LWATI: A Journal of Contemporary Research, 10(4), 144-153, 2013
ISSN: 1813-2227

Three-Valued Logic as an Authentic African Logic: A Critical Reflection

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ABSTRACT

The advent of three-valued logic made hitherto rationally unexplainable beliefs to become plausible. Most of the African worldviews were among those beliefs that were considered irrational but thanks to three-valued or many valued logic, there are now explainable and thus rational. The success of three-valued logic in rendering African beliefs tenable has made a lot of African scholars to clamour for the enthronement of three-valued logic as distinctively African logic. This paper critically reflected on this call by African scholars and discovered both positive and negative implications. In view of these implications, the paper concludes that no one brand of logic is capable of explaining all the beliefs of a region of the world. Thus, no one brand could be designated as African or Western. There exist a moment of oscillation between two-valued logic and three-valued logic in all cultures of the world. Therefore, no culture can rightly hold to one form of logic as distinctively peculiar to it.

INTRODUCTION

Logic as a science seeks to aid human reasoning in its quest for knowledge by articulating rules and principles to guide it. It was in line with this that Aristotle developed his classical two-valued logic, which later was canonized by his followers as the only authentic logical format to be used universally for the attainment of validity in reasoning. Two-valued logic which assumes the existence of two truth value in a given proposition enjoyed this exalted state until the coming of the 20th century, where a lot of philosophers began to see its limitations and acted by decrying its absolutism. For two-valued logic therefore, a thing is either A or B and not A and B at the same time. This brand of logic gives no room for other possibilities and thereby was unable to explain a lot of phenomena. This limitation of two-valued logic

permitted the emergence of three-valued logic and multi-valued logic which explained those realities that were hitherto unexplainable.
In this age, obviously oblivious of the problems that came upon the West while they saw two-valued logic as the only authentic logic, some African logicians are attempting to exalt three-valued logic as an authentic African logic. This paper attempts to discolour this mindset and argues that a complementarity of all the forms of logic is the proper logic of Africa. There is nothing like a distinctive African logic like: Ijiomah 1995, Etuk 2002, Jonathan Okeke 2011, Winch 1972; Evans-Pritchard 1980; Bello 1993 2002; Sogolo 1993; Irele 1997; Isaac, 2001, and others tend to argue. This is because the Africans and the West both have moment of oscillation between two-valued and three-valued logic

What is logic

The word logic is derived from the Greek work 'logos' which etymologically means "speech, thought or judgement" (Ucheaga, Rudiments of Logic 2). This definition suggest a linkage of logic and language, which becomes manifest in the logician concern with statements used in argumentation. This preoccupation of logic with statements used in argumentation is perhaps what informed Nancy Sinco and Gene James definition of logic as "the science which has as its central problem the attempt to formulate principles for appraising arguments as correct or incorrect" (Elementary Logic 1-2). Momoh on his part argues that logic is concerned with the clarity of expression, the avoidance of fallacies, vagueness, ambiguity and contradiction in natural language. According to him;

> In everyday usage of natural language we talk of a person as being logical if he is reasonable, sensible and intelligent; if he can unemotionally and critically evaluate evidence or a situation; if he can avoid contradiction, inconsistency and incoherence, or if he can hold a point of view argue for and from it, summon counter-examples and answer objections (Momoh, 174).

There are various other conceptions of logic which will not be captured in this paper. What ought to be known however, is that the central concern of logic is reasoning and argumentation. Logic helps us to justify our arguments, positions, conclusions, pronouncement, judgement et cetera. To arrive at good judgement, knowledge about the relationship between the evidence and what the evidence supports is required. For something to qualify as evidence, it must relate in a particular way to that which it affirms or denies. This relationship between evidence and what evidence justifies is the object of logic. This is the position of Ijiomah, Cohen, Nagel, Coffey and some other notable logicians as regards formal object of logic. On this basis therefore, logic could be defined as a science of relations. It is a science that concerns itself with the relationship between two or more propositions that is the

evidence and what evidence supports. This could be made more vivid if this logical format is considered:
All men are good
Okon is a man
Therefore, Okon is good
The conclusion, Okon is good, is not based on the truth or falsity of any of the premises. The conclusion is rather drawn from the relationship between premises 1 and 2, such that when premises 1 and 2 are accepted, the conclusion follows necessarily from there. Logic main concern therefore, is not on the material content of an argument but on the relationship between the propositions. Logic is thus a science of relations – the relationships between propositional statements. But since statements do not stand on their own but represent reality, logic by extension becomes a science that studies the relationship between realities. Dummett buttress this point well, when he asserts that

> there cannot be an aseptic logic that merely informs us how language function and what is the structure of thought which is expressed without committing itself to anything concerning reality, since reality is what we speak about … and an account of language demands an account of how what we say is about reality and is rendered true or false by how things are out there in reality (431-432)

Dummett is here asserting that logic is a dependent variable, which is dependent on the nature of reality. This means that logic is shaped and twisted by the nature of reality. This implies that, the conception an individual or group of individuals have about reality, will suggests the nature of the relationship that exist between two or more realities and thereby determines the nature of logic that suits the conceptions. Logic therefore, could be said to be based on the conceptions of reality by individuals. This implies that different logics are possible, since the conception of reality from place to place, and culture to culture differ. This understanding of logic is behind the various attempts by scholars from different parts of the world to carve out the logics of their specific areas. This is the understanding behind African logic, Eastern logic, Western logic etc.

Upon this ground therefore, that logic differ from culture to culture depending on their conception of reality that we based our discussion in this paper on three-valued logic – a brand of logic that is different from the traditional two-valued logic that dominated the world from the time of Aristotle to our contemporary times. Three-valued logic is held by many scholars as an African logic.

Three-valued logic: meaning and history

Three-valued logic also referred to as trivalent or ternary logic and sometimes abbreviated 3VL, is a logical system in which there are three truth values indicating true, false and some indeterminate third value. Three-valued logic unlike two-valued logic does not agree with the law of excluded middle, which holds that 'A' is either 'B' or not 'B'. In other words 'A' is either false or true. This law behoves us to give a thing some particular attributes or it's opposite. There is no middle status. Three-valued logic on the other hand states that, "there are three possible values for any state of affair: (Lukasiewicz, What is many valued logic, 32).

The first known classical logician who did not fully accept the law of excluded middle is Aristotle, who ironically is also regarded as the first classical logician and the father of logic (two-valued logic). He admitted that his laws of logic are not applicable to all events. He therefore advises:

> It is a mark of an educated man and a proof of his culture that in every subject, he looks for only so much precision as its nature permits. For example, it is absurd to demand logical demonstration from a professional speaker; we might as well accept mere probabilities from a mathematician (De Interpretione Ch. IX).

Also in the battle of the sea paradox Aristotle gave allowance for future contingencies. He argues that in a case like this where a ship sails for a battle, both alternatives could be true at the same time. - There will either be a battle, or there would not be a battle is both possible. Aristotle argues that it is impossible to know today whether the proposition is correct or not. In his words he asserts:

> One of the two propositions in such instances must be true and the other false, but we cannot say determinately that this or that is false, but must leave the alternative undecided. One may indeed be more likely to be true than the other, but it cannot be either actually true or actually false. It is therefore plain that it is not necessary that of an affirmation and a denial, one should be true and the other false. For in the case of that which exists potentially, but not actually, the rule which applies to that which exists actually does not hold good. (9)

It is vivid from this that Aristotle did not mean the two-valued logic to be absolute for all cases. He gave allowance for indeterminate occurrences. It is probably "the western philosophers that 'absolutized' Aristotle ideas in order to achieve their political ambition" (Ijiomah, In Praise of Many Valued Logic, 141). Frege claims for instance that "logic is not a science that describes the ways men make inference, but that it is a canon of principles of how rational beings ought to reason in pursuit of truth and knowledge (Proceedings of

Aristotelian Society 46). Frege therefore, sees Aristotelian two-valued logic as a logic that is out there for people all over the world to imitate. All logic therefore, he believes must be in reference to the enlarged Aristotelian logic. The early logicians until the coming of the 20th century followed dedicatedly Aristotelian logic. However, the 20th century brought back the idea of multi-valued logic after a protracted attempt by Don Scotus and William of Ockham was stifled by the church. According to Rescher, the reasoning of the church was that "if future contingent statements are neither true nor, then there would arise a theological problem" (Many-valued Logic, 4). It was however, in 1920 that the break came with the Polish logician Jan Luksiewicz creation of systems of many valued logic. He used a third-value, he called 'possible' to deal with Aristotle's paradox of the sea battle. This Lukasiewicz intermediate 'possible' became very important for the development of many valued logic. Almost at the same time, the American, Emil Post also introduced the formulation of additional truth degrees with n>2, where n is the truth values. Later Jan Lukasiewicz and Alfred Tarsi together formulated a logic on n truth values, where n>2. And in 1932 Hans Rucchenbach formulate a logic of many truths values, where n – infinity (Bezian. What is Many-Valued Logic 117-121). Later Vail'ev also came up with what he referred to as 'imaginary non-Aristotelian logic.' He asserts that development of many-valued logic is possible from the ontological or non-Aristotelian base. This suggestion arises from the fact that, it is generally believed that Aristotle placed a third neutral truth value to unknown future occurrences. Thus, Vasil'ev suggests that, there is a possible case, where in reference a certain object of the same kind, one may possess 'A' another posses '-A' and some other 'AU-A'. The last case expresses a situation where an object contains harmoniously two contraries without contradiction. This last idea is from where African scholars draw on to explain most of African experiences and beliefs. It is from this idea that one would understand the African conception of an object as both material and spiritual at the same time. Ijiomah calls this 'harmonious monism'. He believes that reality in Africa dovetails into one another, with the spiritual dovetailing into the physical and the physical dovetailing into the spiritual, thereby making three-valued logic an authentic African logic (Some Epistemological Tools which Africa Relate to Reality 76).

It is from the point of view of three-valued logic, that one can understand why a child could be both a child and a man at the same time without contradiction. Africans generally believe on the possibility of a death loved one coming back to life by submitting himself/herself to be born again as a baby. It is therefore, the belief in Africa that death does not bring life to an end. The deceased rejoins the ancestors and continues to live in their world. The ancestors are believed to have an active interest in and are able to influence the happenings in the physical world. This explains the reason, why they are often consulted before important decisions are taken in the physical world through libations, prayers and sacrifices. It is by means of this connectedness and the keen interest of the ancestors in the affairs of the

physical world, that they are believed to be capable of coming back to the world through rebirth – a process known as reincarnation. Thus, the soul of a dead man could be reborn in another flesh and begins a new life. This newborn baby could therefore, be said to be at once a baby and a man. To two-valued logic, this is a contrast and therefore absurd, but for three-valued logic this is tenable.

Implications of three-valued logic

The emergence of three-valued and multi-valued logic came as a relief to African philosophers who have over the years laboured to prove the existence of African philosophy through the limitations of the traditional two-valued logic. When analyzed through two-valued logic, most African worldviews turn to fables and myths. This is because a "contradiction emerges when two-valued logic is applied to African life or to supernaturalism" (Ijiomah, In Praise of Many Valued Logic 142). This is the reason why Levy-Bruhl declared Africans as pre-logical (17), after a futile attempt to make sense of African beliefs using the instrumentality of two-valued logic.

The African belief on reincarnation for instance, when viewed through two-valued logic will appear empty and mythic. This African belief is however, so deeply held that it is common to hear people discussing what and how they will be in the next life on earth when they reincarnate. For instance, a person dissatisfied with the kind of family he is born into could say, "in my next life, I will be born to a rich family". And whenever "a new child is born, the first question the relatives ask is; onye loro uwa (who reincarnated" (Nnoruka, Personal Identity 87). The answer to this question Nnoruka asserts enables them to ascertain whether any of their awaited dead relations had come back to life. Some babies are even born with special identities of the dead relatives. For instance, some could be born with grey hairs, some with bodily marks belonging to the deceased elders. My brother for instance, is said to be a reincarnate of a deceased uncle who was bitten to death by a snake. This, my people say accounts for my brother strong aversion to snakes and his constant runny nose. But as beautiful and touching this belief may sound – it cannot be accounted for on the basis of two-valued logic. Only three-valued logic is capable of explaining this. If we take the proposition, 'a child is a child and not a man to denote 'C', and the proposition, a man is a man and not a child to denote '-C'' in traditional logic the set –CuC is an empty set. Thus reincarnation that assumes –CuC, is empty and thus irrational. This is why African worldviews are seen as empty by scholars like Levy-Bruhl and others. However, when we apply three-valued logic –CuC is a possibility. Thus, a child could be a child and a man at the same time without contradiction.

In Africa a thing could be both spiritual and material at the same time without contradiction – a phenomenon which Descartes found impossible to explain due to his look at it on the basis of two-valued logic. When an African swears an oath upon an object, the belief is that the object is both

spiritual and material. This is why in Boki of Nigeria, whoever wishes that his farm products should not be stolen would place or hang an objects like a stone or palm leaves in his farm where everybody will see it. At the sight of this object, nobody would dare take anything from that farm. This is because of the belief that those objects contains some spiritual powers and thus could harm anybody who dares them. There are claims that these objects have actually attacked and harmed some thieves. How could a mere stone (a material object) have spiritual powers, is a question that cannot be answered on the basis of two-valued logic. It is only explainable through three-valued logic. It therefore implies that in some world-views, it is possible to have –SuS without contradiction. Where S represents spirit and –S represent matter. A thing is either a spirit or matter but there is a possibility for the third term which is both material and spirit. This has a lot of implications for the society. The implications three-valued logic has for the society is both positive and negative. Positively, it implies that the long held debate over whether or not Africa has a philosophy has come to an end. Most of the African worldviews were considered illogical and thereby mythic and therefore, not philosophy. Three-valued logic has shown that what hitherto was illogical is actually logical. With three-valued logic an African can explain without being accused of contradiction why a broom stick could be both material and spiritual. It can explain the possibility of a living dead man. It could explain its idea regarding the cosmos, the human person, human destiny, cause and effect, personal identity and a host of other beliefs. Three-valued logic also explains the adoption of the win-win approach to conflict resolution as the best. In traditional two-valued logic, there is a winner or a loser, and no possibility for a winner-winner. Three-valued logic made this not only a possibility but rational. Three-valued and many valued logic have therefore proven to be a good complement of two-valued logic.

Because of the successes of three-valued logic in accommodating African world-views, Chris Ijiomah and a host of other African philosophers are calling for the enthronement of three-valued logic as a distinctively African logic as opposed to two-valued logic which they argue is distinctively Western. This paper call to caution this attempt, because of the negative implication this will have on knowledge advancement. If three-valued logic is enthroned as distinctively African, it would fall into the kinds of problem two-valued logic encountered in the West. Problems like mind – body, personal identity, change and permanence, the one and many et cetera were problems, because the West tried them on the two-valued logic. But these problems when looked at from three-valued or many valued logic perspective will turn out to be no problem at all. What we are saying here is that, no brand of logic could be held as a distinctive logic of an area without dire implications. The West could be excused for they tried everything on two-valued logic when three-valued logic was not discovered. Now that three-valued and many valued logic are available, two-valued logic is no longer seen as absolute even in the West. Three-valued logic is now being employed variously in the West. Quantum mechanics for instance only make

sense if looked at from three-valued logic. The integrated circuit technology is built on many-valued logic. According to Smith, multi-valued logic is now part of commercially available VLSI IC's and gives potential for circuit test (Smith 619). This large scale employment of three-valued logic in the West shows that the West no longer sees two-valued logic as absolute. Perhaps, it considered two-valued logic as absolute in the past out of ignorance, because that was the only logic known. It is surprising why African scholars would want to front three-valued logic as distinctively African, when it is arguably distinctively Western too.

If three-valued logic is upheld as distinctively African as many African scholars are advising, then it invariably means that Africans have no basis for appraising somebody as guilty or not guilty. According to the principles of many valued logic, there is a middle course between guilty and not guilty, which means somebody can be guilty and not guilty at the same time. How then do we judge such a person? Many valued logic is capable of destroying not only our legal system but all criteria for judgment of any sort. Three-valued logic could accommodate phrases like: he is a good and bad man; he is rich and poor, he is tall and short, he is in hell and heaven, he is wicked and kind, he is happy and sad, she is beautiful and ugly, she is fair and dark, he is asleep and awake; he is hardworking but lazy; he is smiling but frowning, he is eating but not eating and a whole lot of similar phrases. These phrases would be adjudged perfectly valid by three-valued logic. Judgment of all kinds follows two-valued logic. Africans make variety of judgments. Africans therefore, employ two-valued logic. The question now becomes, is two-valued logic distinctively African since majority of their reasoning employ it.

No logic is distinctively African and no logic is distinctively Western or Eastern. All hold a broad collection of beliefs, such that some could be justified by two-valued logic and some by three-valued and others by four-valued logic et cetera. For Africans to propose three-valued as distinctively African is a function of a divisive and polarising mindset. The Africans, the West and the East all have a moment of oscillation between two-valued and three-valued logic and other logics. The fact that some Africans beliefs could be explained through three-valued logic, does not mean the same logic does not explain some beliefs of the West, the East and other regions of the world. The Western belief that a human is a composite of a body and spirit for instance, could be explained through three-valued logic. Their belief in purgatory could also be explained through three-valued or many valued logic. The same is true of their idea of the living-dead (saints), incarnation, evil spirit possession and a host of other beliefs. All these beliefs before the advent of three-valued logic where illogical and unexplainable but with the advent of three-valued logic these beliefs along with that of the Africans are made rational and plausible. It would be a form of ethnocentric commitment for Africans to embrace three-valued logic as distinctively African as if it is only with African beliefs that this logic is employable. The different kinds of logic complement one another in all societies and must be seen as such to

avoid the problem the West encountered in their sole usage of two-valued logic. Three-valued logic cannot possibly explained all beliefs in African worldview, thus, it could not be distinctively African. A complementarity of all the forms of logic is the best logical tool to explain the totality of African belief system. To raise one logic to an absolute mode tantamount to a bridge of the complementarity relationship that exists in all realities and thus would not give us authentic knowledge. According to Asouzu any truth claim that ignores the relativity of human existential situation as to state apriori and apodictally what the case would be in all situations and fails to acknowledge the fragmentary and referential nature of all missing links of reality is bound to err" (*Complementary Reflection* 315). Any truth claim that ignores the complementarity existing in all logics would not give us authentic knowledge or insight into reality.

CONCLUSION

While we praise three-valued logic to the highest heavens, we should have recourse to the fact that it cannot be used consistently or it will lead us to a conundrum. No logic is suitable for the explanation of all views in a particular region of the world. Therefore, no logic could be designated as African logic, Western logic or Eastern logic. All the logic exists in a complementary relationship in all societies of the world. No society can authentically explain all its worldviews and beliefs without the recognition and affirmation of this complementarity existing between the different logics in the world. Two-valued logic is not bad in itself. It is only ineffective in explaining some world situations. Many valued-logic is good but it too, cannot lay claim to the capacity of being able to explain everything in the world. There must be this mutual complementarity between the two brands of logic, if we mean to advance in knowledge.

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