.

11.1 General principles of terminology development

The International Standard Organisation (2009, pp. 38–43) outlines the principles that should guide the development of terms: transparency, consistency, appropriateness, linguistic economy, derivability and compoundability, linguistic correctness and preference for native language. Transparent terms or appellations[1] are those that can easily be deduced and have defining characteristics that are unlikely to change in the long term. The key defining features of such a term must stand the test of time, including technological and subject-specific changes. Take, for example, two terms: "Government Task Force on Agencies, Boards and Commissions" and "Woods Task Force". Whereas the two terms have the same meaning, it is argued that the former is more transparent than the latter (ISO, 2009, p. 39). A similar example in Uganda is between "Education Policy Review Report" and "The Kajubi Report". In this case, the former rendition is more transparent than the latter.

A term or appellation must be able to correspond or speak to the entire concept system within which it falls. When a term or appellation is in tandem with how elements within the same system work or how elements with similar characteristics relate to one another within a subject field, it is said to be *consistent* or *regular* (ISO, 2009, pp. 6–8). For instance, if a term is being developed as a noun, it must follow the general nominalisation principles within that specific language. Formations such as "orion", "dacron" and "rayon" are said to be consistent with synthetic fibres (ibid., p. 39).

Appropriate terms or appellations are clear in meaning and do not cause confusion among users. Terms should, therefore, be as 'natural as possible' in usage and avoid distracting users. For example, 'install wizard' might be interpreted as instructions to the user to *install a wizard.*

The intended meaning, though, is a '*wizard'* or program that helps the user to install other programs in the computer. For that matter, a better term for 'install wizard' would be 'installation wizard' (ibid., p.39).

Similarly, terms or appellations must be precise and concise. There is a need to use as few words as possible – as short as possible – in the formation of a term. While the German word "Zivilluftfahrt Versicherungsgesellschaft" ("Civil Aviation Insurance Company") is a correct form, it is boringly long and may be difficult to appreciate by many users. Precision and conciseness can be achieved by clearly identifying key defining features of the concept that needs to be represented. Where the term is too long, a shortened form is preferable; for instance, the acronyms WHO and UNICEF are preferable to World Health Organisation and United Nations Children's Fund (ibid., p.40).

Further, terms must be formed following the linguistic productivity of the language. Each language has its own morphosyntactic and phonotactic rules. Terms that are contrary to the accepted structures of a language are often dispelled by target users and fail the test of time. Term formations should, therefore, take into consideration acceptable *derivations* and *compoundability* in the language (ISO, 2009, p. 40). In Dhopadhola, formations such as *wolo, awolo, wolere, wolawola, wolirok* resonate with native speakers' use of the language and are *linguistically correct.*

The use of indigenous terms, expressions or constructions must take precedence over borrowed terms. This rule is applicable to both the use and creation of neoterms or complete borrowing of terms from source languages (ibid., p.41). Thus, terms in indigenous/native languages should be given priority over those copied from other languages, especially those outside the language family. For instance, whereas 'famile' is widely used and understood by many Jopadhola speakers, or 'familia' among Swahilis, the native terms 'pecho' and 'ukoo' are preferable to the former.

11.2 Definition of the term "term"

An expression W"$_L$ (a phrase W" in any language L) is a term T_L if and only if it represents a concept Θ and fulfils an acceptability function A(P, E, G, I, T, O, S, C)

where A = acceptability,
P = precision
E = economy
G = generativity (or productivity)
I = internationality
T = transparency
O = objectivity
S = systemicity
C = consistency of the term T_L

In the symbolic paraphrase of the definition [1]

[1] $T_L = [Θ + W"_L + A(P, E, G, I, T, O, S, C)]$
A(P, E, G, I, T, O, S, C) is the PEGITOSCA Criterion[2].

11.3 Exemplification of the sub-criteria of PEGITOSCA

In Luganda, precision can be illustrated as in [2]

[2] i) {force = **ekikasi**}, { work = **omulimu** }, {energy= **amaanyi}.**
ii) {mass = **obutole**}, {weight = **obuzito}.**

In Dhopadhola:

[2] i) {force = **derino**}, {work = **tich}**, {energy = **meni}.**
ii) {mass = **muma**}, {weight = **peko}.**

In Lumasaaba**:**

[2] i) {force**= kumusiindikho}, {**work**=kumulimo}, {**energy **=kamaani}.**
ii){mass**=bukali}, {**weight **= busiro}.**

In Runyoro-Rutooro

[2] i) {force**=akasindikaine}, {**work**=omulimo}, {**energy **=amaani}.**
ii){mass**= amalemerro}, {**weight **= obulemeezi}.**

It should be noted that to attain precision in, for instance, Luganda, the coinages '**ekikasi**' and '**obutole**' are contrived such that '**ekikasi**' is derived from '**okukaka**' (to force) and '**obutole**' from '**ekitole**' (lump).

[3] German "Zivilluftfahrt Versicherungsgesellschaft" = English "Civil Aviation Insurance Company" affords us an example of (language – relative) economy.

There are more than 900 **electro•**X and about 250 **micro•**X words, according to Dorian (1978). Therefore, we can say that **electro**- and **micro**- are productive combining forms.[3]

Logical, mathematical, physics and chemical symbols are internationally stipulated. The International Union for Pure and Applied Physics (IUPAP), the International Union for Pure and Applied Chemistry (IUPAC), the International Commission for Botanical Nomenclature (ICBN) and the International Commission for Zoological Nomenclature (ICZN) regulate terminology and standards at the international level.[4]

Language nationalism and/or level of education of the prospective terminology users may lead to transparency or opacity of a term as in [4].

[4] i) German **Sternkunde** = **Astronomie** "astronomy"
ii) Kiswahili **elimunyota** = **astronomia** "astronomy"
iii) Lumasaaba = **bye tsing'enyesi**

However, it should be conceded that opacity will only prevail if the German or Kiswahili speaker does not know Classical Greek intimately.[5] That is, etymologically treated, 'astronomy' originated from the Greek word '*astronomos'*, meaning arrangement of stars.

In the so-called exact sciences of logic, mathematics, physics, chemistry and biology, there is a preference for objective rather than subjective terms, which principle should be upheld for all disciplines in term formation.

Systemicity, as captured formulaically by $CnH2n_{+2,}$ is a hallmark of chemical nomenclature.[6] The alkanes form a system, the first of which is **meth•ane** CH_4[6]. In other words, objectively formulated terms must be guided by a **well-defined system** or principle. Systems allow term coiners to account for every term logically and objectively and demonstrate their validity. This can be illustrated by the argument:
If X_1 and X_2 are propositions and a conjunction of X_1 and X_2 is false, i.e. $[X_1 \wedge X_2] = 0$, then X_1 is inconsistent with X_2. Otherwise, if $[X_1 \wedge X_2] = 1$, then X_1 and X_2 are a consistent set of propositions.[7]
As far as acceptability is concerned, can it ever happen that A(P, E, G, I, T, O, S, C) is optimised by a highly qualified coiner (subject field specialist) and yet be rejected by the relevant terminology user community? Yes, if, for instance, the coiner's spelling or newly extrapolated affix is deemed to be unacceptable.[8]

11.4 Conceptual analysis

If we go along with Matthews (2007), a concept is

> *a mental construct seen as mediating between a word and whatever it denotes or is used to refer to*[9].

Hence, what the English 'dog' and Kiswahili 'mbwa' have in common is the concept *dog.* According to Kiingi (2021, 2022), conceptual entities may be arranged in ascending order of complexity as follows: quantity, quality, form, proposition, set, number, degree, length, neighbour, direction, ordered object, matter, change, non-change, time, energy, material object, living being, plant, animal, human, perceiver, mental being, non-material object, emotional being, institution, supernatural being. He has also arranged conceptual predicates in ascending order of complexity: change bearer, non-change bearer, reference, dynamic contactor, static contactor, contactee, dynamic causer, static causer, and causee.

The conceptual entities may alternately be arranged vertically from I – XXVII and the conceptual predicates be arranged horizontally from 1 – 9. Furthermore, if y = conceptual entity and F = conceptual predicate, then yF is a conceptual element. What emerges is a table of conceptual elements with 27 periods a, q, … i, b; and 9 conceptual groups B, Z, R, …, C, K, E[10].

11.5 A table of conceptual predicates

A table of conceptual predicates is the bedrock of a conceptological theory. It represents an understanding of a universe of words or terms expressible in human language. It is important in two major ways. Firstly, it is a solution to the current problem of semantic role theory. Secondly, and on a practical note, it represents a conceptual framework for all intending term-coiners for whatever language we choose to be concerned with. For more information on semantic roles, please refer to (SIL, 2023; Bornkessel, Schlesewsky, Comrie, & Friederici, 2006).

The Periodic Table of Conceptual Elements

		1 B	2 Z	3 R	4 N	5 T	6 A	7 C	8 K	9 E	
I	a	aB	aZ	aR	aN	aT	aA	aC	aK	aE	Quantity
II	q	qB	qZ	qR	qN	qT	qA	qC	qK	qE	Quality
III	ϕ	ϕB	ϕZ	ϕR	ϕN	ϕT	ϕA	ϕC	ϕK	ϕE	Form
IV	p	pB	pZ	pR	pN	pT	pA	pC	pK	pE	Proposition
V	s	sB	sZ	sR	sN	sT	sA	sC	sK	sE	Set
VI	n	nB	nZ	nR	nN	nT	nA	nC	nK	nE	Number
VII	γ	γB	γZ	γR	γN	γT	γA	γC	γK	γE	Degree
VIII	l	lB	lZ	lR	lN	lT	lA	lC	lK	lE	Length
IX	j	jB	jZ	jR	jN	jT	jA	jC	jK	jE	Neighbour
X	d	dB	dZ	dR	dN	dT	dA	dC	dK	dE	Direction
XI	o	oB	oZ	oR	oN	oT	oA	oC	oK	oE	Ordered object
XII	m	mB	mZ	mR	mN	mT	mA	mC	mK	mE	Matter
XIII	c	cB	cZ	cR	cN	cT	cA	cC	cK	cE	Change
XIV	k	kB	kZ	kR	kN	kT	kA	kC	kK	kE	Non-change
XV	t	tB	tZ	tR	tN	tT	tA	tC	tK	tE	Time
XVI	e	eB	eZ	eR	eN	eT	eA	eC	eK	eE	Energy
XVII	r	rB	rZ	rR	rN	rT	rA	rC	rK	rE	Material object

XVIII	v	vB	vZ	vR	vN	vT	vA	vC	vK	vE	Living being
XIX	f	fB	fZ	fR	fN	fT	fA	fC	fK	fE	Plant
XX	z	zB	zZ	zR	zN	zT	zA	zC	zK	zE	Animal
XXI	h	hB	hZ	hR	hN	hT	hA	hC	hK	hE	Human
XXII	w	wB	wZ	wR	wN	wT	wA	wC	wK	wE	Perceiver
XXIII	u	uB	uZ	uR	uN	uT	uA	uC	uK	uE	Mental being
XXIV	x	xB	xZ	xR	xN	xT	xA	xC	xK	xE	Non-material object
XXV	g	gB	gZ	gR	gN	gT	gA	gC	gK	gE	Emotional being
XXVI	i	iB	iZ	iR	iN	iT	iA	iC	iK	iE	Institution
XXVI I	b	bB	bZ	bR	bN	bT	bA	bC	bK	bE	Supernatural being
		Change Bearer	Non-Change Bearer	Reference	Dynamic Contactor	Static Contactor	Contactee	Dynamic Causer	Static Causer	Causee	

The ascending order of complexity of conceptual entities seems to correlate with the pure subject fields as is shown in [5].

[5] i) a – p logic
ii) a – o mathematics
iii) a – r physics and chemistry
iv) a – v biology
v) a – f botany
vi) a – z zoology
vii) a – g psychology
viii) a – i sociology
ix) a – b "transology" (for lack of an already – existing precise term)[11]

On the link between language and mind Chomsky (2002) writes:

> *When we study human language, we are approaching what some might call the "human essence," the distinctive qualities of mind that are, so far as we know, unique to man [sic].*

While we agree with Chomsky that the qualities of mind are unique to humans, he stops short of stating the infinite ability of language to conceptualise the world around us in its entirety. With language at our disposal, we can discuss concepts in any discipline. For example, language as a system can ably help us map Newtonian and Newtonianised reality on the screen of the human mind.[12] Consider the following example:

> Absolute/relative (non-)change, i.e. force = mass x acceleration = 0 involves the simple/complex predicates: [B], [BR]; [Z], [ZR]. Dynamic/ static contact, i.e. $force_{12} = -force_{21}$, involves the complex predicates [NA], [TA]. Dynamic/ static causation, i.e. force = mass x acceleration ≠ 0, involves the complex predicates [CE], [KE].

Conceptual analysis/synthesis is formalisable as shown in [6].[13] [6]

i) The door opens rB r [B]
ii) The door is open rZqR r [ZR] q
iii) The warden finds the key hNrA h [NA] r
iv) The warden has the key hTrA h [TA] r
v) The key opens the door $r_1C[r_2B]$ E r_1 C[B]E r_2
vi) The warden opens the door hC[r_2B] E h C[B]E r_2
vii) The warden opens the door with the key hC[r_1C[r_2B]E]E h C[C[B]E]E r_2 r_1
viii) The student is learning the theory hNxA h [NA] x
ix) The student knows the theory hTxA h [TA] x
x) The lecturer is teaching him the theory $h_1C[h_2NxA]E$ h_1 C[NA]E h_2 x

Propositions [6 (vii)] and [6 (x)] are paraphrasable as in [7]: [7]

(i) The warden causes the key to cause the door to open.
(ii) The lecturer is causing the student to learn the theory.

If conceptual predicates are juxtaposed with sentence patterns, interesting correspondences become evident, as is shown in [8]: [8]

(i)	[Σ]	S	V	where Σ = B/ Z	
(ii)	[ΣR]	S	V	C/Adl	
(iii)	[ΨA]	S	V	O	where Ψ = N/ T
(iv)	(iv) Φ[Σ]E	S	V	O	where Φ = C/ K
(v)	Φ[ΣR]E	S	V	O	C/Adl
(vi)	Φ[ΨA]E	S	V	O	O
(vii)	Φ[Φ[Σ]E]E	S	V	O	O

The concepto-sentential correspondences play a major part in extrapolative work towards suffixes and combining forms (cf. Sec. 5).

11.5.1 Expressional extrapolation of Luganda

By expressional extrapolation we understand the systematic generation of new affixes on the pattern/basis of already-existing ones or the intensified application of already-existing lexeme formation rules.

Presumably, all languages subtly tend to meet the subcriterion of economy by developing affixes following the order given in [9]:

[9] S" > S' > W" > C > S/ R >F/ H

The formation of the mutative suffix "-en" in [10]: [10]

(i) The sky becomes black. [l^3 B q R]: < S V C/ Adl > l^3 [BR] q

(ii) The sky blackens. [l^3 B]: < S V > l^3 [B]

is an apt illustration of sentence pattern reduction exhibited in [11]:[11]

(i) [∑]: < S V >

(ii) [∑]: < S V C/ Adl >

(iii) [ΨA]/ [Φ[∑]E]: < S V O >

(iv) [Φ[∑R]E]: < S V O C/ Adl >

(v) [Φ[ΨA]E]/ [Φ[Φ[∑]E]E]/: < S V O O >

The most generalised expressional labelling of conceptual predicates in Luganda concurs extrapolatively with [10] and [11], as shown in [12]: [12]

(ia) [B]: **okukyuka/ okufuuka**; khushuukha,

(ib)[Z]: **okuba**

Runyoro-Rutooro = okuba

Lumasaaba = khuuba

(iia) [BR]: **okukyukila / okufuukila**

Lumasaaba: **khukhebulila**

Runyoro-Rutooro: **okuhinduka/okufooka**

(iib) [Z]: **okubeela**

Acoli **= me bedo kamo**

Lumasaaba**= khuuba …**

Runyoro-Rutooro= okuba

(iiia) [NA]: **okukuuta-ku/okukwata-ku**

Lumasaaba**= khuwaamba/khunyoola/khutuya**

Runyoro-Rutooro: okukwata ha…/

(iiib) [TA]: **okwekuusa-ku/**

okukwata-ku/okufa-ku

Runyoro-Rutooro: kukwata-ho/kufaa-ho

(iv) [Φ[Π]E]: **okuleet(el)a**, where [Π] = [∑]/ [∑R]/ [ΨA]

Runyoro-Rutooro: [Φ[Π]E]: **okuleet(er)a**, where [Π] = [∑]/ [∑R]/ [ΨA]

(v) [Φ[Φ[Π]E]E]: **okuleet(el)a okuleet(el)a,**

In Acoli**: me kelo pi-{**to bring for}

Lumasaaba=**khu-reerera**

For the benefit of the reader who may not be familiar with the Luganda labels in [12], the renditions suggested in [13] may prove handy, respectively.

[13] (ia) [B]: "to change/become"
(ib) [Z]: "to be/exist"
(iia) [BR]: "to relatively change/ become"
(iib) [ZR]: "to be relative"
(iiia) [NA]: "to contact"
(iiib) [TA]: "to be in contact with"
(iv) [Φ[Π]E]: "to cause"
(v) [Φ[Φ[Π]E]E]: "to cause to cause"

11.6 Extrapolated lexeme formation rules

From the data in [14], the lexeme formation rule in [15] is extrapolatable.

[14]	(i) F•S	oku•S•H•a	F•S•H•L
	en•naku	oku•naku•wal•a	F_a•naku•wav•u

Runyoro-Rutooro:

en-naku	oku.naku.hara	F_a•naku•ha•ire
"misery"	"to become miserable"	"miserable"
(ii) oku•R•a	oku•R•H•a	F•R•H•L
oku•naab•a	oku•naab•il•a	eki•naab•il•o
"to wash oneself"	"to wash oneself in/at"	"washroom"

Runyoro-Rutooro: o.ku.naaba oku. naab.ir.a eki. naab.ir.o

Dhopadhola:

[14] (iii) F•S	S•H•a	F•S•H•L
chand•i	chand•i•r•o•k	chand•e•r•e
"misery"	"to become miserable"	"miserable"
(iv) R•a	R•H•a	F•R•H•L
lwok	lwok•i•r•o•k	ka•lwok/ka•lwok•i•r•o•k
"to wash oneself"	"to wash oneself in/at"	"washroom"

[15] F•S/R•H•a F•S/R•(a) H•L

Therefore, the sequence in [16] is possible, and is exemplified in [17]:

[16] F•S oku•S•H•a oku•R•aH•a
F•S•H•L F•R•aH•L

[17] (i) circum•X ≡ oku•S•buga oku•R•abug•a
F•S•bug•a F•R•abug•L
(iia) circumlunar ≡ F_a•ezi•bug•a □omu•ezi• "moon"
(iib) circumscribe ≡ oku• wandiik•abug•a □oku•wandiik•a "to write"

From the data in [18], we extrapolate the rule in [19]:

[18] (i) [eki•ntu ki•tt•a abantu] eki•tt•a•bantu
it kills people" "genocide"

Runyoro-Rutooro:

eki.ntu ki.it.a abantu eki. it. a. bantu

(ii) [eki•ntu ki•banj•a mpola]eki•banj•a•mpola
"it duns softly" "soft loan"

Runyoro-Rutooro:

(ii) [eki•ntu	ki•banj•a	mpola]	eki•banj•a•mpola
"it	duns	softly"	"soft loan"
(iii) [omwana	a•ggul•a	enda]	omu•ggul•a•nda
"child	opens	womb"	"first-born"
(iv) [omwana	a•ggal•a	enda]	omu•ggal•a•nda
"child	opens	womb"	"last-born"

(v) [omuntu a•yagalw•a abantu] omw•ayagalw•a•bantu
"He/she is liked by the people" "popular person"
(v) [omuntu a•gonz.eblw•a abantu] omu•gonz•ebwa
"He/she is liked by the people" "popular person"
Lumasaaba: [omundu ukanibwa] ['umanyikhanile']

[19] [F•S F_{pro}•R•a/ wa Z] → F•R•a/ wa/ (y)e•Z*
The extrapolated part of [19] is exemplified in [20]:

[20] [omwana awandiise bubi ebbaluwa] → "child has written the letter badly"
[ebbaluwa empandiike obubi] → empandiikebubi
"the badly written letter" "the badly-written"
The extrapolation in [22] is supported by data in [21]:
[21] (i) [mu•ko li•lomi] → mu•ko•ddomi
F_1•S_1 li•S_2 F_1•S_1•S^+_2
"in-law male" "male in-law"
Lumasaaba: paapa.umu.masaala. Umu'masaala we saani.
(ii) [nnam•pulil•a li•zib•i] → nnam•pulil•a•zzib•i
F_1•R_1•a li•R_2L F_1•R_1•a•R^+_2.L
"hearer hard" "a person who is hard of hearing"
u.rekeeres.a
(iii) [omu•wala li•lume] → omu•wala•ddume
F_1•S_1 li•S_2 F_1•S_1•S^+_2
"girl male" "tomboy"
(iv) [omu•wala li•yana] → omu•wala•jjana
F_1•S_1 li•S_2 F_1•S_1•S^+_2
"girl young" "well-developed teen-age girl"
(v) [oku•sek•a li•buniz•a] → oku•sek•a•bbuniz•a
F_1•R_1•a li•R_2•a F_1•R_1•a•R^+_2•a
khu-tsekh-a

[22] $[F_1 \bullet S_1 / R_1 \bullet L \quad li \bullet S_2 / R_2 \bullet L] \rightarrow F_1 \bullet C_1 \bullet C^{+}_{2}$

While the rule in [15] leads to complex lexemes, those in [19] and especially [22] can be invoked to deal with virtually all English combining-form compounds with hardly any palpable apprehension. Let us look at examples of combining-form words in [23]:

[23] (i) F•tono → Z•ttono ≡ micro•X

Runyoro-Rutooro

"ke" "small"

(i) F•nene → Z•ddene ≡ macro•X

Runyoro-Rutooro

(ii) " kooto" "large"

(iii) ama•meme → Z•mmeme ≡ electro•X[14] "electricity"

(iv) en•kasi → Z•kkasi ≡ cyber•X "oar"

(v) em•baziso → Z•bbaziso ≡ computer•X[15]

Runyoro-Rutooro

(i) em•baziso → Z•bbaziso ≡ computer•X[15] "computer"

(ii) ama•ka → Z•kka ≡ eco•X

Runyoro-Rutooro

ama.ka "home"

(iii) oku•tuuka → Z•ttuuka ≡ ortho•X

Runyoro-Rutooro:

(iv) oku•hika→ Z. hika ≡ ortho•X
"to become right"

(v) en•si → Z•ssi ≡ geo•X

Runyoro-Rutooro

en•si → Z•nsi ≡ geo•X
"earth"

(vi) obu•lamu → Z•ddamu ≡ bio•X

Runyoro-Rutooro

obu•omeezi → Z•omeer.a ≡ bio•X
"life"

(vii) F•kise → Z•kkise ≡ crypto•X
"hidden"

(viii) ebbugumu → Z•bbugumu ≡ thermo•X
"heat"

(ix) kyenkana → Z•kkyenka ≡ virtual•X

Runyoro-Rutooro

(x) kingana → Z• ingana ≡ virtual•X
"virtually"

11.7 Expressing fundamental concepts

It should be underscored that the very essence of terminology development is for the developer to systematically classify and express concepts in his/her natural language. To that end, the periodic table of conceptual elements in Section 11.4 seems to provide an extremely good point of departure, for it purports to encompass all human knowledge. To illustrate this point, let us consider three fundamental concepts, namely gradation (γ), direction (d), and order (o).[16]

11.7.1 Gradation

In specialised Luganda, gradation can be expressed as in [24] with examples in [25].

[24] (i)	F•S•Ø	F•S•ja	F•S•jja
(ii)	F•S•Ø	sse•F•S	sse•F_+•S
[25] (ia)	ekibangilizi	ebbangaja	ebbangajja
	"area"	"volume"	"hyperspace"
(ib)	ekibuga	ekibugaja	ekibugajja
	"town"	"city"	"megacity"
(ic)	F•S•ttono	F•S•ttonoja	F•S•ttonojja
	"micro•X"	"ultramicro•X"	"micromicro•X"
(id)	F•S•ddene	F•S•ddeneja	F•S•ddenejja
	"macro•X"	"ultramacro•X"	"macromacro•X"

(ie)	eggwangawansa "tribe"	eggwangawansaja "subtribe"	eggwangawansajja "infratribe"
(if)	olulimiwansa "dialect"	olulimiwansaja "subdialect"	olulimiwansajja "infradialect"
(iia)	edduuka "shop"	sseduuka "supermarket"	ssemaduuka "hypermarket"
(iib)	olutalo "war"	sselutalo "major war"	ssematalo "world war"

11.7.2 Order

The concept of order subsumes those of the neighbourhood (j) and direction (d). For illustration of expressing order let the data in [26] be studied.

[26] (i) oku•ggal•a #oku•ggul•a

Runyoro-Rutooro:

(i) oku•king•a # oku•kingur•a "to close" "to open"
(ii) oku•bal•a # oku•bul•a "to become plentiful" "to disappear"

Runyoro-Rutooro:

(ii) oku•kany•a # oku•keeh•a "to become plentiful" "to reduce in quantity or in size"

(iii)oku•bbik•a # oku•bbuk•a "to immerse" "to bounce back"

Runyoro-Rutooro:

(iv)	oku•ibik•a	# oku•iburr•a	"to immerse"	"to remove from water"
(v)	oku•kal•a	# oku•kul•a	"to dry up"	"to grow up"
(vi)	oku•om•a	# oku•kur•a	"to dry up"	"to grow up"

We may generalize from the data in [26] to [27]:
[27] oku• (K)Ka/ e/ i Ka # oku• (K)Ko/ uKa, where K is a consonant) as the extrapolative move required. [27] expresses contrast which we may exemplify in [28].

[28] (i)	oku•R•agala	#oku•R•agula	“down•X”	“up•X”
(ii)	F•S•kyana	# F•S•kyuna	“homeo•X”	“poikilo•X”
(iii)	F•S•yawa	# F•S•yuwa	“hetero•X, mixed-X”	“homo•X, same-X”
(iv)	F•S•nkana	# F•S•nkuna	“equi•X, iso•X”	“aniso•X”
(v)	F•S•nnana	# F•S•nnona	“artificial X”	“original X, proto•X, ur•X”
(vi)	F•S•ssonja	# F•S•ssanja	“discrete X”	“continuous X”
(vii)	F•S•mag•L	# F•S•mug•L	“random X”	“systematic X”
(viii)	ttaba•Z	# ttuba•Z	“general X”	“special X”
(viii)	F•S•ttuuka	# F•S•ttaaka	“ortho•X”	“unortho•X”

11.7.3 Direction

[1] (i) oku•S•**w(al)a** = “to become F•S”
(ii) oku•S•**wuka** # oku•S•**w(al)a**

[2] (ia) oku•S•**nawa** = “to become pertinent to F•S”
(ib) oku•S•**nuwa** # oku•S•**nawa**
(iia) oku•S•**mawa** = “to become F•S•**ma**”
(iib) oku•S•**muwa** # oku•S•**mawa**
(iiia) oku•S•**pawa** = “to become an element/ member of F•S•**ma**”
(iiib) oku•S•**puwa** # oku•S•**pawa**
(iva) oku•S•**vawa** = “to become F•S•**va**”
(ivb) oku•S•**vuwa** # oku•S•**vawa**
(va) oku•S•**cawa** = “to become a part of F•S•**va**”
(vb) oku•S•**cuwa** # oku•S•**cawa**

[3] (i) F•S•**bela** = “F•S which is in front”
(ii) F•S•**bega** = “F•S which is at the back”
(iii) F•S•**bwa** = “F•S which is outside”
(iv) F•S•**kwa** = “F•S which is on the surface”
(v) F•S•**mwa** = “F•S which is inside”
(vi) F•S•**gwa** = “F•S which is above/ up”
(vii) F•S•**nsa** =“F•S which is below/under//on the undersurface”
(viii) F•S•**kata** = “F•S which is in the middle”

(ix) F•S•**ndamwa** = "F•S which is within// in there"
(ix) F•S•**kiika** = "F•S which is across"
(x) F•S•**kumpa** = "F•S which is near"
(xi) F•S•**wala** = "F•S which is far"

[4] (ia) oku•S•**la** = "to face F•S"
(ib) F•S•**la** = "that which faces F•S "
(iia) oku•S•**ka** # oku•S•**la**
(iib) F•S•**ka** # F•S•**la**
(iii) oku•S•**belala** = "changing of an entity to become F•**bela**"
(iv) oku•S•**begala** = "changing of an entity to become F•**bega**"
(v) oku•S•**bwala** = "changing of an entity to become F•**bwa**"
(vi) oku•S•**kwala** = "changing of an entity to become F•**kwa**"
(vii) oku•S•**mwala** = "changing of an entity to become F•**mwa**"
(viii) oku•S•**gwala** = "changing of an entity to become F•**gwa**"
(ix) oku•S•**nsala** = "changing of an entity to become F•**nsa**"
(x) oku•S•**katala** = "changing of an entity to become F•**kata**"
(xi) oku•S•**ndamwala** = "changing of an entity to become F•**ndamwa**"
(xii) oku•S•**kiikala** = "changing of an entity to become F•**kiika**"
(xiii) oku•S•**kumpala** = "changing of an entity to become F•**kumpa**"
(xiv) oku•S•**walala** = "changing of an entity to become F•**wala**"

[5] (i) F•S•**mbela** = "an entity which is in front of F•S"
(ii) F•S•**mbega** = "an entity which is behind F•S"
(iii) F•S•**bwela** = "an entity which is outside F•S"
(iv) F•S•**kunga** = "an entity which is on the surface of F•S"
(v) F•S•munda = "an entity which is inside F•S"
(vi) F•S•wagwa = "an entity which is above/ over F•S"
(vii) F•S•wansa = "an entity which is below/ under F•S"
(viii) F•S•wakata = "an entity which is in between F_{+}•S"
(ix) F•S•mundamwa = "an entity which is within F•S"
(x) F•S•nkiika = "an entity which is across F•S"
(xi) F•S•laana = "an entity which is near F•S"
(xii) F•S•suula = "an entity which is far from F•S"

[6] (i) oku•S•**belaka** # oku•S•**belala**
(ii) oku•S•**begaka** # oku•S•**begala**
(iii) oku•S•**bwaka** # oku•S•**bwala**
(iv) oku•S•**kwaka** # oku•S•**kwala**
(v) oku•S•**mwaka** # oku•S•**mwala**
(vi) oku•S•**gwaka** # oku•S•**gwala**
(vii) oku•S•**nsaka** # oku•S•**nsala**
(viii) oku•S•**kataka** # oku•S•**katala**
(ix) oku•S•**ndamwaka** # oku•S•**ndamwala**
(x) oku•S•**kiikaka** # oku•S•**belala**
(xi) oku•S•**belaka** # oku•S•**kiikala**
(xii) oku•S•**walaka** # oku•S•**walala**

[7] Anatomical Directions
(1) (i) "oral" ≡ (ia) F_a•**mwa•na**
(ib) F_a•**mwa•la**
(ii) "adoral" ≡ F_a•**mwala**
(2) "aboral" ≡ F_a•**mwa•ka**
(3) "anterior" ≡ (3i) F_a•**beli•na**
(3ii) F_a•**beli•la**
(4) "posterior" ≡ (4i) F_a•**bega•na**

(4ii) F_a•**bega•la**

(5) "dorsal" ≡ (5i) F_a•**solya•na** (5ii) F_a•**solya•la**

(6) "ventral" ≡ (3i) F_a•**buto•na** (3ii) F_a•**buto•la**

(7) "caudal" ≡ (3i) F_a•**kila•na** (3ii) F_a•**kila•la**

(8) "lateral" ≡ F_a•**nna•luuyi**

(9) "medial" ≡ (9i) F_a•**kati•na** (9ii) F_a•**kati•la**

(10) "proximal" ≡ F_a•**laanajja** (**<***oku*•**lilaanajja**)

(11) "distal" ≡ F_a•**sudde,** F_a•**wala•na**

(12) "cephalic" ≡ F_a•**twe•na**

(13) "cranial" ≡ F_a•**wanga•na**

(14) "superior" ≡ F_a•**gula**

(15) "inferior" ≡ F_a•**gala**

11.8 Tangible results

At this juncture, it should be stated that using the data above, three major results can be propounded from the work done by Dr. Kiingi Kibuuka in Luganda so far:

1) A list of some 1,550 English-Luganda combining forms has been compiled (Kiingi, 2021).
2) Some 250 affixes have been obtained through extrapolation (Kiingi, 2022).
3) With the application of the three newly extrapolated lexeme formation rules, we are able to render virtually all English compound terms into specialised Luganda.

The above achievements are not only a terminological milestone for Luganda, but all Ugandan languages. Both Bantu and non-Bantu languages of Uganda and Africa will extensively benefit from the above principles and examples in Luganda. Additional information can be obtained from www.luganda.com.

11.8.1 Some prototypical terminological systems

11.8.2 Rendition of X•illion into Luganda

X•illion		≡	aka•S_{num}•kkadde[17]
(i)	10^{63}	vigintillion	≡ akaabilikkadde
(ii)	10^{60}	novemdecillion	≡ akakumyendakkadde
(iii)	10^{57}	octodecillion	≡ akakuminaanakkadde
(iv)	10^{54}	septendecillion	≡ akakumisanvukkadde
(v)	10^{51}	sexdecillion	≡ akakumikaagakkadde
(vi)	10^{48}	quindecillion	≡ akakumitaanokkadde
(vii)	10^{45}	quattuordecillion	≡ akakuminakkadde
(viii)	10^{42}	tredecillion	≡ akakumisatukkadde
(ix)	10^{39}	duodecillion	≡ akakumibilikkadde
(x)	10^{36}	undecillion	≡ akakumimukkadde
(xi)	10^{33}	decillion	≡ akakumikkadde
(xii)	10^{30}	nonillion	≡ akendakkadde
(xiii)	10^{27}	octillion	≡ akanaanakkadde
(xiv)	10^{24}	septillion	≡ akasanvukkadde
(xv)	10^{21}	sextillion	≡ akakaagakkadde
(xvi)	10^{18}	quintillion	≡ akataanokkadde
(xvii)	10^{15}	quadrillion	≡ akanakkadde
(xviii)	10^{12}	trillion	≡ akasatukkadde
(xix)	10^{9}	billion	≡ akabilikkadde
(xx)	10^{6}	million	≡ akamukkadde
(xxi)	10^{3}	thousand	≡ olukumi
(xxii)	10^{2}	hundred	≡ ekikumi
(xxiii)	10^{1}	ten	≡ ekkumi

11.8.3 Rendition of Système International (SI) prefixes into Luganda18

10^{30}	quecca•X	ssessegugu•S•ena = df huggu•S•ena
10^{27}	ronna•X	ssegugu•S•ena = df sseggu•S•ena
10^{24}	yotta•X	ssegu•S•ena
10^{21}	zetta•X	wagu•S•ena
10^{18}	exa•X	ogu•S•ena
10^{15}	peta•X	ssegu•S
10^{12}	tera•X	wagu•S
10^{9}	giga•X	sselu•S•ena
10^{6}	mega•X	walu•S•ena
10^{3}	kilo•X	olu•S•ena
10^{2}	hecto•X	sselu•S
10^{1}	deca•X	walu•S
10^{0}	F•S	
10^{-1}	deci•X	wapi•S
10^{-2}	centi•X	ssepi•S
10^{-3}	milli•X	epi•S•ona
10^{-6}	micro•X	wapi•S•ona
10^{-9}	nano•X	ssepi•S•ona
10^{-12}	pico•X	waka•S
10^{-15}	femto•X	sseka•S
10^{-18}	atto•X	aka•S•ona
10^{-21}	zepto•X	waka•S•ona
10^{-24}	yocto•X	sseka•S•ona
10^{-27}	ronto•X	ssekaka•S•ona = df ssekka•S•ona
10^{-30}	quecto•X	ssessekaka•S•ona = df hukka•S•ona

11.8.4 Gandisation of some international chemical affixes and combining forms19

English	Luganda	English	Luganda
-ane	-aani	-al	-ali
-ene	-eeni	-ol	-oli
-yne	-yini	-yl	-yili
-ate	-aati	-ile	-iili
-ase	-aasi	-ide	-iidi
-ose	-oosi	-ic	-iki
aqua-	aqwa-	dehydro-	dehyidro-
aza-	aza-	deoxy-	deoxyi-
azido-	aziido-	des-	des-
but-	but-	deuterio-	deuterio-
bromo-	bromo-	diazo-	diazo-
sec-	sek-	disulfido-	disulfiido-
tert-	tert-	endo-	endo-
catena-	catena-	epi-	epi-
chloro -	kloro	-eth-	eth-
cis-	cis-	exo-	exo-
closo-	kloso-	fac-	fac-
cyano-	syano-	fluoro-	fluoro-
cyclo-	syiklo-	formyl-	formyil-
cycloalk-	syikloalk	friedo-	friedo-
de-	de-	halocarbonyl-	halokarbonyil-
dec-	dek-	hept-	hept-
dithio-	dithio-		
hex-	hex-	para-	para-
homo-	homo-	pent-	pent-
hydro-	hyidro-	per-	per-
hypo-	hyipo-	peroxo-	peroxo-
hydroxyl-	hyidroxyil-	prop-	prop-
iso-	iso-	pyro-	pyiro-
meth-	meth-	rac-	rac-

meta-	meta-	rel-	rel-
methoxo-	methoxo-	seco-	seko-
methylene-	methyileeni-	sulfo-	sulfo-
neo-	neo-	syn-	syin-
nido-	niido-	thioxo-	thioxo-
nitro-	nitro-	trans-	trans-
nitroso-	nitrooso-	tritio-	tritio-
nitrosyl-	nitrosyil-	uranyl -	uranyil-
nitryl-	nitryil-	vinyl-	vinyil-
non-	non-	-co-	-ko-
nor-	nor-	-io-	-io-
ortho-	ortho-		
oxa-	oxa-		

11.8.5 Zoological taxonomy

Neo-Latin	English	Luganda
REGNUM	KINGDOM	OBWA•KABAKA[20]
subregnum	subkingdom	wapi•kabaka
infraregnum	infrakingdom	ssepi•kabaka
superphylum	superphylum	walu•solya
PHYLUM	PHYLUM	AKA•SOLYA
subphylum	subphylum	wapi•solya
superclassis	superclass	walu•siga
CLASSIS	CLASS	ESSIGA (<ELI•SIGA)
subclassis	subclass	wapi•siga
infraclassis	infraclass	ssepi•siga
supercohortus	supercohort	epi•sigo•ona
cohortus	cohort	wapi• sigo•ona
subcohortus	subcohort	ssepi• sigo•ona
infracohortus	infracohort	waka•siga
superordo	superorder	walu•tuba
ORDO	ORDER	OMU•TUBA
subordo	suborder	wapi•tuba

infraordo	infraorder	ssepi•tuba
superfamilia (-oidea)	superfamily	walu•nyilili
FAMILIA (-idae)	FAMILY	OLU•NYILILI
subfamilia (-inae)	subfamily	wapi•nyilili
infrafamilia	infrafamily	ssepi•nyilili
supertribus	supertribe	epi•nyilily•ona
tribus (-ini)	tribe	wapi•nyilily•ona
subtribus (-ae, -i)	subtribe	ssepi•nyilily•ona
infratribus	infratribe	waka•nyilili
supergenus	supergenus	walu•kulilo
GENUS	GENUS	EKI•KULILO
subgenus	subgenus	wapi•kulilo
infragenus	infragenus	ssepi•kulilo
superspecies	superspecies	wapi•yu
SPECIES	SPECIES	ENJU <EN•YU>
subspecies	subspecies	watu•yu

11.8.6 Taxonomy of the dog21

REGNUM	ANIMALIA	OBWA•KABAKA	OBWENSOLO
Subregnum	Metazoa	Wapikabaka	Wapyazinvannyuma
PHYLUM	CHORDATA	AKA•SOLYA	AKAZINNALUGUWA
Subphylum	Vertebrata	Wapi•solya	Wapyazinnalugongo
Superclassis	Tetrapoda	Walu•siga	Walwazinnamagulwana
CLASSIS	MAMMALIA	ESSIGA(<ELI•SIGA)	ELYAZINNAMABEELE
Subclassis	Theria	Wapi•siga	Wapyenjizzi
Infraclassis	Eutheria	Ssepi•siga	Ssepyenjizziwawu
Cohortus	Ferungulata	Wapi•sigo•ona	Wapyazinnabinuulokkambwe
Superordo	Ferae	Walu•tuba	Walwenkambwe
ORDO	CARNIVORA	OMUTUBA	OGWENDYANNYAMA
Subordo	Fissipeda	Wapi•tuba	Wapyazinnabigelejjaseemu
Superfamilia	Canoidea	Walu•nyilili	Walwembwa
FAMILIA	CANIDAE	OLU•NYILILI	OLWEMBWA
Subfamilia	Caninae	Wapi•nyilili	Wapyembwa

GENUS	CANIS	EKI•KULILO	EKYEMBWA
SPECIES	FAMILIARIS	ENJU (<EN•YU)	NNABULIJJO

The systematic name is **Ekyembwa nnabulijjo.**

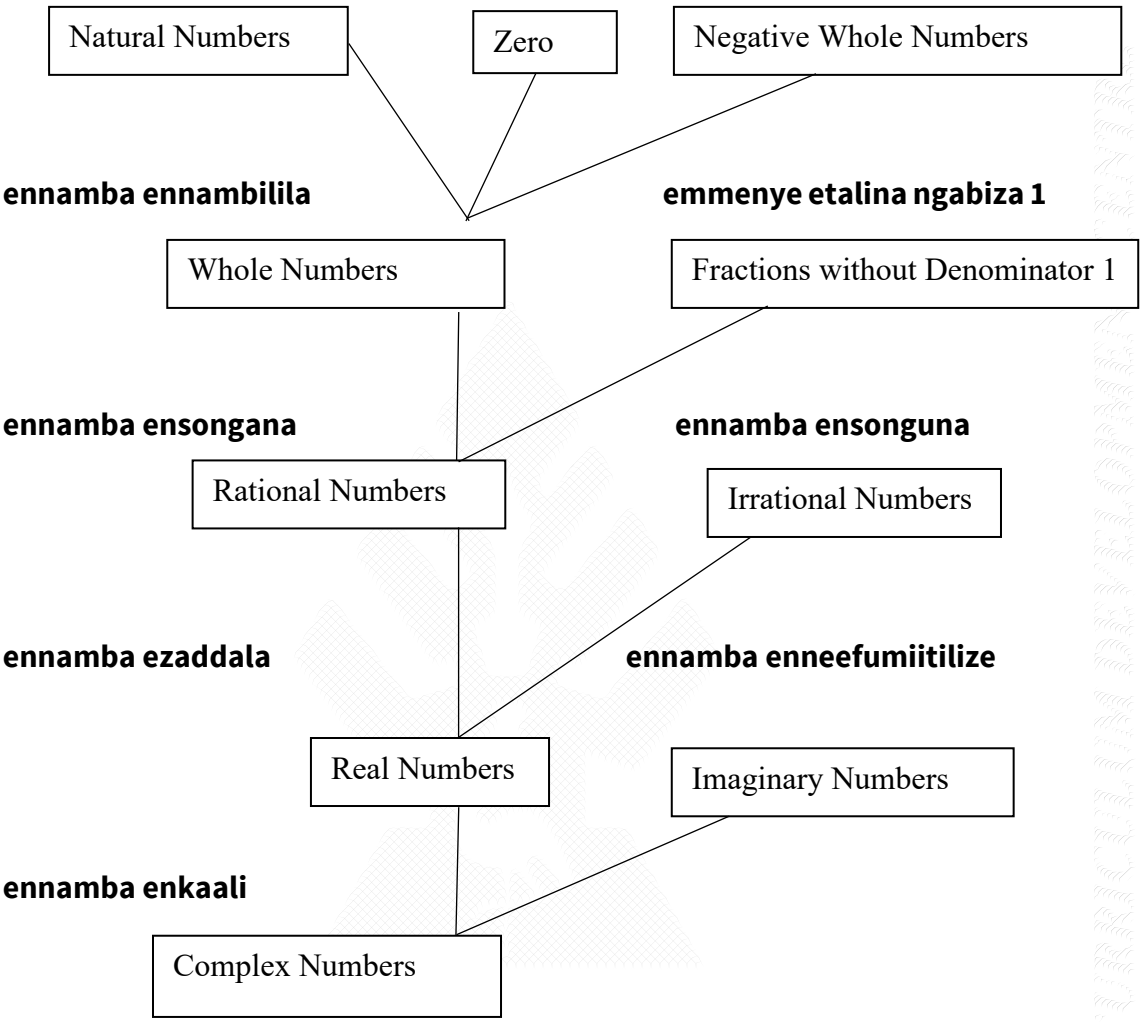
11.8.7 Taxonomy of the human

REGNUM	ANIMALIA	OBWA•KABAKA	OBWENSOLO
Subregnum	Metazoa	Wapikabaka	Wapyazinvannyuma
PHYLUM	CHORDATA	AKA•SOLYA	AKAZINNALUGUWA
Subphylum	Vertebrata	Wapi•solya	Wapyazinnalugongo
Superclassis	Tetrapoda	Walu•siga	Walwazinnamagulwana
CLASSIS	MAMMALIA	ESSIGAELYAZINNAMABEELE	
Subclassis	Placentalia	Wapisiga	Wapyazinnakisungwa
ORDO	PRIMATES	OMUTUBA	OGWAZISSENKULU
Superfamilia	Hominoidea	Walunyilili	Walwennyintu
FAMILIA	HOMINIDAE	OLUNYILILI	OLWENNYINTU
GENUS	HOMO	EKIKULILO	EKYOMUNTU
SPECIES	SAPIENS	ENJU	NNABUGEZI

The systematic name is **Ekyomuntu nnabugezi.**

11.8.8 Classification of numbers

ennamba zinnabutonde **zzeelo** **ennamba zinnabulamba** **enneddayi**



11.8.9 Hierarchy of anatomical structure

"BODY"	≡	OMUBILI	F•S•**vamama** = df F•S•**ga**
"ORGAN SYSTEM"	≡	OMUYUNGO GW'EMILUKEVAMA	F•S•**vama**
"ORGAN"	≡	EKILUKEVA	F•S•**va**
"TISSUE"	≡	EKILUKE	F•S
"CELL"	≡	AKASENGEJJA	F•S•**ca**
"ORGANELLE"	≡	AKASENGEJJACA	F•S•**cama**
"BIOCHEMICAL"	≡	EKIKEMIYANADDAMU	F•S•**camama =** df F•S•**fa**

11.9 Conclusion

From the foregoing discussion, two inferences can be drawn. First, once subject field specialists are trained in general linguistics and the linguistic structure of their language whose corpus is being planned, there is no need to involve the linguists in the **actual term coining**. Second, with **radical expressional extrapolation** terminological maturity is reachable in, say, **five years**; but if the terminologically weak language is left to its own devices, it may take at least **1–1½ centuries** to terminologically mature.

12.0 Methods of Term Formation

This section examines term formation methods that have been used, particularly in English. It also explores the adoptability of these methods in the creation of specialised terms in Uganda's indigenous languages, making a case for Luganda, which seems to enjoy more solid research in this area (see www.luganda.com; Kiingi, 1989; Kiyinikibi, 2011; Namyalo 2010; 2019). Some example terms, symbols and abbreviations used in this section have been adopted from Kiingi (2022) for proper illumination of the main idea of this section.

Terms are items of designation 'characterised by special reference within a discipline', and the totality of terms of a discipline form its *terminology* (Sager, 1990, p. 19). The purpose is often to facilitate communication of specialised knowledge units or knowledge structures that were either previously non-existent in the conceptual universe of speakers of a certain language, or unattested in a form considered adequate for new demands of communication (Antia, 2000, p. 33).

Although terminology resources are meant for various target audiences (e.g. in teaching and learning, mass media, translation, authoring, and so on) with different needs (Arntz, Picht, & Schmitz, 2014, p. 298), terminology development in language planning contexts of the developing world is fundamentally linked to the management of knowledge growth or change. It therefore requires attention to knowledge structure. There are many methods of terminology development and these methods may vary from one language to another (Sager, 1997; Picht, 1985; Kiingi, 2023; Terminology Coordination

Unit, 2023). Several term formation methods such as compounding, blending, abbreviations, acronyms, clipping, initialisation, derivation, eponyms, semantic expansion, borrowing, back-formation, and circumlocution have been discussed under six clear-cut categorial processes, including: composition, morphophonemic change, semantic change, neologism and borrowing, functional change, and miscellaneous.

12.1 Composition

Composition includes all processes that join previously established words, word parts, bound bases, combining forms, or affixes to form new lexical units. These include compounding, combining, derivation, blending, acronymisation, and initialisation.

12.1.1 Compounding

According to Sager (1997), compounding is defined as the combination of two or more free morphemes to form a new syntagmatic unit with a new meaning independent of the constituent parts. Compounding joins two established words into a single new semantic unit without otherwise altering their form. This method is very productive in the aspect of new specialised term creation. Examples of such words include the following:

(a) [N + N] airwaves [AIRWAVES TRANSMISSION) = mayengobbanga
(b) [A + Adv] white-out(HIDE ERROR) = ekikwekansobi
(c) [N + N] Family planning (BIRTH CONTROL) = ekizaalaggumba
(d) [N + N] carnivore(MEAT-EATER) = endyannyama
(e) [N + N] herbivore (HERBAGE-EATER) = endyamuddo

Also classed as compounds in this handbook are lexical units made up of a word plus a letter or symbol (provided the letter was not simply an initial), for example:

(f) [letter + N] x-ray = endasabifaanyindamubiri-X ; ekisire
(g) [letter + N] A-amplifier = Enzimbulukusaddoboozi-A
(h) [letter + N] X-bar = omulabba-x
(i) [symbol + N] I2R loss = okufiilwa-12R
(j) [symbol + N] SIN ratio = ebinnakitundu-SIN
(k) [letter + N] z-parameter = olugelelo-z

Dubic (1997) explains that compounds are made of two, three or more units in which the nucleus is determined by the modifier(s). He explains that the relationship between the nucleus and the modifier can be that of subordination, coordination, juxtaposition or disjunction. In English, just like in Ugandan native languages, compounding is one of the methods used in the formation of words and terms. Compounds can be categorised in terms of their word class and meaning. Compounds can be further classified into four types, namely endocentric (with transparent meaning predictable from their constituent parts), exocentric (with non-transparent meaning), copulative (with two semantic heads) and appositional (with two [contrary] attributes that classify the compound) (Kuiper & Allan, 2004, pp. 33–35).

12.1.2 Combining

Combining is the formation of words by joining those bound morphemes commonly referred to as "combining forms". Initial and terminal combining forms may be joined to each other to come up with the following resultant terms:

a) aerography (from aero- + -graphy)
b) coprolite (from copro- + -lite)
c) eolith (from eo- + -lith)
d) rheostat (from rheo- + -stat)
e) xenomorphic (from xeno- + -morphic)

Initial combining forms and free forms resulted in geomagnetic, megaton, monaural, plano-convex, and thermocouple. Free forms and terminal combining forms were joined to create powerstat and sodalite.

12.1.3 Derivation

Derivation is a method of creating new terms usually by adding one or more derivational affixes to an already existing root of a word or term. Derivational affixes are grammatical elements that occur as prefixes and suffixes. Prefixing and suffixing are both prominent in the formation of specialised terms. In

semantics, every affix is defined and technical terms, for example in the category of nouns, can be derived from verbs using derivational affixes. For example:

a) **micro- =** (i) **F•**S.**tono** [SIZE/ QUANTITY]; microscope = endabisottono
(ii) **F•**S.**tono** [SIZE/ QUANTITY]; microwave = ejjengottono

b) **micro- =** (i) **F•**R.**tono** [SIZE/ QUANTITY]; microwave = okuyengottona

c) **inter- =** (i) F•S**•gana** [BETWEEN/AMONG]; intersection = ekisalagano
(ii) F•S**•kata** [BETWEEN/AMONG]; international= obuwangakafu

d) **mono- =** (i) F_{num}**• S•mu** [ONE/SINGLE]; monocotyledon = oluuyilumu
(ii) F_{num}**•nna•**S**•mu**[ONE/SINGLE]; monocotyledous= ekinnaluuyilumu

e) **poly- =** (i) F**• S•ngi** [MANY] ; polygon = ekyanjuyinnyingi
(ii) F_{num}**•nna•**S**•ngi** [MANY]; polygamous = omunnabakyalabangi

f) **per- =** F**• S•buga** [THROUGH(OUT)]; perimeter = olubugirizo

g) **cross- =** (i) F**• R•buga** [MUTUALITY; SWITCH]; cross-examine = okwekebejjassaaba
(ii) F**• S•buga** [THROUGH (OUT)]; cross-examination = ekyekebejjossaaba

h) **equ- =** F_a•S**•nkana** [EQUAL; BALANCED]; equation = ekyenkanonkano

The above examples emphasise that Luganda employs the derivational method of term formation as is the case with other Ugandan indigenous languages. Note that an affix is attached to the base or root form of a word to create a new concept and each affix has a special meaning or definition. Among the kinds of affixes are prefixes, which are the morphemes added to the beginning of a word to modify its meaning. Thus, prefixing can form new adjectives, and alter old nouns to form new nouns, such as semiconductor from conductor; and can also form new verbs from old verbs, such as de-energise from energise. Prefixes can also be joined with combining forms to create new free forms like anhedral, subhedral, and epitaxy. As is the case with prefixing, suffixing can be performed by many similar operations, as illustrated below in ((i)-(iv)):

(i) nominalising adjectives: absorptive; neutral (to form absorptivity, neutron)
(ii) nominalising verbs: amplify; refract (to form amplifier, refractor)
(iii) forming adjectives: (like hydrogenous from their antecedent nouns and verbs)
(iv) altering noun names (from names of things, like epidotisation from epidote)

Suffixes also joined with combining forms to create cyclotron, dendrite, and poecilitic. The terminal form -tron ' – apparatus' – is particularly productive, attaching itself to a wide variety of bases, both free and bound, creating such terms as digitron, plasmatron, and sigmatron from free forms; chronotron, cryotron, and megatron from bound forms; and apparently capacitron and transitron from shortened free forms. The following examples are given to further illuminate the potentiality of suffixation in Ugandan indigenous languages, a case in point being Luganda:

(i) **-ize =** (i) oku•S•**wala** [MAKE OR BECOME] ; pasteurise =okuttabuwukawala

a. (ii) oku•S•**waza** [MAKE OR BECOME]; sterilise = okuttabuwukawaza

(j) **-logy =(i) kayiga**•W [SUBJECT OF STUDY]; biology = kayigabilamu

a. **(ii) kanna**•W [SUBJECT OF STUDY]; zoolology = kannakayigabisolo

(k) **–let = aka**•S [SMALLER/LESSER]; piglet = akabizzi

(l) **-graphy = kalojja**•W [DESRIPTIVE SCIENCE]; geography = kalojjansi

(m) **-proof =** F•**guma**•W [RESISTANT; WITHSTAND]; waterproof = ekigumiramazzi

(n) **-metrics=kapima**•W [RELATING TO MEASUREMENT]; geometrics =kapima**bbanga**

12.1.4 Blending

Blending is the complex cutting involving the removal of multiple parts from multiple words and joining the remaining fragments or morphemes into a single term to describe a new invention or phenomenon that combines the definitions or traits of two separate existing words. Simple blending of the beginning of one word with the end of another produced the following terms:

(a) boffle (from box baffle)

(b) thermistor (from thermal resistor)

(c) electret (from electricity + magnet)

(d) wavicle (from wave + particle)

(e) varactor (from varying reactor)

(f) camcorder (camera + recorder)

(g) Microsoft (from microprocessor + software)

Other simple blends were formed from the beginning of the first word and the entire second word, as indicated in the following examples:

(h) contrails (from condensation trails)
(i) permafrost (from permanent frost)
(j) vocoder (from voice coder)

Overlap blending, in which the antecedent words have common phonemes at the point of juncture, can also be represented in the following scientific terms:

(k) transistor (from transfer resistor)
(l) positron and negatron (from positive and negative electron)
(m) dynamoter (from dynamo + motor)
(n) brunch (from breakfast + lunch)
(o) motorcade (from motor + cavalcade)

Word blends therefore result in change in spelling and can also be created by joining a full word with a splinter of another word. Blending and new blends are inevitable in African indigenous languages, considering the need to articulate science and other specialised fields. Thus, new word blends are being created all the time as cultural and technological trends emerge, and this has not excluded our native languages. Some of the Luganda words that have been formed by blending words in catch phrases include:

(p) Ssembuule (blended from personal names from Ssembuya + Bbuule)
(q) Kase (blended from personal names Kato + Ssekandi)
(r) Runyakitara (blended from names of languages Runyankore-Rukiga-Runyoro-Rutooro)
(s) Lusoganda (blended from names of languages Luganda and Lusoga)

12.1.5 Acronymisation

Acronymy and initialisation both pertain to the creation of new lexical units from the initial letters of a phrase, but here the term acronymy is reserved for letter groups or syllables that are pronounced as words rather than as groups of initials.

Examples of scientific English acronyms include the following:

(a) laser (from light amplification by stimulated emission of radiation)
(b) maser (from microwave amplification by stimulated emission of radiation)
(c) elsie (from electronic letter sorting and indicating equipment)
(d) hermes (from heavy element radioactive material electromagnetic separator)
(e) zeta (from zero energy thermonuclear apparatus)
(f) RADHARD (from Radiation Hardness)
(g) NOMAD (from Neutrino Oscillation Magnetic Director
(h) LEAR (from Low Energy Antiproton Ring)
(i) HEP (from High Energy Physics)

It should be further emphasised that, acronymy at times uses syllables, and they can also be a mixture of syllables and can be pronounced as words (see (j)–(n)) or as individual letters (see (o) – (q)) below:

(j) Benelux (short for Belgium, the Netherlands and Luxembourg)
(k) MIDAS (Missile Defence Alarm System).
(l) UNESCO (United Nations Educational, Scientific and Cultural Organization)
(m) NASA (National Aeronautics and Space Administration)
(n) NATO (North Atlantic Treaty Organization)
(o) ATM (Automatic Teller Machine)
(p) FBI (Federal Bureau of Investigation)
(q) GMA (Global Media Arts)

It should be noted that, when an acronym takes a full transition to an English term, then it is rarely capitalised as in ((a) and (b)). As a method of term creation, acronymisation has also been witnessed in some Ugandan native languages, especially in relation to names of political parties and associations, to mention but a few:

(r) GUZU (Gula Uganda Zimba Uganda) (proper name of an association agitating for local consumption)

(s) BABA (Bazzukulu ba Lwomwa) (proper name of an association uniting Sheep clanmates)
(t) KY (Kabaka Yekka)
(u) BABU (Bataka Bbu) (name of Baganda association of the past)

12.1.6 Initialisation

Initialisation is a method of term formation in which the initial letters of a multiple-word/term are pronounced/written individually, as in (a) and (b) below. Partial initialising, the reduction of only part of the term to initials, may also occur with the retention of the remaining words in their entirety as in (c) and (d):

(a)a.h.m. (from "ampere-hour metre")
(b) z.f. (from "zero frequency")
(c)VU metre (from "volume unit metre")

This process is similar to the compounding of words and letters, except that here the letters are always abbreviations of words in the original group. It should be noted that the terms formed by initialisation are basically nouns and they maintain the same semantic value of the terms from which they are extracted. Below are some examples of initialised terms formed by taking the initial letter of the words that occur as a phrasal term, as in (d)–(g):

(d) TB = Tuberculosis
(e) Kg = Kilogramme
(f) CM = Centimetre
(g) DA = Discourse Analysis

Initialisms are mainly used in written language, not spoken language. In African languages, we might have to borrow most of the chemical elements and their abbreviated chemical symbols as well as the units of measurements from Source Languages (SL) like English. Example of units of measurements in Luganda which are borrowed are in (h)–(r):

(h) M = Metre = **Miita**
(i) Kg = Kilogramme = **kirogulaamu/kiro**
(j) S = Seconds = **Sikonda**

(k) A = Ampere = **Ampaya**
(l) K = Kalvin = **Kaluviini**
(m) Yi = Inches = **Yinsi**
(n) Ft = Feet = **Fuuti**
(o) Yd = Yards = **Yaadi**
(p) Ml = Mile = **Mairo**
(q) Gn =Gallon = **Ggalani**
(r) Sm = Centimetre = **Sentimita**

12.2 Morphophonemic change

Morphophonemic processes alter form but not meaning or function class. Morphophonemic changes are evidenced by the various clipping processes by which a new term is formed from a shortened original longer term, often reducing it to one syllable. Many examples of such formations are informal.

According to Dubic (1997), clipped forms come about as a result of either front clipping (fore-clipping), back-clipping (hind-clipping) or middle clipping (mid-clipping). Combined clipping (front-clipping and back-clipping) does also occur although rarely.

12.2.1 Front-clipping (fore-clipping)

Two possible examples of front-clipping were found: holder and crop, which Collocott (1971) indicates are short forms of lamp-holder and outcrop. Webster's *Third Dictionary* lists outcrop as one of the definitions of crop, but for holder, it only says "a device... in which something is held". Examples of front-clipped words include the following ((a)–(c)):

(a) university = varsity
(b) internet = net
(c) telephone = phone

In Luganda, there are cases of front-clipping as indicated in the following examples:

(a) Nantongo = Ntongo
(b) Basajjamivule = Mivule

12.2.2 Back-clipping (hind-clipping)

The English terms formed by back-clipping include the examples (d) – (j):

(c) amp (from ampere)
(d) strobe (from stroboscope)
(e) dis (from discontinuity)
(f) pot (from potentiometer)
(g) math (from mathematics)
(h) photo (from photograph)
(i) lab (from laboratory)

In Luganda, this method of word formation has been so popular in the proper personal names and also in toponyms but can also be identified elsewhere as shown below:

(a) Nantongo = Ntongo
(b) Basajjamivule = Mivule
(c) Buddukiro = Buddu
(d) Zaamufuula = Zaamu
(e) Najjalwambi = Najja
(f) Ssekkadde = Sseeka
(g) Zirabamuzaale = Ziraba

12.2.3 Middle-clipping (combined clipping)

Front-clipping, the opposite of back-clipping, and double-clipping, which is the combination of the two, are significant term formation processes. However, middle-clipping works by shortening a word through the removal of a group of phonemes from the middle. Examples include *muon* derived from "mu-meson" and *pion* derived from "pi-meson". Today, 'muon' and 'pion' have become new words used in physics (Soudek, 2007, p. 103). In health, the word "flu" has been shortened from "influenza". The fact is that middle-clipping has been proven to be more productive than both front-clipping and double-clipping. These processes therefore deserve further investigation in relation to their applicability to African indigenous languages.

13.0 Semantic change formation processes

The processes of semantic change alter meaning but not form or function class. Semantic change was by far the most productive of the categories, and the most common type of semantic change was the widening of the meanings of established words.

14.0 Adoption

Meaning widening can be effected by simple adoption, which alters the use of a word by giving it a new specific meaning but one still within its established general meaning. An example is the adoption of the general term 'accumulator' into the jargon of electrical engineering to refer specifically to a device for accumulating electricity, a storage battery.

15.0 Semantic expansion

A more radical process is expansion of meaning, by which a new denotation, with perhaps little or no relation to previous denotations, is given to an established word. Caso (1980) observes that "[n]uclear physicists expanded the meaning of dollar to designate a certain quantity of atomic reactivity. This quantity was then divided into 100 parts called cents."

The semantic extension of words already available in the language is a powerful source of qualitative development of the vocabulary despite the fact that it does not necessarily add to its numerical growth. It is only the split of polysemy that results in the appearance of new vocabulary units, thus increasing the number of words. In semantic extension, archaic or obsolete words may be resurrected in the language or dialect in order to accommodate the burden of new technical meanings. "A great number of new meanings develop in simple words which belong to different spheres of human activity" (Semantic extension, 2023). These new meanings appear mostly in everyday general vocabulary, for example:

(a) beehive = 'a woman's hairstyle'
(b) lungs = 'breathing spaces', such as small parks placed in congested areas
(c) bird = 'any flying craft'

(d) vegetable = 'a lifeless, inert person'
(e) clean (slang) = 'free from the use of narcotic drugs
(f) uncap (slang) = to disclose.

There is a strong tendency for specialised terms to develop non-specialised meanings, for example, the technical term "feedback" developed a purely non-technical meaning: 'a reciprocal effect of one person or thing upon another'. It is important to note that many new meanings are stylistically and emotively non-neutral and marked as colloquial and slang, for example:

(g) juice (US sl.) - 'position, power, influence, favourable standing'
(h) bread (sl.) - 'money, food'
(i) straight (sl.) - 'not deviating from the norm in politics, habits; conventional, orthodox'

Scientific and technical terminological meanings appear as a result of specialisation as in *read* (genetic) - 'to decode'; *messenger* - 'a chemical substance which carries or transmits genetic information'. New terminological meanings also appear as a result of expansion of the sphere of application, that is to say, when terms of one branch of science develop new meanings and pass over to other branches.

It is worth noting that new meanings appear not only as a result of semantic development of words but also as a result of semantic development of affixes, for example the prefix 'anti-' developed two new meanings: 1) 'belonging to the hypothetical world consisting of the counterpart of ordinary matter' such as anti-matter, anti-nucleus etc.; 2) 'that which rejects or reverses the traditional characteristics', for example anti-electron, anti-novel etc.; the prefix 'non-' also developed a new meaning 'sham, pseudo', for example non-actor, non-book etc.

In a nutshell, the semantic development of words already available in the language is the main source of the qualitative growth of the vocabulary, though

it does not essentially change the vocabulary quantitatively. In Luganda we have a number of words which have undergone semantic extension:

(j) **Okubala** = to count (original meaning); to think hard; to plan (extended meanings)

(k) **Okutema** = to cut (original meaning); to go; to give (extended meaning)

(l) **Okulya** = to eat (original meaning); to get a position of influence (extended meaning)

(m) **Omusaayi** = blood (original meaning); money (extended meaning)

(n) **Caayi** = tea (original meaning); bribe (extended meaning)

16.0 Metaphor

Another common variety of widening is metaphorical use, which lies between adoption and expansion in the degree of semantic change made. The following metaphorical example expression from plasm physics can be illustrated:
= doughnut (to refer to a doughnut-shaped apparatus).

17.0 Eponymy

Somewhat similar to expansion is the process of eponymy, which widens a proper name into a common noun. Etymologically, the word 'eponym' came into use around 1833 and comes from the Greek word '*eponymos*', structurally broken into '*epi*', meaning 'after/upon', and '*onyma*', meaning 'name'. Simply put together, it is: 'name after'. The English language, like other languages of the universe, has a large number of eponyms. An eponym is a person or a thing, whether real or fictional, after whom or which a specific discovery, place or era is believed to be named. Thus, the person becomes the 'eponym' of that thing. Eponymous words/terms cover a wide range of subject fields, for instance, astronomy and zoology, geographical exploration and physics. It should be noted that the name-giving part of the term is mostly capitalised in the English language while the common noun part is not capitalised.

In physics, particularly, eponymy is a more favourite process, where the practice of naming units of measure after distinguished scientists has become popular. It has given us several examples:
ampere, coulomb, curie, fermi, gilbert, henry, hertz, newton, ohm, rutherford, watt etc.
When the eponym is too lengthy for convenience, eponymy is often employed in conjunction with back-clipping. Joint products of eponymy and back-clipping include:

(a) *torr* from Torricelli
(b) *gal* from Galileo
(c) *farad* from Faraday
(d) *volt* from Volta

Six types of eponyms can be identified:

(i) Simple eponyms in which a proper noun has been fully adopted and become the common noun of something else such as 'Atlas' (now used as a common term for a book of maps).
(ii) Compounds and attributive eponyms; these eponyms combine names and attributes such as 'The Loganberry' (named after the United States lawyer, James Logan).
(iii) Possessive eponyms, which are written in the possessive style and attribute ownership of their namesake, such as 'Newton's laws' of physics (named after the physicist, Sir Isaac Newton).
(iv) Suffix-based derivative eponyms, which are eponyms in which the name of the person is combined with a suffix to make a new word, for example, 'Mesmerism' (is named after a German physician, Franz Mesmer).
(v) Clipped eponyms, which are the eponyms where the names have been shortened or adapted, for instance, a 'gal' is the name of a unit of measurement of acceleration shortened from the name of the scientist Galileo Galilei.

(vi) Blended eponyms, which refer to eponyms in which two words are blended together to make a new one, as in the term 'Reagonomics', a combination of the name 'Reagan' and the word 'economics', and refers to the policies of ex-US President Ronald Reagan.

The potentiality of indigenising these eponyms in Ugandan indigenous languages such as Luganda is indisputable, as illustrated in the following examples (g)– (i):

(a) The Napoleonic Code = **Amateeka ga Napoleon**
(b) Newton's Laws of Motion = **Amateeka ga Newton ag'Okwejjulula**
(c) Archimedes' Principle = **Etteeka lya Akimedizi**
(d) **Omukaabya** (a period of suffering named after Kabaka Muteesa)
(e) **Omuteesa** (a period of dialogue named after Kabaka Muteesa)
(f) **Ow'e Ddambwe** (deaf) (Named after Kabaka Kiggala)

Observing from (a) – (f) above shows that eponyms can be found throughout pop cultures when names or titles of famous folks such as kings become names of things they have invented, coined, or popularised. Thus, some eponyms can be identified in Luganda and most probably in other Ugandan languages.

18.0 Induction antonomasia

Widening by inductive antonomasia (Logan, 1989; Caso, 1980), by which a specific term becomes generic, occasionally converts a trade name into a common noun. A good example is the use of 'aspirin', which has become synonymous with 'painkiller' (UsingEnglish.com, 2023). Further examples are aqualung, fathometer, and gramophone, all of which were previously trade names but are now used to refer to the respective kinds of device, regardless of its manufacturer.

19.0 Neologising and borrowing

The fifth category encompasses processes that introduce new words that were never existent in the language or with no antecedents in the target language.

20.0 Neologism

There are genuine root creations in neologisms that spring full grown from the minds of their creators with no prior history. Neologisms are rare; for example, onomatopoetic zoop, a name for a kind of noise sometimes produced by electronic audio equipment. In Luganda, there are many neologisms in general vocabulary, and this is an indicator of the potentiality of term creation using neologisms. Some Luganda neologisms include the following:

(a) ebicupuli (fake money etc.)
(b) ekiwaani (also means fake)

21.0 Borrowing

Borrowing "… is the process by which a word from one language is adapted for use in another" (Nordquist, 2023). Borrowing from foreign languages is proving to be the second largest contributor to the specialised term formation, being surpassed only by widening of meaning. The traditional sources of Latin and Greek have been by far outnumbered by borrowings from modern French and German. Physicists and earth scientists apparently prefer commandeering terms from their European colleagues to resorting to the ancients. Geologists, mineralogists and meteorologists also seem happy to accept terms for substances and phenomena from the languages of the locales where they commonly occur and, as a result, the list of terms from the earth sciences donated from different languages include:

(a) breccia (from Italian)
(b) banket (from Afrikaans)
(c) burin (from Russian)
(d) caldera (from Spanish)
(e) carbonado (from Portuguese)
(f) nunatak (from Eskimo)
(g) Swedish (from skarn)
(h) polje (from Serbo-Croatian).

The English language has been described by David Crystal (2008) as an 'insatiable borrower' for all fields, both specialised and general (Nordquist, 2023).

More than 120 other languages have served as sources for the contemporary vocabulary of English. Today only about five per cent of new English words are taken from other languages. They are especially prevalent in the names of foods such as focaccia, salsa, vindaloo, ramen etc. Present-day English is also a major donor language –the leading source of borrowing for many other languages (Crystal, 2008). We borrow cultural words or phrases to express technological, social or cultural innovations. As Semuwemba (2009) puts it, "one language may possess words for which there are no equivalents in the other language." Nordquist (2023) observes that "there may be words for objects, social, political, and cultural institutions and events or abstract concepts which are not found in the culture of the other language." In Luganda, Semuwemba (2009) observes, "many specialised terms have been adopted and adapted from different foreign languages such as English, Arabic, and so on and the orthography has been indigenised":

(i) hydrogen = **ayidolojeni**
(j) carbon dioxide = **kaboni-birokisayidi**
(k) acid = **asidi**
(l) science = **sayansi**
(m) technology = **tekinologia**
(n) oxygen = **okisijeeni**

When adopting and adapting the chemical names of nitrate, nitrite or oxides, identify the phonological patterns and affixes and decide how to adopt and adapt them in the target language.

22.0 Functional change

This term formation process considers only terminological changes in regard to the functional class, such as noun from adjective or noun from verb, as instances of functional change. Generally, there are only a few cases of functional change, as indicated below:

(a) **Fuse** *n*. 'electrical circuit breaker' from **fuse** *v*.
(b) **Overcast** *n*. 'a covering, especially of clouds' from **overcast** *v.*
(c) **Scram** *n.* emergency shutting down of a nuclear reactor' from **scram** *v*
(d) ***Butter*** *v 'to butter the bread'* from butter *n.*

23.0 Miscellaneous

There are few processes that cannot adequately be classified into any of the above terminological processes. They include folk etymologization, loan translation, anagramming, backformation, concatenation, and circumlocution.

24.0 Etymologising

The effect of folk etymologising was stated or implied by Webster's dictionary (Merriam Webster Dictionary, 2023) in the etymologies of felspar, carstone, and carnelian. Felspar is listed as an alteration of feldspar, "influenced by Gfels rock". Carstone is derived "by folk etymology fr. quernstone". Carnelian is entered as an alteration of cornelian, "prob. influenced by L carn-, caro flesh...fr. its flesh-red colour".

25.0 Loan translation

Literal translation into English, or loan translation, is sometimes resorted to. Examples are 'after-image', from German '*nachbild'*, and 'potstone', from New Latin '*lapis ollaris'*. Partial loan translation results when one of the elements in a foreign compound is translated and the other is borrowed, as in 'eigenvalue', from German '*eigenwert'*. Partial loan translation has been classified as borrowing, but complete loan translation as miscellaneous because, although the latter involves borrowing, it does not introduce any new morphemes.

26.0 Anagramming

The only citable anagrams here are those derived through backwards spellings. Some electrical terms, such as 'ohm' and 'farad', are derived from proper names, and refer to dimensions common in electrical calculations. Their reciprocal values are also quite common, and the reciprocal units have been named as in (a) – (c), thus the reverse spelling being seen as analogous to the taking of a mathematical reciprocal.

(a) ohm (the unit of resistance) = mho
(b) farad (the unit of capacitance)= daraf
(c) henry (the unit of inductance) = yrneh

27.0 Concatenation

Concatenation refers to a compositional process that joins word elements in ways which seem to break etymological conventions or which are too complex to classify otherwise. Examples are hydrocalumite (from hydro- + c- (from calcium) + alum- (from aluminium) + -ite, kalsilite (from kalium, aluminium, and silicon, with the suffix -ite) and estiatron, which seems to be a distillate of electrostatic + -tron. Hyper- on is probably from hyper- + -on, but these elements seem to be identified as prefix and suffix, respectively, making the word an unorthodox merger of affixes with no intervening stem or base. The same is true of peritron, apparently formed from the prefix peri- and the suffix -tron. Possibly -tron has now become a terminal combining form, and hyper- an initial combining form or a free form.

28.0 Back-formation

Back-formation refers to either the process of shortening or creating a new lexeme (less precisely, a new 'word') by removing actual or supposed affixes, or to the neologism formed by such a process. Back-formation is not a new or particularly unusual process, and literature on word formation includes classic examples (see (a)–(d)) and back-formed scientific terms formed from adjectives to nouns (as shown in (e) – (i)):

(a) burgle (from burglar)
(b) edit (from editor)
(c) grovel (from grovelling)
(d) pea (from peas)
(e) syncline (from synclinal)
(f) anticline (from anticlinal)
(g) haze (from hazy)
(h) ultramicroscope (from ultramicroscopic)

In contemporary English, back-formation continues to make a few contributions to the language. 'Television' has given 'televise' on the model of revise/revision, and 'donation' has given 'donate' on the model of relate/relation.

Babysitter and stage manager have given 'babysit' and 'stage manage' for obvious reasons. Back-formations are more likely to occur with very strongly entrenched patterns and they have the effect of filling an apparent void. The process has given us many more verbs, such as:

(i) afflict (from affliction)
(j) enthuse (from enthusiasm)
(k) laze (from lazy)
(l) liaise (from liaison)
(m) aggress (from aggression)
(n) housekeep (from housekeeper).

It should be noted that many back-formations never gain real legitimacy, some are aborted early in their existence, and still others are of questionable vigour. However, many of them have survived respectably.

29.0 Circumlocution

Circumlocution (also called circumduction, circumvolution) is a method of introducing new terms into a language by giving the meaning of a foreign term. It involves the use of unnecessarily large numbers of words to express an idea. It is a universal phenomenon in natural languages covering all the aspects of the lexicon. The preference for circumlocution is a result of the abundance of foreign terminology, especially compound neologisms, where conventional attempts to reduce them to one-word terms have failed. Circumlocution is necessary in communication (for example, to work around lexical gaps that might otherwise lead to untranslatability), but it can also be undesirable (when an uncommon or easily misunderstood figure of speech is used).

Circumlocution, which is looked at as '*roundabout speech*', is the use of many words to describe something that already has a common and concise term, for example saying 'a tool used for cutting things such as paper and hair' instead of scissors.

Most dictionaries use circumlocution to define words. Circumlocution is used by people with aphasia and people learning a new language, where simple terms can be paraphrased to aid learning or communication, for example, paraphrasing the words:

(a) grandfather (paraphrased as 'the father of one's father')
(b) antagonist (paraphrased as 'He-Who-Must-Not-Be-Named')
(c) urinate/defecate (paraphrased as 'go to the bathroom')

Circumlocution can also be used to construct euphemisms, innuendos, and equivocations in African indigenous languages in order to express those words that are considered to be vulgar or indelicate. For example, in Luganda we may have the following expressions (d)–(f):

(d) okulya (kabaka) (paraphrased as 'Kabaka okubeera mu bibbo')
(e) okufa (kabaka) (paraphrased as 'Kabaka okuggya omukono mu ngabo')
(f) okupama (paraphrased as 'okugenda emmanju')

In conclusion, circumlocution is not always a good linguistic practice, because it blurs clarity and directness, especially in specialised communication, and therefore it is not a recommended feature in writing.

30.0 Conclusions

By examining the various word formation processes above, it is observable that some processes are more dominant than others. Thus, the hierarchisation of the categories of word formation processes is in this order: semantic change (adoption, semantic expansion, metaphor, eponymy, and induction antonomasia); composition (in their order: derivation, compounding, combining, blending, initialisation, acronomy); neologising and borrowing (mostly from German, French, and other modern languages, New Latin, Latin and Greek); functional change; morphophonemic change; and miscellaneous (including other methods such as folk etymologising, loan translation, anagramming, back-formation, and concatenation).

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APPENDICES

Appendix I: Indigenous Communities in Uganda as of February, 1926

Acholi, Alur, Baamba, Babukusu, Babwisi, Bafumbira, Baganda, Bagisu, Bagungu, Bagwe, Bagwere, Bahehe, Bahororo, Bakenyi, Bakiga, Bakonzo, Banyabindi, Banyankole, Banyara, Banyarwanda, Banyole, Banyoro, Baruli, Basamia, Basoga, Basongora, Batagwenda, Batoro, Batuku, Batwa, Chope, Dodoth, Ethur, Ik (Teuso), Iteso, Jie, Jonam, Jopadhola, Kakwa, Karimojong, Kebu (Okebu), Kuku, Kumam, Langi, Lendu, Lugbara, Madi, Mening, Mvuba, Napore, Nubi, Nyangia, Pokot, Sabiny, So (Tepeth), Vonoma.

Appendix II: Indigenous communities as in the 2006 Constitution of Uganda

Acholi, Aliba, Alur, Aringa, Baamba, Babukusu, Babwisi, Bafumbira, Baganda, Bagisu, Bagungu, Bagwe, Bagwere, Bahehe, Bahororo, Bakenyi, Bakiga, Bakonzo, Banyabindi, Banyabutumbi, Banyankole, Banyara, Banyaruguru, Banyarwanda, Banyole, Banyoro, Baruli, Barundi, Basamia, Basoga, Basongora, Batagwenda, Batoro, Batuku, Batwa, Chope, Dodoth, Ethur, Gimara, Ik (Teuso), Iteso, Jie, Jonam, Jopadhola, Kakwa, Karimojong, Kebu (Okebu), Kuku, Kumam, Langi, Lendu, Lugbara, Madi, Mening, Mvuba, Napore, Ngikutio, Nubi, Nyangia, Pokot, Reli, Sabiny, Shana, So (Tepeth), Vonoma.

Appendix III: Languages of Uganda by Makerere University (2008)

Acholi, Alur, Ateso, Dhopadhola, Jonam, Kakwa, Kinubi, Kumam, Kupsabiny, Lango, Lendu, Lubwisi, Luganda, Lugbarati, Lugungu, Lugwere, Lukenyi, Lukhonzo, Lumasaaba/Lugisu, Lunyole, Lusamia-Lugwe, Lusoga, Madi, Ndo, Ngakarimojong, Pokoot, Rufumbira, Ruhororo, Rukiga, Runyankore, Runyarwanda, Runyoro, Ruruuli, Rutagwenda, Rutooro, Rwamba, Soo, Southern-Madi, Toposa/Ik.

Appendix IV: Minority Languages of Uganda by Makerere University (2008)

Babukusu, Bahehe, Banyabindi, Banyara, Basongora, Batuku, Batwa, Chope, Dodoth, Ethur, Jie, Mening, Mvuba, Nyang'i, Napore, Vonoma.

Appendix V: Languages of Uganda by SIL/Ethnologue (2024)

Acholi, Adhola, Alur, Amba, Aringa, Bukusu, Bari, Ganda, Gungu, Gwere, Ik, Kakwa, Karamojong, Kebu, Kenyi, Khonzo, Kiga, Kumam, Kupsabiny, Lang'o, Lendu, Lugbara, Madi, Masaaba, Ndrulo, Nyang'i, Nyankore, Nyole, Nyoro, Pokot, Ruuli-Nyala, Rwanda, Saamia, Soga, Soo, Southern Madi, Talinga-Bwisi, Teso, Tooro, Ugandan Sign Language.

Appendix VI: Principles of Term Formation Endnotes

1. Proper names that relate to specific subject fields or individual concepts within a subject field such as The President of Uganda, Office of the Prime Minister, Political Commissar, The United Nations Commissioner for Human Rights (ISO, 2009, p.36).
2. In a personal communication on 23 February 2023, Mr Abraham Wepukhulu, a Kiswahili teacher at Bududa Secondary School, informed me that the Government of Tanzania had reinstated English as the medium of instruction at secondary school level.
3. Acceptability is a subcriterion which in turn is a function of the other subcriteria for term status of an expression.
4. Matthews (2007) defines "combining form" as "a form of a word, or a form related to or in meaning like a word, used only as an element in compounds: e.g. Anglo- in Anglo-American or socio- in socio-economic; retro- in retrovirus or bio- in biotechnology". For Luganda, a combining form C is given as: C = S/ [R•L] e.g. ddeka• in ddekabusa "devastating" or •ddomi in mukoddomi "male in-law"
5. Consequently, a coiner of natural-scientific terms should ideally be competent in his/ her subject field and linguistics.
6. Will Luganda subject-field specialists prefer kompyuta to embaziso even though "to compute" ≡ okubazisa (< okubaza < okubala)?
7. "Marsh gas" is the non-systematic name for CH4.

8. Letting 1 and 0 be the truth values "true" and "false" respectively, the following
truth-table shows us the four possible situations in relation to X1 and X2.

X1	∧	X2
0	0	0
0	0	1
1	0	0
1	1	1

[X1 ∧ X2] = 1 if and only if X1 = X2 = 1

9. For remarks on gandisation of international chemical affixes and combing forms, see Note 19.

10. Matthews' definition of "concept" is consistent with meaning as being sense and reference of an expression.

11. Newton's first, third, and second laws of motion underlie the conceptual predicates B, Z, R; N, T, A; C, K, E respectively.

12. We are using the word "transology" to mean the study of what putatively exists beyond our perceptional, cognitive, axiological and emotional experience.

13.

[∑]	VgI	intransitive verb group(Vg)
[∑R]	VgII	complex-intransitive Vg
[ΨA]/ [Φ[∑]E]	VgIII	monotransitive Vg
[Φ[∑R]E	VgIV	complex-transitive Vg
[Φ[ΨA]E]/ [Φ[Φ[∑]E]E]	VgV	ditransitive Vg

Newtonian/ Newtonianized World Mental Screen

[∑] = [B]/ [Z]
[∑R] = [BR]/ [ZR]
[ΨA] = [NA]/ [TA]
[ΦE] = [CE]/ [KE]

14. We may interpret the formalizations as follows:

(i) physical change
(ii) physical non-change
(iii) perceptional change
(iv) static contact
(v) instrumental causation of physical change
(vi) human causation of physical change
(vii) human causation of instrumental causation of physical change
(viii) dynamic cognitive contact
(ix) nondynamic cognitive contact
(x) human causation of dynamic cognitive contact

15. Kiswahili u•meme ≡ “electricity”; ama•meme is adapted in preference to the already established ama•sannyalaze ≡ “electricity”.

16. embaziso is adopted in preference to kompyuta (cf Note 5).

17. The fundamental concepts involved in the study of mathematics are: a, q, ϕ, p, s, n, γ,
l, j, d, o: in other words, a student of mathematics is required to articulate gradation,
order and direction.

18. 103(n + 1) = X•illion ≡ aka•Snum•kkadde,
Where n = 1, 2, 3, 4, 5, 6, 7, 8, 9, 10

X = bi tri quadr quint sext sept oct non dec undec duodec
= 2 = 3 = 4 = 5 = 6 = 7 = 8 = 9 = 10. = 1+10= 11 = 2+10= 12
tredec quattuordec quindec sexdec septendec octodec
= 3+10 =13 = 4+10 = 14 = 5+10 = 15. = 6+10 = 16 = 7+10 = 17 = 8+10 = 18
novemdec vigint
= 9+10 =19 =

aka•Snum•kkadde results from the application of the formula F1•C1•C+2.

19. The prefix sse• intensifies more than wa•; (o)gu• > (o)lu• > (e)pi• > (a)ka• where > stands for the greater – than relation. The prefix (e)pi• is adopted from Common Bantu.

20. The notational needs in the fields of logic, mathematics, physics, and chemistry

necessitate the adoption of the entire Roman alphabet and the Greek alphabet. The affixes and combining forms laid down by the IUPAC will be gandized through Standard Average European, i.e. not directly from English (the anglicized SAE); for example, “alkane” will be assimilated to Luganda as alkaani and not alukeeni. Retention of SAE consonant clusters will be the order of the day. The lexeme formation rule F1•C1•C+2 will be applied to English compounds <X1 X2> in which X1 is adjectival. For example, CaCl2calcium chloride is:

German	Calciumchlorid
French	chlorure de calcium (“chloride of calcium”)
Luganda	kloriidi ya kalsiumu (“chloride of calcium”) → kloriidikkalsiumu

21. The ICZN stipulates that zoological nomenclature be conducted in neo-Latin. The

seven principal taxa, namely KINGDOM, PHYLUM, CLASS, ORDER, FAMILY,

GENUS, and SPECIES are named in Luganda using the kiGanda clan nomenclatural

system. The taxonomic labels in Luganda are distinct in terms of nominal prefixes:

OBU•, AKA•, ELI•, OMU•, OLU•, EKI• and EN•. To a limited extent, neo-Latin

evidences distinctive suffixes: -oidea, -idae, -inae, -ini, -ae and –i as shown in Sec

6.4.

22. The formula for systematically naming an animal in Luganda is:

Ekya•Z1 nna•Z2

Consider the following examples:

(i) Canis familiaris
"dog" embwa
Ekyembwa nnabulijjo

(ii) Canis lupus
"dog" omusege
Ekyembwa nnamusege

(iii) Musca domestica
"housefly" ensowela
Ekyensowela nnamumaka

(iv) Felis catus
"cat" kkapa
Ekyakkapa nnakkapa

(v) Pan paniscus
"bonobo" bonobo
Ekyabonobo nnabonoko

(vi) Crocodilus niloticus
"Nile crocodile" goonya
Ekyagoonya nnakiyila

(vii) Lates niloticus
"Nile perch" empuuta
Ekyempuuta nnakiyila

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