

# Considering Transdisciplinarity for a New Engineering Systems Science

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**Abstract:** *The role and importance of each country in the world economy are in direct dependence on how much it owns high technology. Engineering is what makes technology possible and the flexibility in the nature of this engineering and the type of engineers trained to solve complexities facing our world is of paramount importance. Engineering education is developing as a link in the system of continuous education and is intended to meet the needs of the individual, society and state in the training of specialists with a high level of professional competence and mobility. Aristotelian-based engineering science is not prepared to tackle modern complexities affecting our world today because it is limited in mechanics and scope, it also does not understand this because it is empirical analytical-based. A new type of engineering science that can foresee such occurrences, understand its microphysics and mechanics, even predict them and craft suitable engineering-based preparedness (along with suitable systems technologies for tackling them) lies in the integration of the Transdisciplinary scientific logic and process, the in between and hidden third that today's engineering science does not consider. This new engineering can only be achieved through the consideration of a Transdisciplinary*

*chair which would infuse Transdisciplinary culture in academia. The case of this new engineering systems science is used for substantiating the call for a Transdisciplinary chair and an aspect of Transdisciplinary systems engineering used for unifying entropy and order, to produce intelligence explained as further evidence.*

**Keywords:** *modern complexities; transdisciplinary entropy; transdisciplinary systems engineering science; transdisciplinary systems science and engineering.*

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## 1. Introduction

Society's transition and indeed leap from their underdeveloped state to the advanced, further sophisticated and relatively stable through the deliberate, careful and dynamic application of technology. The realization, for instance, of the central features of Rostovian hypothesis for economic growth: the preconditions for take-off, take-off, drive to maturity, and age of high mass consumption<sup>1</sup> are all predicated on this deliberate consideration of scientific development and support made possible by the science of engineering, its application and resultant technologies utilized directly for sustaining the operationalization of key economic infrastructure. The role and importance of each country in the world economy therefore are in direct dependence on how much it owns high technology<sup>2</sup>. The transition of the economy of industrially developed countries on the path of technological development, the dominance of science and knowledge-based economies determine the key role of highly qualified personnel of an engineering profile in the socio-economic sphere of society and have a significant impact on the formation of a new content for the training of future engineers to multifunctional engineering activities<sup>3</sup>. Simply put, the application of key technology for this purpose is made possible and incubated through an engineering process backed by effective public-capital and regulatory policy.

New problems<sup>4</sup> gnaw us in the face and these new problems which are extreme complexities, even considered more distressing than wicked problems themselves. Identifying therefore the direction, the deep microphysics and scale of modern day complexities indeed entail that the engineering we possess must also change to adapt to the dynamism and evasiveness of these new complexities. This process therefore calls for a critical look in the science of this engineering and to make this possible, our engineering has no choice than to have a Transdisciplinary shift from its foundational, traditional methods to something reflective

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<sup>1</sup> Rostow, W. 1960. 'The stages of economic growth: A non-communist manifesto'. Cambridge: Cambridge University Press; Tsiang, S. 1964. 'A Model of Economic Growth in Rostovian Stages'. *Econometrica*, 32(4), 619–648. <https://doi.org/10.2307/1910181>; Malenbaum, W. 1961. 'Economics and Labor: W. W. ROSTOW'. *The Stages of Economic Growth: A Non-Communist Manifesto*. Pp. x, 178. New York: Cambridge University Press, 1960. *The Annals of the American Academy of Political and Social Science*, 333 (1), 164–165. <https://doi.org/10.1177/000271626133300128>; Osafo-Gyimah, K. 1972. 'Rostow's Stages of Economic Growth: Does it Provide a Useful Scheme for Viewing and Interpreting Modern Economic Growth in Developing Countries? A Case Study of Ghana'. *Journal of Eastern African Research & Development*, 2(1), 13–27. <http://www.jstor.org/stable/43658225>.

<sup>2</sup> Tagay, O. 2015. 'Contact disturbances, self-esteem and life satisfaction of university students: A structural equation modeling study'. *Eurasian Journal of Educational Research*, 59, pp. 113–132.

<sup>3</sup> Subetto, A. 2002. 'The quality of continuous education in the Russian Federation: state: trends, problems and prospects'. St. Petersburg-Moscow: Research center of quality problems of specialists training, p. 498.

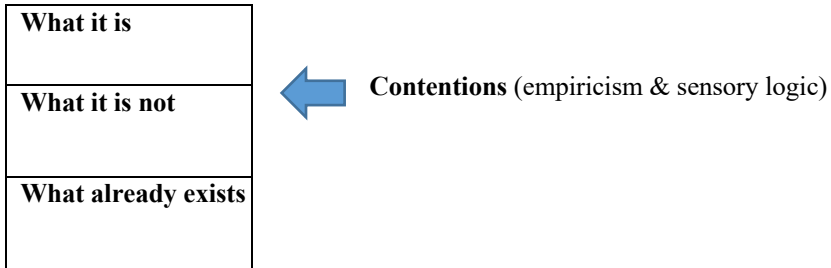
<sup>4</sup> Idejiora-Kalu, N. 2024a. 'Epistemology in AI (Transdisciplinary AI)'. *Transdisciplinary Journal of Engineering & Science* 15 (January). <https://doi.org/10.22545/2024/00244>.

of the change, dynamism and Transdisciplinary nature of modern complexities. The entire gamut of this shift must have to be predicated on a deliberate consideration of the type of engineering studies right from academia where the knowledge of this science is first incubated and researched (processed). The entire structure must not only consider the shift in engineering curricular but should involve an entire pedagogical adjustment which would also consider how Transdisciplinarity itself can be brought into other spheres of science, since all problems are connected. This new engineering must consider seriously the connectedness factor in other sciences and develop integration or infuse methodology for looking at the complexities in those sciences through the lens of engineering and Transdisciplinarity because Aristotelianism (upon which modern engineering is founded and regulated in our countries) does not possess Transdisciplinary culture. There is therefore the need to identify extensive, effective methods for determining how the complexities these societies would face will be tackled. The effectiveness-ability for tackling these complexities would therefore depend on the farsightedness in the design and delivery of the engineering scientific basis of such societies. Again, the ability of this new engineering to detect early enough (and it can), the dynamic change and evasiveness of the complexities that are meant to meet them as a causality necessity, the ability of such societies to overcome these complexities and even use them for their benefit, giving these societies a fulfilled direction, will be dependent on the flexibility and robustness of their (society's) engineering science. What crowns this up will entail how the training of these engineers would be, as much as the type of engineering science they would be trained in. For the relevance of Transdisciplinarity and the need for its inclusion in all sciences, the consideration of a new engineering that agrees with Transdisciplinary culture is an undisputed requirement for managing the complexities of our 21<sup>st</sup> century world and beyond.

In the study, engineering is used as a theme (a case study) to drive home the need why a Transdisciplinary Chair is needed as a stronger basis for tackling the complexities we face in our world today. The study makes a strong case why this new form of engineering systems science is needed using a method of unifying disorder and order through explaining how intelligence emanates from this activity (entropic intelligence). This demonstration is a complete shift from the formerly held belief of Aristotelian predicated science and engineering that entropy is anti 'order'. The boldness for considering therefore this Transdisciplinary insight in engineering systems science attempts something different, stating unequivocally that indeed disorder creates order and the entire activity produces a realism known as 'intelligence'.

## 2. The Limitation & Reductionist Factor of Aristotelian Logic-Based Engineering

Aristotelian-based engineering is inflexible. It is heavily predicated on the following notion that ‘for something to come to be, it must come either from what it is or from what it is not but it cannot come from what it is, for what already exists cannot come to be; nor can it come from what it is not, because there would not be anything for it to come to be from.



**Table 1.** Aristotelian predicated engineering contentions

Aristotelian logic limits engineering science to empiricism & sensory experiences alone and leaves no room for transcendental & pure logical realism. How can engineering science or developed engineered Systems prove what it is, what is not & what already exists when empiricism alone is the governing rule? Aristotelian logic is reductionist and does not allow the investigation and explanation of the mechanics of what is or what is not. It assumes full empiricism but has a blind spot in considering that not everything has ‘known’ or ‘discernable’ values but exist and are dynamic in nature. That we cannot see or measure them does not mean they do not exist or be. Aristotelian logic-based engineering therefore has no room for understanding quantum states or the mechanics of subatomic elements and their intelligence. In considering this, accepting their intelligence in engineering (the mechanics of the intelligence of subatomic elements) becomes a utopia if not laughable. But this dynamic nature exists also contributing to what is considered intelligence associated with entropy or disorder.

Aristotelian logic is also Western epistemology & dialectics based, restricting the entry & acceptability of the imagination and epistemologies of other peoples. And every scientific realism first draws its life and inspiration from an epistemological knowledge-based realism before the metrological basis sets in, as indeed, the ability of a people to estimate and understand scientific logic by metrology is heavily predicated on the epistemological originality of the people, their culture, cosmologies and environment, because we first imagine before we investigate or have or develop. A typical example for explaining this is demonstrated in the narrative of Dr. Zerbins (the surgeon who performed the first heart

transplant in Brazil in 1968) who saw how the health system worked in China, impressed with a lung surgery where a patient was anesthetized only with acupuncture<sup>5</sup>. In this context, some physicians and scientists, not being able to explain acupuncture scientifically, simply deny its existence, in this same isolated rationalist paradigm that may be seen also in Artificial Intelligence (AI), in tools like the ChatGPT and therefore do not admit that a technique such as acupuncture exists independently of science<sup>6</sup>.

From this, we see further how Aristotelian-empirical-premised engineering cannot explain the mechanics of that which is, what is not, nor what already exists because it relies solely on empiricism which does not have the capacity and tenacity to accept nor utilize transcendental or imaginative realism. Based on this premise, modern engineering science cannot define, for instance, the distinction between quantum states & the complex intelligence & operational dynamics of subatomic elements nor can it unify disorder exhibited in these complex elements. Thus, modern engineering systems science does not present any solutions for complexities predicated on this as its functions and insights are only limited to mere empirically observational spheres and not the real epistemological and transcendental coordinate realities. The idea of the real epistemological and transcendental coordinate sphere logic of engineering science must involve the intermingling with other sciences and unification created for understanding them as a whole with their associated problems. The problems of climate change, expected coronal mass ejections possibly hitting our earth, space wars which could be triggered by the deliberate and heightened militarization of space against the 1967 Outer Space Treaty, the means of conserving water and food availability, threats of HIV/AIDS, Tuberculosis, Cancer, and even the most recent technoscientific worry of the advancement of AI and how Transdisciplinary AI and the possible human replacement agenda<sup>7</sup> are all real treats which modern engineering does not seem to have proactive solutions for. It is therefore pertinent that we train engineers in the understanding of Transdisciplinary culture, making them further familiar with a new engineering systems science that would allow a Transdisciplinary outlook on new problems. The premise of this would only be made possible through the effective presence of a Transdisciplinary Chair in our universities and research institutes of learning.

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<sup>5</sup> Costa, L. & Thieriot-Loisel, M. 2024. 'March 21–22 TD Chair Symposium: Suggestions for Introduction and Questions'. (Unpublished Manuscript).

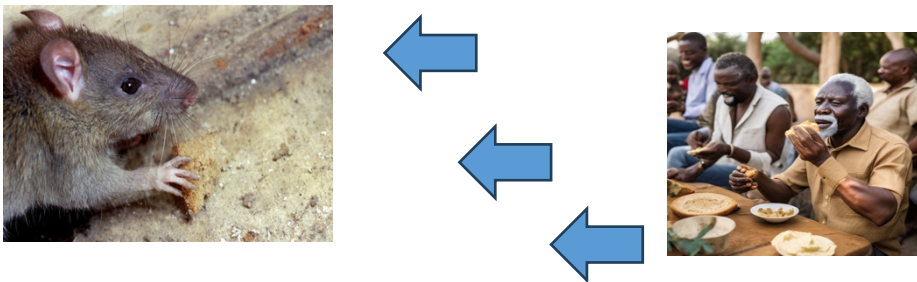
<sup>6</sup> Costa, L., 2024. 'Artificial Intelligence and the Transdisciplinary Human Mediation of HPTD-M'. *Transdisciplinary Journal of Engineering & Science*, 15. <https://www.atlas-tjes.org/index.php/tjes/article/view/864/393>.

<sup>7</sup> Idejora-Kalu, N. 2024a. 'Epistemology in AI (Transdisciplinary AI)'. *Transdisciplinary Journal of Engineering & Science* 15 (January). <https://doi.org/10.22545/2024/00244>.

### 3. Unification of Entropy and Order

Mankind has paid dearly as a result of the inflexibility of modern engineering. The case begins to present a possible picture that is very embarrassing to accept that former civilizations could indeed have been more scientifically and technologically advanced than us. Though one may admit that they never had airplanes, computers and AI, but a careful study of their times shows they never needed such technologies as we have today as they operated within the normalized use of telepathy for communication and teleportation for travel, and even the smartest mobile satellite-based technologies or airplanes of our day would seem analogue to them a useful technology or enablement worth celebrating. We visit today the Stonehenge in England, the Pyramid of Khafre in Egypt and Aramu Muru Portal in Peru as tourist sites and with our seemingly vast knowledge of science and engineering cannot decipher how to reprogram these communications, knowledge and transport portals to achieve our envisaged smart world views, we mostly do not seem in most cases to understand what these portals were used for and in this, our capabilities as humans continue to be limited. For mankind therefore to transcend into the next level, it must be prepared to redesign its engineering systems science to allow Transdisciplinarity and this is when it can arrive at the premise where it can be said it has succeeded in living at a time where it has conquered science and achieved full intelligence. Until this time comes, mankind, it must be said, would have not been able to capture full intelligence.

A premise for further explaining this (as a case in this study) is in unifying disorder, defining the intelligence that creates order, the intelligence of entropy or entropic intelligence, using a simple Bread Crumbs Reality.



**Fig.1** Demonstration of entropic intelligence (The Bread Crumbs Entropic Interaction)

The breadcrumbs entropic interaction explains a simple term which reveals that indeed it is disorder that makes way for order. Using this demonstration (**Fig.1**), a group of men enjoy a meal of bread, a staple food (for breakfast) in most African societies. What they do not know is that as they enjoy the meal, the crumbs fall (must fall) to the ground to provide food for the waiting mouse and

other super micro-organisms unseen to the human eye or even observable using known scientific procedures. An interesting thing in this activity is that their ability to prevent these crumbs from falling either from their hands or the table and by this from dynamically providing food for the mouse and other super micro-organisms (even when they seem to clean the entire table and floor) is beyond their ability or carefulness. The mouse and the super micro-organisms having this awareness that this must happen (that the crumbs must fall to the ground) are patient, waiting for the men to leave the space, for the intelligent process to complete through them, for it to partake in what it considers a meal. The body of the men after eating the bread undergoes a careful biological digestive process which leads to defecating the food and right from the toilet to the soak away pit or septic tank, this excretes awaits consumption by millions (if not billions) of super micro-organisms which wait and know under this intelligence that their food must be provided. This to them (what we humans see as the messy floor or disorder) is an intelligence which reports to them every natural and dynamic process of intelligence needed for their survival. So, the entire cycle (intelligence) of the crumbs falling to mess the ground for the human (a disorder) is an intelligence which is perfectly in order (an order) for the mouse and super micro-organisms.

The nature of the unseen crumbs that fall to the super micro-organisms and the nature of the super micro-organisms themselves are all supported by quantum mechanics in that although we do not have the empirical basis for determining their existence, we know they are there, and even when we debate that they are not there, it does not in any way imply they do not exist in their super subatomic, perfectly, structurally dynamic states and levels. The electromagnetic field effects emitted from the bread in the men's hands, the exhaling of their breath and touch on surfaces, all contribute to a certain form of what Aquinas defines as 'the elan (vitality) in everything'<sup>8</sup> which sustain the structural materials used for building the house and sustaining the macro environment enabling all to remain green and active, without which the wood of the house, the walls and even the air (inside and outside) and plants would all degrade or die. The entire cycle is a complex intelligence which emanates from what is formally considered a disorderly or disorganized process. While modern engineering stops here concluding and insisting it is disordered, not useful and must be overcome, Transdisciplinary systems engineering refutes this and says though it agrees that a process of order is expected and must be made possible, it must be made possible through a process and system that accepts (or agrees) that it is a normalized process climaxing to order (intelligence). This entire entropic intelligence is explained using the following formula that a certain **force of disorder (Fn)** is indeed responsible for the **activity (y)** which in turn results to the unification of another factor **Fn-y** to produce a grand factor **Fn = Fn-y** as the product of order or that which we

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<sup>8</sup> Fox, M. 2020. 'The Spiritual Leadership of Thomas Aquinas'. Creation Spirituality Leadership. February 19, 2020, <https://dailymeditationswithmatthewfox.org/2020/02/19/the-spiritual-leadership-of-thomas-aquinas/>.

may consider as **intelligence (entropic intelligence)**. The formula for the intelligence derived from this entropic process can then be given as a binomial function which properly sets the probability of the entropic intelligence resultant factor as:

$$Fny^2 (y + a)^n = \sum_{k=0}^n \binom{n}{k} y^k a^{n-k}$$

y being the independent case of any element of disorder (disordered or displaced activity), while the factorization of the entire sequence produces a constant (an expected constant of order or intelligence) when computed.

### 3.1. Consubstantiality of Disorder, Order and Intelligence

Intelligence is therefore a product of disorder and disorder must be present before there is order or intelligence. Disorder is the beginning of order, disorder is the force of order, the activating force of order and the rudimentary element of intelligence, intelligence comes from disorder, and whenever there is disorder, if allowed to complete its cycle (or climax), must produce order, the entire activity resulting in intelligence. Matter, space and time are not the only components of our world, there are transcendental realities and Aristotelian, empirical dependent engineering cannot search this out. And for the need for tackling modern complexities, these transcendental realities need to be searched-out and understood, if not for the science of it but to understand how they are associated with new problems, their microphysics and dynamic operational nature. Our new endeavors in Space for instance expected to consider life and activity there will be predicated on such Transdisciplinary engineering culture. So, apart from what is formally held by Aristotelian engineering that disorder is anti-order, indeed Transdisciplinary systems based engineering hypothesizes that entropy is a unique function of order and intelligence. A simple description of this can be seen also in the resultant feature of a pearl which comes about as a result of a healed wound. If an oyster has not been wounded in any way, it does not produce pearls. Pearls are products of pain, the result of a foreign or unwanted substance entering an oyster, such as a parasite or a grain of sand bread (a seemingly disorder).

In Hegelian master-slave dialectics<sup>9</sup>, self-consciousness is achieved when two people meet at a balanced state (both seeing themselves as equals) until a fight to death ensues (disorder) with a first self-realization and self-consciousness realism taking place where the one seeing that he is about to be killed submits (and becomes the slave or bondman) and the other assumes the position of a lord or master. After a period of time, a second self-realization and self-consciousness begins when the slave or bondman realizes that because he serves the needs of the master (food, water, medicine when sick, shelter, etc.), the life of the master

<sup>9</sup> Hegel, G. 1977. 'Hegel's Phenomenology of Spirit'. New York, Oxford University Press, pp. 16–18.

is in his hands. The master also on realizing this strives to achieve an equilibria understanding and normalcy (order), to be perpetual friends with the bondman (and in his good books) to preserve his own life (intelligence). This brings about balanced relations (intelligence) with the slave and general life becoming better (intelligence), passing the decorum and equity bar (intelligence). Having explained that a Master-Slave Psychology Syndrome exists in relations between nation states<sup>10</sup>, the disorder-turned-order in master-slave realism is also expectantly tenable in relations between formerly sworn state enemies who have (and can now) become great friends and partners in multilateral global development and prosperity. A good example is the realism of the 1618–1648, 30-year war in European history (disorder), a resultant realism of the 1648 Peace of Westphalia (order) which culminated (or climaxed) to modern diplomacy (intelligence) and further the strength of the European union today (intelligence). Using the aforementioned entropic intelligence therefore, whatever conflict that exists between states, however, grave these conflicts are, are indeed a coordinated process, expected at some point to achieve good and normalized relations (order) between such states. Intricate dynamic factors (some known and unknown) and at the mercy of time and chance would always facilitate this.

Therefore, it is apt to imply that any situation that presents itself as a disorder indeed is the consubstantiality of order and intelligence. Whether it be in the form of unexplainable chaos and underdevelopment of nations or dark societies seeking light, all are coordinated and intricately involved in a complex dynamic intelligent cycle of events meant to achieve order, sustainable development, stability and beauty whenever it climaxes. The knowledge of this, therefore, would allow mankind seek this order and intelligence hidden in disorder as presented in the initial manifestation of the first self-consciousness or first self-realization factor (the disorder) and even forecast what the end of such disorder or crisis can be (entropic forecasting or entropic intelligence forecasting), going further as even inviting or preempting this order before the time-centric process. This area requires future research and Critical Systems Heuristics<sup>11</sup> may provide

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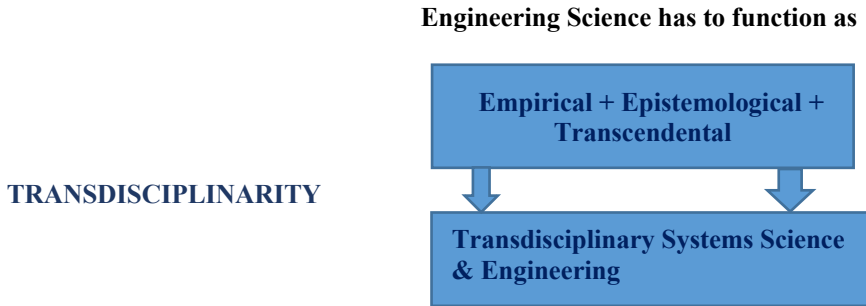
<sup>10</sup> Idejiora-Kalu, N. 2019. 'Understanding the effects of the resolutions of 1884-85 Berlin Conference to Africa's Development and Euro-Africa Relations'. Prague Papers on the History of International Relations. Issue 2. pp. 99-108; Idejiora-Kalu, N. 2020. 'Economic and religious interplay of interests as a reason for drastic change in Africa's electioneering dynamics'. In Bondarenko, D. (Eds.), *Africana Studia* no. 31, WP/CEAUP/#2020/1, pp. 1–16; Idejiora-Kalu, N. 2021. 'Master-Slave Psychology Syndrome: Imbalances in the Legal Interface of Treaties between powerful & less-powerful States'. *Public Goods and Governance Journal*. Volume 6. Issue 2. DOI 10.21868/P GnG.2021.2.2.

<sup>11</sup> Idejiora-Kalu, N. 2023a. 'My Journeys, My Story!' Doctorate of Professional Studies (DProf) Stage 1 Review (Registration) submitted to Middlesex University, London, UK in partial fulfillment of the award of the DProf Degree in Transdisciplinary Practice (Transdisciplinary Systems Engineering and International Relations). Supervisor: Dr. Nico Pizzolato (unpublished); Idejiora-Kalu, N. 2024b. 'Unravelling the Microphysics of Disorders in Institutions in Post-colonial Countries using a CSH-based Transdisciplinary Systems Engineering Paradigm – A Case study of Nigeria'. Sixteenth International African Studies Conference 'The New World Order: From the Legacy

models for achieving this.

#### 4. TD Chair in Academia

The driving home of the understanding of the new engineering systems science has to take footing in our tertiary institutions. The rule must have to be relaxed and must not take the same orthodox admission criteria which fall within Aristotelian rule-based reductionism and must be spearheaded by a new engineering systems science that would have the following study, pedagogical and research architecture:



**Fig.2** Transdisciplinary architecture of the new engineering science (Transdisciplinary systems engineering)

Engineering has to assimilate epistemology and not base only on empirical logic because not all real and dynamic systems have yet known empirical signatures. Because of the subatomic and mostly evasive and transcendental nature of these elements, their empiricity (or empiricism) may be unknown and can disprove valid scientific enquiry. Costa (2024) strongly affirms that it is very risky to deny the existence of something simply because it cannot be explained rationally or scientifically, even if empirically it is evident, like the ‘off-label’ prescriptions of medicines by physicians: They understand that it works but don’t know the mechanism<sup>12</sup>. Also, in Huxleyian logic which states that ‘facts do not cease to exist because they are ignored’, the dynamism and facts of the life and

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of Colonialism to Sovereignty and Development’. Moscow, Russia May 21–23, 2024 (Published Abstract); Ulrich, W. 2002. ‘Boundary critique’. In H. G. Daellenbach and R.L. Flood (eds.), *The Informed Student Guide to Management Science*, London: Thomson Learning, pp. 41–42; Ulrich, W. 2005. ‘A brief introduction to critical systems heuristics (CSH)’. Paper available in the Open University’s ECOSENSUS project web site, <http://projects.kmi.open.ac.uk/ecosensus/about/csh.html>, or in the CSH section of Werner Ulrich’s Home Page, <http://wulrich.com/csh.html>; Ulrich, W. & Reynolds, M. 2010. ‘Critical systems heuristics. In: Reynolds, Martin and Holwell, Sue eds. *Systems Approaches to Managing Change: A Practical Guide*. London: Springer, pp. 243–292. <sup>12</sup> Costa, 2024 Costa, L., 2024. ‘Artificial Intelligence and the Transdisciplinary Human Mediation of HPTD-M’. *Transdisciplinary Journal of Engineering & Science*, 15. <https://www.atlas-tjes.org/index.php/tjes/article/view/864/393>.

mechanics of these super subatomic elements imply they ought to be investigated and accepted as real even when we do not have empirical logic for supporting their existence and dynamic activity. In this way, Transdisciplinary systems engineering can assume the flexible nature (or shedding light into the objective and less objective) consideration of the value of realness contained in epistemological insights (**Fig.2**) which explain transcendental nature and activity, a high form of intelligence which expects to reveal more of the dynamics of new problems and the complexities we face now and beyond.

The institutionalization of this should take a central stage in academia and must acquaint other fields on the Transdisciplinarity in their spheres. There is the need to acquaint ‘the Transdisciplinarity’ in other sciences and fields if our complexities and new problems can be given a strengthened attack as it ought to. Transdisciplinarity would therefore have to be infused into modern engineering as a Specialized Academic Concern (TD Chair) and expanded in other sciences and fields using a Universal TD Integration Systems (UNITD) Model. This ‘*TD in everything*’ would show how Transdisciplinary thinking can be integrated into the disciplinary thinking of other sciences. In this manner, solutions that emanate from this sort of thinking would have a Transdisciplinary patterned process which would produce solutions that are vast in scope and applicable for the complex problem area. In this way, the complexity factor in new problems would be unable to escape the solutions bracket (or solutions trap) and the intelligence from their consubstantiality factor of empirical intelligence made quickly possible and brought to the fore.

Expounded further, the following would have to be the case and inform the engagement architecture as a rule:

- Transdisciplinary rationality would have to be explained for all sciences, fields & complexities.
- A comprehensive Curriculum for Transdisciplinary Systems Science and Engineering as an academic discipline (BSc, MSc, MProf. PhD, DProf, DSc-Habilitation) all without traditional admissions criteria would have to be prepared and made functional in our universities.
- Arrange funding for the creation, teaching & research of Transdisciplinary studies, Transdisciplinary sciences, Transdisciplinary systems science and engineering, in universities across the world.
- Prepare engineers & scientists that can understand new problems and tackle them if we would succeed also in new frontiers such as Space and the unknown extraterrestrial.

## 5. Conclusion and Recommendations

The international community must make sure that a global funding scheme which would assist developing regions integrate this study, pedagogical and research engineering process into their universities and research structure is

made available, the process of accessing it must be free also from traditional fund accessing bottlenecks and bureaucracy. This is to make sure that the divide in this new area of understanding is not further widened as history has shown that because of lack of funds, most developing regions are unable to implement their chapters or components of Transdisciplinary study even when they identify the relevance. During the course of this research, universities like Peaceland University in Nigeria in noticing the relevance of Transdisciplinary studies (itself an institution built on interdisciplinary and multidisciplinary ethos) indicated interest to host a pioneering faculty of Transdisciplinary studies and research in Nigeria on the condition that a modality must be made possible for funding its set-up, management and sustenance. This reflects the general envisions of many universities in countries across Africa and the global south in this quest to institute strong study and research chapters of Transdisciplinary science in their countries.

The International Center for Transdisciplinary Studies and Research (CI-RET) therefore ought to take it upon herself to galvanize these funds (possibly through mediation with specialized agencies of the United Nations, governments, the Sovereign Wealth Funds and even willing private sector, to support the creation and running of such faculties for Transdisciplinary studies (and their TD Chairs) in especially global south countries grappling with problems of funding, and indeed augment the meager funds made available to them through their lean national budgets as Transdisciplinarity is an expensive science. CI-RET cannot fully achieve its mandate if it does not have a deliberate policy for the institutionalization of Transdisciplinary studies and research all over the world. The idea again has a common sense of earth and humankind sustenance logic, as the problems of cancer, HIV AIDS, tuberculosis, terrorism, climate change, coronal mass ejections and hunger are shared, it makes sense therefore to allow and share the solutions paradigm. This will include considering a Transdisciplinary exchange of ideas for this and the outlook of Transdisciplinary research and culture has to be encouraged and supported from the epistemological lens of other societies and not only in the West. This, when done, will broaden our scientific scope and remove epistemological limitations.

Finally, tackling modern day complexities which we know today as new problems is serious business if we intend eradicating or putting a control system over what we consider our shared, humanist problems. The overlooking of outside empirical logic because we do not have an engineering that factors this in will continue to have damaging effects on our world and existence as humans, even in the way we see and utilize science. Therefore, the interest in equipping our engineering with this new type of engineering science is paramount. This activity is centered on the need of the TD Chair as this activity must emanate from the stool of academia and engineering plays a coordinating role. The substantiation of this is that it has been explained that engineering education is developing as a link in the system of continuous education and is intended to meet the needs of the individual, society and state in the training of specialists with

high-level professional competence and mobility, a broad outlook, which is based on knowledge related to primary specialty fields, highly creative potential, which is realized in technical creative thinking to solve complex engineering and economic challenges in the increasingly complicated information environment<sup>13</sup>.

Our understanding also of disorder in light of the new Transdisciplinary systems engineering that indeed disorder is a component of order and intelligence is interesting revelation for our modern day scientific enquiry as standing on this scientific premise, we may appreciate disorder whenever it arrives and know that indeed we are in the step to finding what is considered normalcy, a whole new perspective in our understanding of thermodynamics, systems thinking and problem mapping. The cleaning of a house because it is untidy creates room for a better environment which produces an ordered space, healthy and comfortable to live in. This should be our focus for every aspect of disorder and outlook to our new problems. Current activity in the research area is in visiting universities and research centers across the world to demonstrate the UNITD process of infusing of Transdisciplinarity in various fields and sciences. The research solicits sponsorship.

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