New Numerals and Alphabets-Contribution towards New Knowledge, Cryptology, Encryption, Learner Support, and Afrocentric Studies

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Abstract- Human communication has developed over thousands of years with contributions to the development of written alphabets and numerals coming from the ancient Phoenicians, Sumerians, Egyptians, Chinese, Greeks, Romans, Indians and Arabs. Our objective in this paper is to introduce new forms of alphabets and numerals which have been developed by us as our personal contribution to the subject of human communication. We developed these characters about ten years ago and now we feel it is time to publish it in a short communication. In this paper, we review some of the literature pertaining to the development of writing and then we introduce the new forms of writing developed by usby stating forward how these new forms of writing can be applied in the real world of human communication. We hope that the new numerals and alphabets will be useful in the fields of encryption, cryptology, and education.

Keywords: alphabets, characters, communication, cryptology, encryption, linguistics, numerals, phonology, syllables, calligraphy, palaeontology.

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NEWNUMERALSANDALPHABETSCONTRIBUTIONTOWARDSNEWKNOWLEDGECRYPTOLOGYENCRYPTIONLEARNERSUPPORTANDAFROCENTRICSTUDIES

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I. Introduction

We are social scientists with training and academic background in Educational Pedagogy and Psychology, Economics, Geography, Business Management, Public Administration, and we have a passion for the English Language as poets and authors. We aim in this article to introduce new and innovative numerals and alphabet characters which we hope will have many applications in Linguistic Studies, Phonology, Cryptology, Programming Language, Computer Science, Machine Learning, Encryption, Communication Science, Information Technology, and Early Childhood Education.

In this article, we introduce new numerals and alphabets with a view to adding a new and fresh angle to the study of human communication. The article is a short communication that addresses our desire to show creativity by adding to the corpus of existing knowledge as part of our contribution to African scholarship. Information is any data that is organised into meaningful form so as to be useful in addressing human problems and, which can be communicated strategically and meaningfully to elicit appropriate responses (Turban et al., 2015).

Since the last two decades from the year 2000, there have been tremendous advancements in technological development in the Information Communication Technology arena, so much so that, there is need to pause and take stock of our gains and losses. We are now in the era of Artificial Intelligence (AI) and Machine Learning (ML), which offer many vistas and new opportunities for breakthroughs, and at the same time, they pose as threats to human peaceful co-existence, as some discoveries such as AI and ML may be used for diabolical and destructive ends, such as creation of intelligent weaponry systems and unmanned weapons launched from outer space.

We are likely to see vistas of Smart Cities with extraordinary seamless and integrated transportation systems, all made possible by AI and ML, using Big Data Analytics in Data Science. Also, we are likely to see further, the merging and integration of world trade, commerce, e-learning, e-money or crypto-currency, and convergent sociological systems in an integrated and boundary-less global community, tending towards what many see as one World New Order (Turban et al., 2015; Kissinger). Convergence itself can offer many cost-saving opportunities, yet it can also lead to intrusion into people's privacy, as governments take control of databases like the case is in China, Russia and many of the centrist-command nations of the world, where databases are at the disposal of the authorities.

Also, we see a lot of kickback around the world against the installation of secret cameras in public places to spy on people, especially to help detect crime and apprehend traffic offenders. We find that many people worldwide are sceptical about the use of facial recognition technologies. All these events and actions have moral, ethical, and technical implications in the fields of information and communication technology, and they have capability to impact positively or negatively on the future lifestyles of human beings.

We take note that Convergence of data systems, through the use of the internet, can create problems of cyber-security for individuals and nations,

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as it was the case of William Assange and the saga of the Wikileaks (Wikipedia).

The poor people who live in areas which lack internet connectivity may further be impoverished and marginalised, leading to the widening of the gap between the haves and have-nots, and also the widening of the internet divide between the rich North and the poor South. We perceive that the migration of businesses and educational systems online, into cyber space post-COVID-19, will cause many disruptions to the way businesses have been run, and also it will cascade into a quantum leap in unemployment in the first phase of this second wave of the great depression. Thereafter, we estimate that about 20-30 years from now, governments and the private sector will find ways to introduce new forms of market interventions, through deskilling and retraining employees to adapt to the new normal, and also through restructuring and reform of the current moribund economic system of free markets and selfish capitalist principles.

II. BACKGROUND

We observe that, from time immemorial, human beings have been thrilled by the desire to use devious means to communicate their ideas to their neighbours, and also to future generations, by the use of symbols, designs, letters, characters, engravings, inscriptions, etchings, incisions, graphics, recorded sounds and videos, sculpture, artefacts, and paintings(Powell, 2009; Schmandt-Besserat, 2007; Schmandt-Besserat, 1996; Nissene & Heine, 2009; webspace.ship.edu).

Our modern alphabets have evolved from many sources, through the contributions of the ancient Egyptians (Hieroglyphics or picture writing), Sumerians (Cuneiform or wedge-shaped writing), Syrians, Greeks, Phoenicians (Aleph Beta), Arabs, Israelites, Persians, Chinese, and Hindus (Sanskrit), among others (Chrisomalis, n.d.; Coe & Stone,2005;Moos, 1997; Bagley, 2004; Baines, 2007; Black, 2008; Bernal, 2007; Chrisomalis, n.d.). In Africa however, we note that the Amharic Language of Ethiopia, and the Fon Language of Dahomey (now Benin Republic in West Africa), are the only African languages which developed their own alphabets or their own unique forms of writing (Boahen, 1968; Mazrui, 1987). As recently as 1989, two brothers in Guinea, West Africa, also developed the Fula alphabet which is called ADLAM, for the Fulani language, a language that was threatened with extinction (Wikipedia, n.d.).

Ethiopia Airways proudly displays the Amharic characters on their aeroplanes. It reveals the long history of Ethiopia and gives them a sense of pride and unique national identity. Writing is the only form of human communication which captures sounds, ideas, emotions, legends, and records of human transactions. Writing has the capability of transmitting messages accurately across countries and across generations, whether electronically or manually (History.com; Powell, 2009; Rogers, 2009). About ten years ago, we sat down and thought of developing new forms of alphabet and numerals which we hope will be innovative to communicators, scientists and those interested in evolution of new ideas.

When we recall history through the works of Johann Guttenberg, William Caxton, Wycliffe and the host of writing and printing pioneers, we are struck with awe at their relentless efforts to bestow to us the art of writing and publishing, which at a point in the distant past, were activities reserved for priests in performing their sacred rites (Sass, 2005; Nice, 2010). Writing, at a point in time, was an exclusive preserve of the few initiates of esoteric and arcane society; a select few in the ancient world. The written word was not easily accessible to everyone, especially the heathen or those considered vulgar, unlettered, and *sans culottes* or those of low pedigree in society (Racoma, 2018; History.com, 2018).

III. LITERATURE REVIEW

a) Afrocentric Viewpoint

According to the United Nations Educational Scientific and Cultural Organization (UNESCO), Arabic, Bengali, English, French, German, Hindi, Japanese, Mandarin Chinese, Portuguese, Russian and Spanish, each has at least 100 million speakers worldwide (UNESCO, n.d.). These languages account for 51% of the population of the world. The remaining 49% speak any of the remaining 6000+ languages, with most sharing a mother tongue with only a tiny percentage of the world's population (UNESCO, n.d.).It is believed that many minority languages throughout the world will soon vanish or become extinct, including the Effutu language (part of the Guan Languages in Ghana) of the people of Winneba, to which we belong.

Most of the world's languages (33% or 2197) are found in Asia, followed closely by 30% coming from Africa (2058). The people of the Pacific and the Americas combined, use 34% (2324) languages, while Europe, with its 230 languages, accounts for only 3% of the total number of languages used across the globe, yet the European languages paradoxically are predominant and are widely spoken around the world, as they are used as official languages and languages of educational instruction, commerce, government business, and general purpose of daily communication (UNESCO, n.d.).

It was the colonial legacy which bequeathed these European languages to their former colonies. The ignominious Trans-Atlantic Slave Trade which was started around 1480 through the recommendation of a Spanish Catholic priest, Las Casas, did serve as a stumbling block to the development of indigenous

African languages(Boahen, 1968; Fage, 1983; Agbodeka, 1967; Ansah, 2018).

In a mixed feeling context, the arrival of foreign religions to Africa such as Islam and Christianity did havoc to the development of indigenous African authentic cultural forms and other art forms on the one hand, and on the other hand, they created educational and commercial opportunities which benefitted both coloniser and colonised. However, we cannot lose sight of the tremendous work which many Christian Missionaries in Africa did to provide an authentic orthography of the indigenous African languages (Ansah, 2018; Ajayi, 1972; Okpewho, 1981; Fanon, 1967; Rodney, 1973; Boahen, et al., 1986).

In Ghana, former Gold Coast, the works of the Scottish, Basel, Wesleyan/Methodist, and Presbyterian churches stand out clearly in the area of studying the local dialects and helping to codify them, and to give them written format (Ansah, 2018; Davidson, 1995; Webster, et al.,1967).

We can recall and recount names such as Rattray, Christaller, Andres Riis, Balmer, Phillip Quarcoe, Thomas Thompson, Dunwell, J. A. Annobil, C.F.C. Grant, Ato Ahuma, C. A. Akrofi and Ajayi Crowther, among many other missionaries in the Gold Coast who contributed in a humungous way to the study of indigenous languages (Ansah, 2018; Boahen et al., 1987; Claridge, 1915).

The desire to promote indigenous languages and African art forms was given a boost after Ghana attained independence in 1957, and the first founding father President, Osagyefo Dr Kwame Nkrumah, set up the Institute of African Studies and the Department of Drama and Dance at the University of Ghana in 1963 to promote the study of African art forms (Ansah, 2018; Obeng, 1997:127-139). This gave impetus for the study and preservation of African folkloric knowledge, and to project the image of the black person as being capable of attaining the highest levels of excellence in intellectual achievement and scholarship (Ansah, 2018).

Nkrumah assembled the best brains around the world to help drive his vision, and he brought eminent scholars to Accra, including Dr W.E.B. Du Bois, the first African American to graduate with a doctorate from Harvard University (Obeng, 1997: 87-88). There was also the famous West Indian Economist, Sir Arthur Lewis, to advise on economic planning. Lewis brought to Accra other expatriateeconomists such as Neustadt, Arthur Nurske, and Rosenstein Rodan who worked alongside Ghanaian pioneer economists such as J.H. Mensah, K.Y. Amoako, Robert Gardner, R.A. Arkhurst and E.N. Omaboe, among others. Nkrumah relied much on the prodigious knowledge of indigenous scholars like Professors KwabenaNketsia, J.H. Nketia, Ephraim Amu, John De Graft, and Efua Sutherland, among others to push through his development agenda in Ghana and Africa (Ansah, 2018; Obeng, 1997).

The early missionaries brought to Africa the religion of Christianity with the Book (Bible) and accompanying education. The Moslem scholars from Persia and Saudi Arabia who went to teach at Sankore University in Timbucktu (c.800-1500 AD) such as IbnBatuta, IbnKhaldun, and Al Bekri also came with Islamic lore and education (Ajayi, 1972; Boahenet al., 1987; Webster et al., 1967). It was a mixed blessing in the sense that while it exposed the Africans to the then new Knowledge, it also displaced their own indigenous traditional forms of art and knowledge.

Even though the imposition of foreign religions on Africans brought them new forms of enlightenment in the form of education and religion, yet this act did them a disservice by depriving them the opportunity of developing their own indigenous artistic forms of expression which foreigners derided as inferior. Therefore, Colonialism, the Slave Trade, and the imposition of foreign Religious beliefs were the trio nemesis of the development of indigenous African civilizations (Boahen, 1986; Davidson, 1995).

It will be preposterous to presume that Africans did not have scholarship in the form of written alphabet or symbols before the advent of colonialism. The famous Cave paintings in Namibia, of the Okhavango and Khoi-khoisan people, and the famous Adinkra Symbols and gold weight measurement symbols of the Ashanti people of Ghana, do attest to the high forms of artistic attainment and expression, and scholarship prior to the arrival of Europeans in Africa, towards the end of the 15th century (Opoku, 1978). The same can be said about the famous Benin Face masks of the people of the Niger Delta area in Nigeria, and the Bakongo in Congo. The architectural monuments in Mwanamwatapa in Bulawayo in Zimbabwe also show evidence of high sense of critical thinking, engineering proficiency and prowess (Opoku, 1978; Smit, Posnansky & Danzig, 1974; Mazrui, 1987; Fage, 2001; Davidson, 1985; Ajayi, 1972; Afigbo, 1986; Armah, 1995; Armah, 2002).

In Africa, language is written large in art forms such as the rich Kente Tapestries of the Ashanti, and the richly-coloured and intricately designed Ashoke textiles of the Yoruba. In- deed, in Africa, language is written large and bold in artistic expressions and forms, such as carvings, sculptors, paintings, intricate and well-choreographed dance forms, traditional drumming, and oral traditional folklore such as the Ananse Stories of the Akan people of Ghana, and the Kalulu stories of Zambia, among others (Opoku, 1978; Armah, 2002).

b) Early Forms of Writing

Wonderopolis.com (n.d) informs us that early forms of writing were principally developed in three parts of the ancient world in China, the Near East, and Mesoamerica. Writing in China dates back more than 3000 years ago, while writing in Mesoamerica dates

back more than 2500 years ago; and writing in the Near East is more than 5000 years ago. According to Schmandt-Besserat (2007), forms of writing developed independently of one another in these three regions of the world. In Central America, in Mexico, the Olmecs (600-500 BC) developed a form of writing which resurfaced again around 250-900 AD, among the Maya people (Schmandt-Besserat, 2005; Sass, 2005; Nissen & Heine, 2009; Coe & Stone, 2005; Marcus, 1998).

In China, writing was invented during the Shang Dynasty (1400-1200 BC). The early forms of writing were used mainly for Accounting and commercial record keeping. In other places of the ancient world, writing was used during religious ceremonies and also used on tombstones. Early writing was held sacred as a few select among the priesthood class held the secrets to deciphering the strange-looking symbols or characters of the alphabet, especially in ancient Egypt (Schmandt-Besserat, 2007; Xigui, 2000).

It is conjectured that the Arabic numeral system of number digits, which we use today, came out of the Indian Sanskrit language, which itself came out of the Chinese (LINFO, 2004; webspace.ship.edu, n.d.; Boyer, 1944; Heath, 1921; Ifrah, 1998).

It is known that before Rome was founded in 756 BC by the twin brothers Remus and Romulus on the River Tiber, there was a black race called the Etruscans living in the area (Bonfante & Bonfante, 2007). It was they who gave the Romans their seven letter alphabet in the year 700 BC. The Roman alphabet had no lower case letters, as all seven characters were upper case (LINFO, 2004; Fowler, 1999; Bernal, 2007).

In later years, writing was deployed for artistic and literary engagement, for entertainment, and for preserving human records of achievement. According to Schmandt-Besserat (2007; 2005), writing is the main technology for gathering, processing, storing and retrieving, communicating, and disseminating information. Early writing appeared in three different forms as Alphabet or Character Set, Syllabaries, and Ideographs or Logographs or Pictographs (LINFO, 2004; Salomon, 2012; Bernal, 2007). Alphabet is made up of a set of letters or characters such as the English/Latin alphabet, where each letter represents a sound.

Syllabaries are letters that stand for syllables or vowel sounds, and this applies to languages such as Korean, Japanese and Chinese languages, which have many syllables in their languages. Pictographs or logographs are characters which are ideas or pictures such as ancient Egyptian Hieroglyphics (LINFO, 2004). The earliest writing from which the English alphabet has evolved is that of the Phoenicians who occupied present day Lebanon and Syria. The Phoenicians themselves, being great seafarers and traders, are thought to have learnt the art of writing from a Semitic group that was found to the north-east of Egypt (Factsanddetails.com; History.com, 2018).

The Phoenicians were the first to develop the first alphabet with 22 characters, around 1200 BC but they were not the first to invent writing, because the Sumerians and the Akhadians were the first writers, but they did not have alphabets; only wedge-shaped writing for keeping accounting records (Black, 2008; Chrisomalis, n.d.; Melissa, 2013; Gow, 1883)(see Appendix A, Appendix B, and Appendix C).

Chrisomalis (n. d.)contends that through trade, the Greeks learnt of the art of writing from the Egyptians. In ancient Mesopotamia, wedge-shaped writing or Cuneiform was used by the traders to keep records of their business transactions. The Phoenician letter N was the letter for fish called NUN, which is similar to our Effutu language in Ghana in which fish is called INU. The Phoenician symbol or letter for O was that of a picture of the eye called AYIN, which again in Akan language of Ghana, is ENYI for the eye.

A fence in Phoenician is called HE, which in Akan language of Ghana is called HE or border or boundary. A spear in Phoenician is called GIMMEL, which in Akan language of Ghana is called KAMMA, with a slight resemblance in sound to the Phoenician, GIMMEL. Oral tradition in Ghana states that some tribes in Ghana came from far off places such as Egypt, Iran, Yemen, Israel, and Sudan (Armah, 2002; Armah, 1995; Opoku, 1978).

c) Evolution of language and alphabet

The Harvard website for Chaucer stated that the art of reading ancient hand-written manuscripts is called Palaeontology. In the Middle Ages (500-1500 AD), before printing was invented, books were rare as they were meticulously written by hand by monastic copyists who were monks. The writings or calligraphy was ornate, embellished and garnished so much so that it is difficult to distinguish the alphabets in them. There was a time in England, when the letters J, U, W and I were missing in the alphabet (Melissa, 2013; Racoma, 2018; Parpola, 1994; Southgate, 1929; 1956).

The arrival of immigrants to England such as William the Conqueror in 1066 AD, brought with it different inputs and changes to the culture, and the way the indigenous English language was spoken and written (Underwood, 1946; Southgate, 1929; 1956). So many years ago, the letter W was missing from the English alphabet, until someone thought of adding two Vs together to have a double V (W) (Racoma, 2018; Melissa, 2013).

Even on the computer typeface, we find an array of fonts such as Calibri, Bookman Old School, Times New Roman, Valdana, and Arial, among many other font types. Our current 26 letters of the English alphabet have undergone many translations, rotations and reform to come to the standard we find them today

(Salomon, 2012). The alphabet during the time of Geoffrey Chaucer in Medieval England was different from those in Shakespeare's time in the 16[th]century, and also different during the times of Ben Johnson and the Victorian era of the scholar and writer, Oscar Wilde.

d) Non-English Alphabet Countries

There are many countries in the world today which do not use the English alphabet of 26 letters. Russia, Iran, India, Armenia, China, Turkey, Korea, Japan, Thailand, Israel, Greece, Saudi Arabia, Ethiopia, Egypt, and Vietnam, among many others, use their own forms of alphabet. The Russian alphabet has Greek and Bulgarian origins (Wikipedia). It is called Cyrillic script. History records that in 893 AD, the Bulgarian Tsar, Simeon I the Great, commissioned a new alphabet to replace the old Galgolithic alphabet which was used during the time of his father, Boris I (Wikipedia). Later, the script spread to Iran, Russia, and many parts of Eastern Europe, where Cyrillic or Russian alphabet is in use(Wikipedia). Other similar scripts are the Coptic and Armenian scripts (Wikipedia).

Other scripts which are non-English or Latin are Urdu, Arabic, Chinese, Japanese, Thai, Korean, Hebrew, Amharic, and the Fula/Fulfulde of the Fulani people of West Africa. Wikipedia (n.d.) stated that in 1989, two brothers, Abdoulaye Barry and Ibrahima from Guinea, developed a new alphabet system called ADLAM for the Fulani, Fula or Fulfulde language, which was about to get extinct (Wikipedia). This is a commendable effort worth noting. To date, this is the latest addition to the body of alphabets in use around the world. The Fula alphabet is supported by Android and Google Chrome (Wikipedia, n.d.).

e) Letters, Numerals, and Computers

According to LINFO (2004), characters are the building blocks of a language. The written form of a language consists of letters, punctuation marks, numerals, and other symbols for things such as punctuation marks, money symbols for the dollar, pound, cedi, yen, yuan, and peso, ampersand, and other symbols in mathematics, sciences and computing (LINFO, 2004).

Language evolves over time as some of the characters and symbols change, with some becoming defunct, and new ones come to replace them, through cultural diffusion, colonization, and acculturation. According to Nice (2010), the English alphabet has not always been 26 letters, as there was a time it had only 24 characters, with the letters J and U missing. Through cultural diffusion, we have the current form of 26 letters in the English alphabet. The English language has greatly been influenced by cultures around the world, notably those from Indian, Arabic, Creole, and Afrikaan influences.

The Chinese language is said to have between 40,000 and 60,000 characters in its alphabet system, although not all characters are in active use, as a highly educated Chinese is expected to know about 5000 characters (LINFO, 2004). Those pursuing basic education are expected to master, at least, about 500 Chinese characters (LINFO, 2004).

On the computer, characters are used as input devices from the keyboard to process and print out data or for storage and also as input, by using scanners to present data on the screen and also to print out information (LINFO, 2004; Turban, 2015).

Optical devices such as Optical Character Recognition (OCR) can be used to scan data for analysis, for marking school work, and for creating Artificial Intelligence systems for processing huge amounts of data, using Machine Learning principles in a SMART environment such as in a Smart City.

LINFO (2004) stated that characters are used in programming language by using commands and logic, to structure situations for critical thinking decisions. Programming language include C++ and Java. Such programming languages help to systematize and economically process and store data in user-friendly formats, for later use. Characters or letters are converted into computer electronic and digitized signals for the purposes of storage, processing, transmission and enabling data exchange between and among computer network systems, through what is called Electronic Data Interface (EDI).

Cloud computing enables flexible storage of vast amounts of data, which can be accessed anywhere any time by the users on any device or gadget. Numeric and alphabet letters are electronically converted into binary electrical impulses of zeros and ones, or alternating electrical impulses of positive and negative charges for easy storage and processing. The mathematics involved is called Boolean algebra (Turban, 2015; Tesla, Shannon).

LINFO (2004) also stated that when dealing with internationalization, computing becomes complex as many alphabet systems and languages have to be dealt with, because there are different alphabet sets to deal with, which require different keyboards, soft-wares and hardware systems.

We saw it fit to introduce new forms of numerals and alphabet as a way of having a new normal international alphabet system that will be neutral, not claimed by any country or region. We shall classify and term it as a Logogram or Locograph or Locobet, as they have some system of order, where by a letter evolves and is dependent on the shape and form of its predecessor. We shall call it the Kasian Alphabet System (KAS).

(See attached pdf file of photos of new alphabet and numerals, which we developed, with their equivalent English alphabet letters written above each one).

According to LINFO (2004), Unicode version 2.0 was released in 1996 with 38,885 known human alphabet characters. In 2000, version 3.0 was released with 49,194 characters, and again in 2003, it was upgraded to 96,382 characters (LINFO, 2004). The American Standard Code for Information Interchange (ASCII) was set up as the only encoding soft-ware which is used by computers and communication equipment, to represent text in any format. It uses eight bits or one byte to represent one character or letter. ASCII is based on the English alphabet, and it uses 128 characters, with an advanced version that uses 256 characters (LINFO, 2004).

f) Pioneers of Information Communication Technology (ICT)

When we come to discuss advances which have been made in ICT over the last 100 years or so, great names come to mind. We shall not reference so much in this section as the information on these great names are everywhere on Wikipedia and other sites online. Guiglermo Marconi from Italy was the first person to send a wireless message across the Atlantic many years ago, and it marked a watershed and breakthrough in communication (Wikipedia).

Had his technology been available in 1912, perhaps many souls who perished in the Titanic could have been saved. In America, Samuel Morse came up with his Morse code which became the basis of telegrams or telegraphy, which consisted of signals of dots electronically transmitted as codes, and at the receiving end, the encoded message of signals of dots is decoded as telegraph message (Wikipedia). Charles Babbage from the UK in 1948 worked on a crude system of what we know today as computing (Wikipedia).

His system was based on the ancient Abacus, which was used by the Romans to do arithmetic. During the Second War, which began in 1939 and ended in 1945, Allan Turing from Cambridge University led a team of scientists to develop cipher systems of messaging and decoding enemy messages, through advanced systems known as encryption and cryptology (Wikipedia). Again in America, Thomas Edison patented more than a thousand inventions, including the electric bulb (Wikipedia, n.d.).Alexander Graham Bell, a Scottish American engineer and scientist, invented the telephone for voice communication over long distances (Wikipedia, n.d.).

He was the one who set up the American Telephone and Telegraph (AT&T) in 1885. In the 1950s, John Baird from Scotland invented the Television set using the Rutherford tube technique to transmit sound and pictures over a distance. Television (TV) came to replace Radio Broadcasts as the preferred public address system, as it brought live communication of news broadcasts, entertainment, and advertisement messages live into the bedrooms and sitting parlours of millions of viewers, worldwide (Wikipedia).

In the 70s and 80s, Sir Tim Berners Lee worked at the European Science and Research Centre (CERN) in Switzerland, with other collaborators from MIT in America, to develop the information Super Highway or what we now call the World Wide Web (www) or the Internet (Wikipedia, n.d.). The internet took off tremendously in the year 2000 due to the innovation and works of people like Bill Gates of Microsoft Corporation, Steve Job of Apple, Mark Zuckerberg of Facebook, Jack Ma of Ali Baba, Jeff Bezos of Amazon, and Elon Musk of SpaceX. We cannot here leave out the great work done in universities around the world and at NASA to develop newer technologies to improve communication and information management(Wikipedia, n.d.).

g) Origin of Computer Communication-Work of Claude Shannon (1916-2001)

A famous American mathematician, electrical engineer, inventor, visionary, and computer scientist, Claude Shannon who graduated from MIT is said to have calculated accurately that in 103 pairs of moves of Black and White marbles of a Chess game, there would be 10^{120} unique games of chess (itsoc.org, n.d.). In his 1937 thesis at MIT, he stated that,

If we could someday invent a computing machine, the way to make it

think would be to use binary code, by stringing together switches and

applying Boole's logic system to the result.
(itsoc.org, n.d.).

Shannon's MIT thesis is thought to be the most remarkable thesis of the twentieth century (Wikipedia; itsoc.org). It is believed that Shannon's famous paper which was written in 1948 created what is now known as information theory. His paper in 1948 was entitled, '*A Mathematical Theory of Communication*'. In that paper, he put forward the seminal idea of converting any kind of data, such as sound, photos, and text characters into a series of electronic signals of zeroes and ones which could be transmitted without errors. In actual fact, Shannon invented digital communication as it is now used by computers around the world, and also by telecommunication equipment in binary format (scientificamerican.com; Wikipedia, n.d.).

h) Work of Nikola Tesla (1856-1943)

Tesla was a Serbian-American who was an electrical and mechanical engineer, an inventor and a futurist who was credited with numerous inventions such as the radio, radar, AC current, TV, and Hydro-electricity, among a legion of other inventions (theoatmeal. com; Wikipedia.com; history.com; biography.com; Britannica.com). Modern Information Communication Telecommunication (ICT) cannot be discussed without

mentioning and relating it to the work of Tesla, because it was he who has made it possible for us to have electricity to power all internet and telecommunication activities.

Tesla lived ahead of his time as he predicted many of our modern devices such as electric-powered cars, among others. In the tradition of Tesla, we believe that one day, humans should be able to talk back to nature and understand the speech of birds and animals, by being on the same frequency with them. Every morning, some woodpeckers, weaver birds, sparrows, swallows, and other birds come to our window sill to talk to us all day long in uninterrupted clatter of chatter, and they seem so excited. We guess they are telling us a lot of things which we fail to comprehend. However, we are with them in spirit, knowing that they mean well for us, and humankind in general. In our own estimation, birds are the first creatures on earth which are very close to God, as they know more about our health, doings, character, and lifestyles and they come to share news with us, but we fail to comprehend and reciprocate their good gesture. Bird-speak will one day become intelligible and decipherable through technological breakthrough.

Also, we foresee a day when we shall have plastic newspapers and books to save our trees. If we use plastics to make books and newspapers, we can save many trees and help preserve nature. Plastic books can last longer than cellulose-based books. Hardcopy-books are indispensable to children; as they are not to be exposed too much to radiation on laptops and computers, which are harmful to them. We also foresee a future state whereby in future, we shall have robots (AI) studying our lifestyles and summarizing and presenting news to us in readable formats on screens and panels on our walls at home, on our car dashboards, and on our computers, laptops and wrist watches. We can foresee AI and ML helping us to write books and stories, musical compositions and artwork, all being done through AI and ML, using neuroscience-technology so that thought becomes reality.

i) Contributions to ICT by Africans

PhilipEmeagwali, a Nigerian Computer scientist who was studying at the University of Michigan in the USA, was said to have done the fastest mathematical computation in the world, by interconnecting computers. His feat led to great improvement in internet speed, and also it contributed immensely to recovery of petroleum from underground seams (Wikipedia, n.d.).

Another Nigerian, Chinedu Echeruo, who studied at MIT, developed a smart city navigation app called HopStop.com that helps city dwellers find their way back home if they get lost. He was said to have sold the app to Apple for one billion dollars (Wikipedia; guardian.ng.news).

Victor Lawrence, a Ghanaian American, is Professor of Intelligent Networked systems and he has contributed to increasing the speed of the internet and high speed connectivity at the Stevens Institute of Technology. He has 400 patents to his name (face2faceafrica.com). He is a Fellow of IEEE.

Prof NiiQuaynor, another Ghanaian, is said to be the first African to have a Phd in Computer Science from SUNY (researchictafrica.net) and the first person to set up an ISP in West Africa in 1993. He was awarded for promoting the internet in Africa (research ictafrica.net).

The name Dr Thomas O. Mensah is known to a lot of people around the world. Thomas Mensah is another Ghanaian American who pioneered fibre optics, and he is a leading expert of fibre optics in the world (Wikipedia, n.d.). His work led to the ability of fibre optic to carry greater and more volumes of data, using fibre optic rather than by using copper cables. He is a Chemical Engineer and a nanotechnologist. His inventions have revolutionized the way we communicate using the internet. Fibre optic cables have been laid under the sea to connect all the continents for speedy communication, and it is complemented by satellite communication from outer space (Wikipedia, n.d.).

Elon Musk of SpaceX and others hope to cover every part of the world with satellite coverage, to make internet a free and accessible resource for all humanity. Currently, in parts of Africa such as Zambia, internet connectivity is very slow, poor, unreliable and above all, very expensive. This noble gesture by Elon Musk and others will help to break the stranglehold of the ISP monopolies which are fleecing African residents for their use of the internet. The problems of internet connectivity affect productivity of researchers like us and others in Third World countries.

At NASA, there is Ave Klutse who is a Ghanaian Rocket Scientist in charge of space shuttle flights at the control room. He deals with complex systems of communication and remote control (cnn.com; Wikipedia/ghana's rocket man).

Another Ghanaian scientist at NASA is Trebi-Ollennu Ashitey, who is a Robotic Engineer who designs robotic arms for collecting samples. His area of expertise requires high levels of innovation and computer science. All these people from Africa are helping to advance the frontiers of knowledge in computing, information management, and communication science (Wikipedia).

Dr Isaiah Blankson, like the ones earlier mentioned above, is a rare gem Ghanaian American who leads the US Air Force in researching jet propulsion systems and advanced materials for military aircrafts. He is said to be a mathematical genius. He is an alumnus of MIT/1967.
(Wikipedia, n.d.).

Lastly, we have the late Prof Francis Allotey, who developed the Allotey Formalism system that is able to prove the presence of matter in space (Wikipedia). The late Ghanaian professor was instrumental in introducing computer science as a field of study in Ghana, and also in Africa as he held positions in many international research organisations. He was an alumnus of Princeton University and Imperial College in the UK (Wikipedia, n.d.).

It was necessary here to have highlighted the contribution of Africans to the emerging field of information and communication science, because Africa is the last frontier to develop fully into an industrialized region. There is therefore great potential in Africa for the growth of ICT.

IV. Methodology

Since this article communicates a novel idea, we the authors, thought of a method of proceeding in this article by engaging in desk research to review some literature on writing in general, hence the approach being qualitative, historical, and narrative. It could also be said that the methodological approach we adopted was based on secondary research, even though the findings are original contribution to knowledge.

V. Findings and Results

a) New Numerals

The numerals presented herein show new images which evolve from progressive developments (See attached pdf file for the numerals and characters of the new alphabet).

0

The new numeral (0) zero is drawn with a cross inside it to differentiate it from what we know as zero on the number line, and which in Cartesian Coordinates, represents the origin of the number line which stretches to infinity on either side of it, and in Cartesian Coordinates, both positive and negative axes of Y and X originate from zero, hence the cross describing zero as the central focus of mathematics. Therefore, zero should not be drawn empty as it is the demarcation point of Cartesian planes, and infinite imaginary plains in space or topology.

1

Figure 1 is drawn withone stroke downwards, which is fixed at its base as a pillar, marking reality and counting numbers.

2

Figure 2 progresses from the downward stroke of 1 with a horizontal perpendicular stroke on the top of 1, to the left to indicate a second reinforcement.

3

Figure 3 is drawn with another stroke on top of 1, this time to the right, showing three strokes, one to the left, another to the right, and yet another downwards.

4

Figure 4 is derived from the figure for 2, and adding its mirror reflection on top of Figure 2 to form a cross, thus Figure 4 is twice Figure 2.

5

Figure 5 is derived by pulling off the top L shaped part of Figure 4.

6

Figure 6 is obtained by pulling off the lower part of Figure 4

7

Figure 7 is a mirror reflection of Figure 6 with a cross across its middle part to differentiate it from Figure 2.

8

Figure 8 is obtained by rotating Figure 7 through 180 degrees from the page towards yourself to form an L, facing the wrong way.

9

Figure 9 is made up by completing the conjugate of Figure 8 to form a rectangle.

b) Comments

We can see from the shapes of the new numerals that Figures 1 and 3 have close resemblance as 1 is a T turned upside down. Figures 2, 4, 5, 6, 7, 8, and 9 are all rotations, reflections and combinations of the Letter L. In fact, except Zero, all the new numerals are derived from the letter L, which shows Zero to be unique from the others. Therefore the new numerals could be called L numerals or Letter numerals, based on Logic.

c) Large numbers

As new earths, planets, and new interstellar travel is evolving from technological and scientific advances, there will be a great need in future to have cryptic and shorthand form of representing astronomical figures hence this author thought of developing Hieroglyphic-like representation of astronomical numerals, showing human forms. The notation of Light years sometimes becomes unimaginable and unfetchable, and abstract to many, forgetting that a light year is simply figuring out how many seconds make 1 year, multiplied by the speed of light in one second, which is approximately 300,000 kilometres per second, multiplied by 60 seconds by 60 minutes by 24 hours by 365 1/4 days, which is 9.461 Quadrillion.

100

Hundred is represented by the Greek letter Pi with elongated legs.

1000

Thousand is represented by Pi with a dot on top of it.
1,000,000

One million is represented by Pi with two dots on top, and a billion by Pi with fore hands down and three dots on top, a trillion by all the dots connected into

- 1,000 = 10^3 Thousand
- 1,000,000 = 10^6 Million
- 1,000,000,000 = 10^9 Billion
- 1,000,000,000,000 = 10^{12} Trillion
- 1,000,000,000,000,000 = 10^{15} Quadrillion
- 1,000,000,000,000,000,000 = 10^{18} Quintillion
- 1,000,000,000,000,000,000,000 = 10^{21} Setillion
- 1,000,000,000,000,000,000,000,000 = 10^{24} Septillion
- 1,000,000,000,000,000,000,000,000,000 = 10^{27} Octillion
- 1,000,000,000,000,000,000,000,000,000,000 = 10^{30} Nonillion

(Source: https://www.thoughtco.com/zeros-in-million-billion-trillion-2312346).

a crescent moon, Quadrillion by upraised fore arms and a triangle on top, Quintillion with a circle on top, Sextillion with a cross in the circle, and Septillion with the palms of the man outstretched. and feet stretched out as well.

VI. DISCUSSION

a) New Alphabetical Letters and Possible Applications

The Latin alphabet consists of 26 letters but the one we invented has added 6 six more single characters or letters to represent sounds such as E in the English word BET, CHI sound in the English word CHICKEN, ING sound in the last letter of the word KING, O sound in the sound in the word HOT, long O sound in the word HALT, and SH sound in the word SHIRT.

The alphabetical letters which we invented have a logical structure at the beginning for easy remembering while as we proceed, we find some of them depart from this logical structure, which makes it the more interesting. These new alphabetical letters can be used in psychological testing as memory tests, intelligence quotient tests, and also as aptitude tests. The new alphabetical letters which we have derived are artistic in nature as they are mainly strokes, circles, dots, and geometrical patterns, some of which resemble typical Ashanti Adinkra symbols in Ghana.

We believe the new alphabet system can be used in coded messages, cryptology, encryption, computer programming, and also as a form of technological breakthrough for designing new computer keyboards for communication.

Early Childhood educators can have fun with young children in their art classes in drawing out the characters and letters in fun writing of these letters as they have capacity to help children develop skills in recognition of shapes and in writing strokes, straight lines, curves, circles, rectangles, triangles, and other geometrical shapes (see Appendix).

b) Vistas for the future of ICT

We can see that before the year 2000, the growth of ICT was linear of the form

$$Y = a + bx$$

Before 2000, technological growth had only one variable, namely Time represented by X in the above equation.
After 2000, the growth turned exponential to the form of

$$Y = A e^{rt}$$

After 2000, the variables became r and t where t refers to time and r refers to rate of growth of technology. R is a function of education, innovation, entrepreneurship, capital, and the PESTEL factors in the macro environment. T is time as time is an exogenous factor.

In the third phase of the ICT revolution and growth, we may conjecture having a Sigmoid Curve or a Gompertz Curve (Logistic Curve) of an S shape, showing that growth will increase rapidly in the first phase of this long run curve, then it will slacken to a plateau due to what Malthus referred to as the Doom factors of famine, wars, epidemics, catastrophes and cataclysms, among many negative factors such as the imminent threat of the wrong use of Artificial Intelligence and Machine Learning. Thereafter, there will be a new spurt in growth of an exponential form to complete the long run cycle. This curve can also be related to the innovation diffusion curve for information-communication technology by Rogers (Wikipedia, n.d.).

Finally, the new numerals and alphabet which we suggested in this paper can be used in the field of encryption and cryptology, whereby companies such as Apple, Microsoft, and SpaceX can set up their secret

language by starting from anywhere in the new alphabet as their origin or beginning, so that they can send and receive encrypted messages which should have a cipher or key somewhere to decode the message.

VII. CONCLUSION

In this short paper review, we have endeavoured to share with you new forms of numerals and alphabet letters which we developed, based on our imagination. This work has been on the cards for six years and upwards, waiting to be unveiled, and we are happy that, at long last, we are able to share it with you. We hope that academics, educators, scientists and various communicators will find these new forms of numerals and alphabetical letters useful for their work. We hope also that our work will inspire many Africans to be innovative in diverse fields of endeavour.

Knowledge knows no racial, geographical, gender, and time boundaries. It transcends all of us, and we should all together embrace true and valid knowledge in order to extend its frontiers for the greater good of humans and our world. The new numerals and alphabet which we introduce here can be used in cryptology, encryption and educational instruction. We can develop a multiple keyboard whereby the English alphabets and our alphabets and numerals could be juxtaposed so that we can switch communication between the two forms.

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Appendix

Appendix A
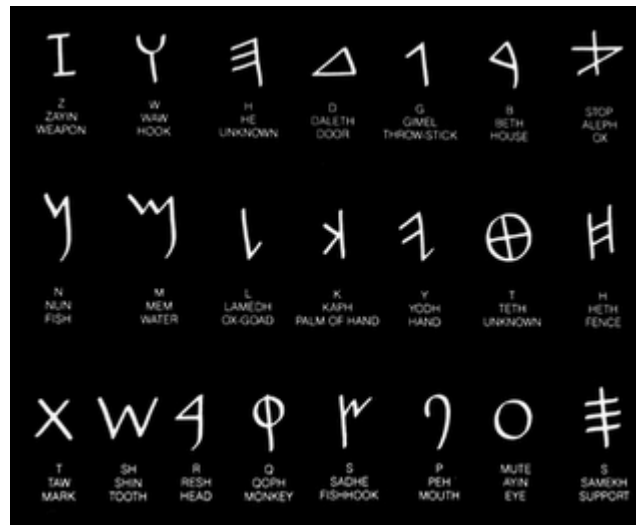
*Source: Hays, A.J.*

Example of ancient Phoenician alphabet

Appendix B

Clay tablet of Cuneiform writing

Appendix C

ʔa	b	g	ḫ (x)	d	h
w	z	ḥ (ħ)	ṭ	y	k
š	l	m	ḏ (ð)	n	ẓ (θ̣)
s	ʕ	p	ṣ	q	r
ṯ (θ)	ġ (ɣ)	t	ʔi	ʔu	s₂

Example of Cuneiform or wedge-shaped writing

Appendix D

ḥet ḥ courtyard	waw w hook	haw h hurrah	ḏ ?	digg d fish	gaml g throwstick	bet b house	ʾalp ʾ ox
ʿen ʿ eye	śamk ś ?	naḥš n snake	mem m water	lamd l goad	kap k hand	yad y arm	ḫa ḫ yarn
taw t owner's mark	šimš š sun	ṯann ś/ṯ bow	ra's r head	qup q monkey	ṣad ṣ plant	pi't p corner (?)	ġa ġ ?

Example of Hieroglyphics or picture writing of ancient Egypt

Appendix E

PROTO-CANAANITE	EARLY LETTER NAMES AND MEANINGS
ỏ	*alp* oxhead
☐	*bêt* house
L	*gaml* throwstick
◁◇	*digg* fish
☿ ☿	*hó(?)* man calling
?	*uó (waw)* mace
	zĕ(n) ?
Ⅲ	*hĕ(t)* fence?
	tĕ(t) spindle?
⎰	*yad* arm
�	*kapp* palm
∼	*lamd* ox-goad
∿	*mêm* water
⌐	*nahš* snake
⬤	*cĕn* eye
⌐	*pi't* corner?
Ψ	*sa(d)* plant
8	*qu(p)* ?
⋒	*ra'š* head of man
W	*tann* composite bow
X +	*tó (taw)* owner's mark

Example of Logography or ideograms or pictography