INNOVATIVELY EXPLORING PROVERBS WITH TRANSDISCIPLINARITY

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ABSTRACT
Purpose: This study examined proverbs with transdisciplinary to discover indigenous elements that can be synthesized to open new proverb application frontiers and create hybrid indigenous global knowledge concepts and techniques.
Design/Methodology/Approach: This study used literature review, analysis and synthesis method.
Findings: Findings indicated current African technical proverb research and thinking is a non-innovative silo and routine thinking that doesn't lead to commercialized technical innovations. Transdisciplinary thinking across, between and beyond silo boxes is a way of restoring proverbs to their original creative and innovative technical traditional thinking. Story design thinking method and Per-Poor system of innovation proverbs provide proof of concept that this can be done using transdisciplinary, artificial intelligence and bioinspired design inspiration.
Implications/Research Limitation: The implication of the study is transdisciplinary creative proverb application enables proverbs to be applied in new areas. Proverb intensive methods will enable the creation of inclusive approaches and easier to diffuse research as all people can visualize it to a higher degree. The limitation of the study is it was based on a literature review and no practical demonstration of inclusiveness was carried out.
Practical Implication: This study stimulates proverb researchers and practitioners to innovatively apply proverbs in their research, practice and technical writing. Ordinary people should provide feedback from their experiences on learning and using proverb intensive technical writing literature through shared proverb language. This would allow the evolution of the style.
Originality/Value: The study is first to explore proverbs with a transdisciplinary lens and show how technical writing can be made more proverb intensive.

Keywords: Analogy. metaphor. puzzle. riddles. solving. symbol substitution

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1.0 INTRODUCTION
1.1 Background
Proverbs are a powerful means of learning, teaching and practising that can creatively be used to explore or introduce any topic in any area or discipline. Metaphors are means to codify tacit knowledge, explain, understand complex phenomena and innovate. Analogies are similar to metaphors. Their difference is analogy puts more emphasis on relations, and metaphors on attributes between source and target (Hey, Linsey, Agogino, & Wood 2008). Proverbs are a shared, common world view that everyone uses while transdisciplinary unlocks and unifies knowledge bounded in different areas. Both share values of universalizing knowledge and practice. The power of proverb applications is limited by the amount of creativity used. Most everyday proverb technical applications are routine rather than creative and innovative. Proverb thinking is mostly routine, inside the silo box thinking and transdisciplinarity is the key to unlocking, expand or breaking the silo boxes. One way to get out silo thinking is to use transdisciplinarity to move across, between and beyond the silo boxes (Niscolescu, 2010). Niscolescu (2010) concept of across, between and beyond has become a powerful widely applied beyond disciplines' level. All proverbs are put in double-quotes, acronyms by convention and metaphors are in upper case.

Proverb sub language is used in all daily life activities, due to its applying to a lesser or greater extent wherever the language is applicable. Language is used both in everyday activities and outside in science, technology, innovation, research and development, theory and practice. This study establishes the foundations of a technical proverb intensive writing style. Proverb intensive writing is used in writing some stories, poems and songs indicating style can be extended to other areas like proverb technical writing domain. Thinking across, between and beyond thinking boxes was used to show how micro-level scarcely used proverb technical writing can be mainstreamed into a micro and system macro-level proverb intensive technical writing style.

Speculative writing unique ability to describe the relationship between creation and context may be the most important skill in design and is a means to elicit creative critical design thinking that can be used in the technology arena for design fiction (von Mengersen, 2018). Once upon in the African continent, many people's minds were full of imagination of giants challenging people nature of the order as stories were told around fireplaces in the evenings. The first step of the story design thinking process (Beckman & Barry 2007, Beckman & Barry, 2009) is a call to adventure that can be used to discover novel ways. This is the traditional way of doing that enabled everyone to be an active consumer and creator of knowledge and can be used to disseminate relevant published technology work to everyone including children. The second story design step is making this a great journey that leads to the next step of exploitation. Design exploitation involves creating innovations that add value to an

organization or person's activities in a profitable way. This can be done by turning published work to design fiction that generates profit. For example, using stories such as ones where giants swallowed people who shouted from giant stomachs exposing what giants had done. Design fiction can create a humanoid robot having giant characteristics. How can a person swallowed by a humanoid robot communicate to the outside world? Emerging technologies that enable converting brain signals into human understandable senses like speech can be used to hack into robots communication systems enabling swallowed humans to communicate to humans in the outside world. This could be turned into a design/science fiction film that would employ animators and other professionals and generate money. Speculative proverb intensive writing using proverbs themes, strategies and tactics can be used. This would make it possible for any person to visualize, imagine and actualize design fiction film. For example, the paper on how to develop indigenous design and manufacturing in Ghana (Akayeti, Sackey, & Dzebre, 2015) is likely to be read-only by journal paper readers a small proportion of the population. Turning it into design fiction would make it reach and capture the imagination of the masses. Design fiction is transdisciplinary so would enable overcoming political, economic, social, technological barriers of indigenous automobile manufacturing arising in ways that can capture the public imagination. Design writing gives form and process to imagination allowing innovation and speculation to emerge as speculative writing turns design into action von Mengersen (2018). Speculative design fiction can help turn technology research into something public act on

Proverbs and metaphors have been used by philosophers and indigenous people to transfer and transform knowledge (Grisham 2006). Technology development is a transformation of abstract concepts in one domain into concrete concepts in another. Proverbs are metaphoric systems that allow substituting one or more concepts in a proverb with novel concepts from the same or different domain.

Proverb literature and communication aspects are well researched and applied, but little research on proverb problem solving and application to technology development has been done. There is a large amount of well-developed African global technical knowledge without a critical mass of people to apply it and less developed technical indigenous knowledge theory and practices with a large number of people who need to apply it. This study's objectives are: to examine proverbs with transdisciplinarity to discover elements that can be synthesized to open new application frontiers and create hybrid indigenous global knowledge techniques and concepts; and to identify ways and benefits of the increasing proportion of proverbs in technical writing

2.0 THEORIES UNDERPINNING THE STUDY

Creative application of proverbs is an adventure into known and unknown worlds. Similar to reading or writing a good novel, proverbs are guides to navigate or create other peoples

theoretical and practical worlds as well as imagine possible ones that could be made to exist thus wearing others imaginations, academic and practice shoes. Transdisciplinary is an unconventional exploration journey across, between and beyond disciplinary boundaries. Disciplinary boundaries are silo walls that hide disciplinary specialists' knowledge. A disciplinarian has to decide to go to disciplinary boundaries to see further to travel the transdisciplinary invention and innovation journey. African traditional societies were more innovative and inclusive compared with modern societies as indicated by their innovation processes and many prototypical radical innovations. They developed most innovations through improvisation leveraging predominantly tacit knowledge. Because of their tacit orientation, African traditional technology literature has few theories. Traditional and grassroots innovations (African Jua Kali) are likely the basis of the industrial revolution in developing countries, determinants and drivers of these below radar innovations were identified (Pansera, 2013). Some identified determinants and drivers are common among developing countries and provide foundations for developing transdisciplinary below radar innovation theory applicable to developing countries including African traditional and grassroots innovations.

An example of radical traditional innovation is fire (Mambo, 2020b). It seems more natural to switch from innovative culture to routine culture than vice versa. Very young children are known to be very creative but as they mature, experience and knowledge hinder them from remaining as creative resulting in continuous decline of creativity with growth. There are successful cases of individuals and societies rebuilding their lost creativity and innovation capabilities for example innovation lagging behind societies rebuilding their cultures of innovation for industrialization. On other hand, African modern society has large amounts of global knowledge, African indigenous knowledge and indigenous knowledge from other parts of the world. This knowledge should be used to sustain new capabilities and rebuild lost ones.

Proverbs enable thinking, communicating and feeling from another person's perspective thus walking in other person shoes (Grisham, 2006) using experiences and wisdom of many. One knows how one's LIFE AS SHOES is comfortable or hurt, making one walking in their shoes empathize with their situations. Proverbs are society's shoes for walking the talk and walking the wisdom. They form a loose skeleton weaving disciplinary knowledge as well as disciplines together that triggers knowledge flow inside, across, between and beyond disciplines. Transdisciplinarity is what is across, between and beyond disciplines (Nicolescu, 2010) and other bounded regions of knowledge. African proverb philosophy is transdisciplinary (Nabudere, 2011) making it possible to apply proverbs across, beyond and between knowledge territories and boundaries. Transdisciplinarity turns proverbs into the shoes of walking new worlds to build new bridges.

The whole is greater than the sum of parts. Knowledge and technologies should be organized as systems of systems (Bunge, 2000). African indigenous knowledge (IK) and global knowledge

(GK) systems have not been synthesized denying would-be users opportunities and possibilities this would avail. Proverbs and transdisciplinarity can provide a way of creating a unified system of indigenous and global knowledge. Creating a unified system would enable interoperability, portability and communication of GK, African and other IK systems. Western systems and Japanese Kaizen were once indigenous but have become global by improving them through enriching them with knowledge from other regions. Countries that industrialized recently used their indigenous knowledge to enrich global knowledge to enable technology to catch up. Creating a hybrid GK-IK unified system for upgrading capabilities is a journey of thousand steps. This study uses metaphors and analogies to create foundations for a unified system, the journey's first step.

3.0 RESEARCH METHODOLOGY

Two research methods were used: design science conjecture analogy method (DSCAM) (Gero 2000) nested with story design thinking method (SDTM) Beckman & Barry (2007). Nesting two methods was due to Design science research methods lacking design reasoning techniques to link design and knowledge (Ondrus & Pigneur, 2009). Design thinking (Gabrysiak, Holger, Giese, & Seibel, 2011) and design science research methods are used for problems combining innovation, research and contributing knowledge. Additional reasons for using DSCAM are it's was used to create an indigenous Per-Poor proverb innovation system Mambo (2020b) providing prove of applicability for creating indigenous artefacts. Another reason is DSCAM uses analogy and metaphor. SDTM was selected because it is based on stories, one oral literature type and is consistent with the way stories are created and used.

DSCAM analogy connects similar situations to discover solutions elements that can be used to create novel solutions. Phases of a design story are: call to adventure, a great journey, daring to exploit, resolution and return Beckman & Barry (2007). Attempting to use proverbs for innovation is a call to adventure, transdisciplinarity makes a great journey by increasing possibilities and challenges, and whatever is discovered is exploited for beneficial ends.

4.0 PROVERBS AND TRANSDISCIPLINARITY
4.1 Proverbs, invention and design

Africans created many traditional innovations and were therefore creative and innovative. Their creativity was embedded in their indigenous knowledge and reasoning including proverbs. However current proverb thinking is predominantly siloed conventional routine thinking. Divergent thinking and combining ideas in novel ways are the basis of innovation. Mambo (2020b) everyone designs because everything created has a structure and Africans have a proverb "everything is designed" that supports this. Design heuristics are strategies that increase diversity to generate new ideas and solutions using existing ideas and solutions, an example of a heuristic is "apply a new mechanism in a new way" (Daly, Yilmaz & Christian, Seifert, & Gonzalez, 2012). This engineering design heuristic example shows it's easy to codify

engineering knowledge as proverb heuristics or substitute proverb symbols with concepts to turn them into engineering design heuristics. Story-based Design Thinking by Beckman & Barry (2007); metaphor and analogy methods are used for engineering design innovation (Hey et al., 2008). Stories are oral literature constructs like proverbs. Current common proverb application only individual proverbs are applied in a non-creative way in an activity. This lacks the synergy of using proverb systems creatively as a whole is greater than the sum of parts.

Proverbs were used by indigenous societies to construct their buildings according to Alexander (Coplien 1999), knowledge, technology and indigenous social-technical systems (Mambo, 2020b). Design strategies are like proverb strategies (Norvig 1996). Riddle reasoning, design reasoning (Njoroge 1992) and proverb reasoning (Sunkuli & Miruka 1990) use functionalism theory. Proverbs being design heuristics, similar to design strategies and using functionalism theory for reasoning makes design reasoning substitutable for proverb reasoning. The story design thinking process is an example of using stories as a framework for design reasoning. Proverb reasoning can be used analogously to create indigenous innovation techniques. The study uses African not only to mean reasoning with African proverbs though it is important but also proverb oriented reasoning whether using African or non-African proverbs.

The proverb "Rome was not built in a single day", Rome symbol can be substituted with academic discipline, knowledge, technology or system and symbol 'single day' with single community or discipline and so on. Technology development transforms abstract science concepts into embedded concrete technology concepts. Building a city unifies abstract concepts from different disciplines by transforming and embedding them into buildings and systems of buildings. Symbol substitution technique is the basis of innovative intelligent thinking and can be used as a transdisciplinary technology development technique by substituting problem and solution abstract proverb concepts (symbols) with abstract concepts from different disciplines, then continuous transforming them into more and more concrete concepts. This can be done by converting a concrete problem into an abstract problem, an abstract problem into an abstract solution and an abstract solution into a concrete solution. Different variations of this pattern are used in several innovation methods such as TRIZ general problem-solving process. This is continuous stepwise application GENERIC IS SPECIFIC metaphor (Turner & Lakoff 1989) it's inverse SPECIFIC IS GENERIC and applying symbol substitution technique.

Invention and commercialization of large complex technology systems like an aeroplane are a "Rome" that uses knowledge from different disciplines. The aeroplane was not invented and commercialized in a single place but by people from different parts of the world and with different types of knowledge and experiences. The flat world view in which ships would fall at the edges was changed by explorers trying to reach its boundaries but then they went around the world discovering it's was a sphere. Building "Rome" knowledge, technology or a city is transdisciplinary. Proverbs are models that use a metaphor, analogy, abduction, induction, case-

based reasoning, abstraction and concept substitution mechanisms to develop solutions. Models are the simplification of complex systems and phenomena that are easier to understand and apply than real systems or phenomena. Metaphors like "A CITY IS A BIOLOGICAL CELL" and "DESIGNING/TECHNOLOGY DEVELOPMENT IS GROWING A BIOLOGICAL CELL", enables the transfer of biological cell knowledge to design and build better cities; and technology innovation solutions. Designing metaphoric systems for transferring knowledge from better-understood domains to less understood ones can help leverage underutilized metaphoric thinking.

4.2 Culture and proverbs

Cultural world view shapes professional world view determining how professionals chose conceptual models, research questions and what professional researchers and practitioners do (Bhawuk, 2008) and influences selection of indigenous exploratory research methods. Cultures that shape professionals worldviews are national, disciplinary, organizational and ethnic cultures (Hinds & Lyon, 2011). A frame is a set of cultural resources that innovators selected from their cultural resource stores to construct technology innovation strategies for action with different individuals having different tools in their store thus constructing different frames making innovation teams six blind men studying the elephant (Leonardi, 2011). The blindness is due to differences in resources stored, constructing frames with different tools and frames are not completely visible to others. In Africa different countries have overlapping national cultures, employees working in different organizations are influenced by their organization cultures, those from different disciplines have different disciplinary cultures, and different communities have different social-cultural cultures. Individuals adopt different cultures that determine their strategies and actions.

Proverbs are useful in science, technology and business (Nyota & Mapara, 2007) and enhance local design culture (Mambo, 2020a) by connecting popular understanding, academic research, civilization assumptions and metaphors to explore alternative futures (Potter, Osseo-Asare & M'Rithaa, 2019). They are transdisciplinary since they cut across, are in between and beyond disciplines. Metaphors transfer knowledge system from one discipline to another for example metaphor "MIND IS A COMPUTER" (Kintsch, 2008) transfer's mind knowledge to computing. Apple Company used the metaphor "APPLE COMPUTER IS BICYCLE OF MIND" to transfer metaphoric knowledge of mind as a bicycle to computers that helped align the company's engineering development processes and customer reasoning about Apple computers. Computing professionals can use computer knowledge to understand the mind better and vice versa for psychology professionals. Metaphor theory uses one direction metaphor where a target solution is used to develop a source solution or both directions where the source and target change positions during development (Wolff & Getner, 2011). Metaphors have conventionally been used in one direction can be reversed to discover new relationships.

Technological advancement is possible because culture drives technology innovation (Ogungbure, 2011). In the technology advancement journey, culture is the driver and technology innovation is the vehicle. Technology is a systematic study and way of doing things (Ogungbure, 2011). Thus culture drives a systematic way of studying and creating novel things by using the philosophy steering wheel to steer innovation vehicles in novel directions.

According to GREAT CHAIN, metaphor knowledge is built using metaphors of phenomena organized as hierarchies with higher levels founded on lower levels (Turner & Lakoff, 1989), proverb metaphors map things in different hierarchies and domains of GREAT CHAIN metaphor (Lakoff & Johnson 1989, Özbal, Strapparava & Tekiroğlu, 2016). Transdisciplinarity can systemize the mapping. Scientific theories are often based on metaphors that have a physical and cultural basis, for example, the high in "high energy particles" is based on MORE IS UP metaphor, THEORIES AND ARGUMENTS ARE BUILDINGS (Lakoff & Johnson, 1989:20, 48). An example of the related proverb is "knowledge is a building to which every person brought a brick". IDEAS ARE PEOPLE for example in the phrase: relativity theory gave birth to a large number of physics ideas (Lakoff & Johnson, 1989) and inventors of major technologies and pioneers of ideas that formed disciplines as fathers. The proverb necessity is the mother of invention has been combined with expression with father as creativity, experience or curiosity. In these metaphors ideas and inventions are children. For example, is "necessity is the mother of invention and father of innovation is curiosity". Edison is the father of the invention industry and historians of technology debate whether the story of Edison can best be understood by Steve Jobs who largely invented modern computers or Bill Gates who benefited most from the invention (Gallant, 1997). MOTHER NATURE and NATURE IS MENTOR metaphors are based on PHENOMENA AS PEOPLE. Creating systems and extensions of proverbs like "necessity are the mother of invention and curiosity is father" and combining with saying can be used to create new proverbs and improve existing ones.

4.3 Proverbs, metaphors and higher-order reasoning

Current proverbs, riddles, metaphor and analogy reasoning can be considered as first-order reasoning. In this type of reasoning conventional operations, connections relations, transformations and substitutions are used. Metaphors and analogies source object properties are related to target object properties. Proverb riddles (Messenger, 1960) are second-order reasoning structures as they combine oral types proverbs and riddles by relating proverbs properties to the riddles and vice versa. Based on analogy inspired design study makes the analogy between conventional folklore reasoning with logical reasoning. First-order logic deals with propositions, predicates and logical operations. In second-order logic, the variables are composite functions, predicates and propositions. The study proposes analogous second-order folklore reasoning where analogies and metaphors source or targets object symbols are connected or substituted with other metaphors, riddles, proverbs rather than atomic concepts.

Second-order reasoning connects proverbs with other composite constructs or uses symbol substitution to replace proverb symbols with proverbs and other higher constructs. Foundations of second-order reasoning should be developed. The GREAT CHAIN metaphor is suitable for creativity but not science and technology, but second-order reasoning can create 2nd order metaphors like GREAT CHAIN IS CHEMICAL PERIODIC TABLE and its inverse CHEMICAL PERIODIC TABLE IS GREAT CHAIN, GREAT CHAIN IS BIOLOGICAL TAXONOMY and its inverse BIOLOGICAL TAXONOMY IS GREAT CHAIN that links creativity, science and technology.

Necessity driven resource-constrained innovation starts where one is, with what one has (e.g. resources) or can be easily acquired Mambo (2020a). Traditional societies were invented through clusters of local innovators with exchanges between clusters carrying out similar innovations. Traditional societies used proverbs for technology innovation creatively. But creative use proverbs in current societies especially for technology innovation have become extinct. Cultures of innovation are based on techniques of learning, thinking and working (Fischer & Ostwald 2002). The traditional culture of innovation made everyone a creator, consumer of knowledge and innovator. Current African innovation culture is based on global knowledge which only a small proportion of the population possess, making the majority of people consumers of knowledge. Local indigenous innovation is marginalized by having little support, funding, recognition and infrastructure.

According to personal construct theory (PCT) everyone is a scientist (Kelly, 1955). Extending PCT to technology then everybody is a technologist and engineer because everybody develops artefacts. A child turning a stick to an aeroplane while playing has created a virtual artefact innovation. A commonly used metaphor is SCIENCE IS PUZZLE SOLVING that symbol substitution technic can change to EXPLORATION IS PUZZLE SOLVING. Proverb symbol substitution technique uses induction and abductive reasoning. Scientists and technologists are attracted to science because of the adventure of puzzle-solving (Kuhn, 1970). But exploration adventure is not only for scientists but for everyone even early explorers were motivated by the adventure of solving for example the puzzle of the shape of the world as well as regions found in it. Explorers solved the puzzle by finding the world was a sphere and then physicists solved the puzzle of why the world and universe are spherical with the theory that gravity pulls all pieces together with the same amount of force resulting in a spherical shape. Science and technology puzzle pieces are from their paradigms and techniques from scientific and technological trajectories.

Lakoff & Johnson (1980) leading idea conceptualizes the world fundamentally metaphorically by mapping one concept into another (Kertész 2015). Proverbs are intelligent wisdom metaphoric structures. Wisdom is win-win leveraging of knowledge by an entity for good of the individual, society and the world. Developing metaphoric systems for different domains and

disciplines can accelerate technology development, knowledge and experience sharing and collaboration between scientists, technologists and the public. Metaphors can help non-scientists approach everyday problems the same way scientists approach them (Harwood, Reiff & Phillipson, 2005). Putting pieces of science puzzle metaphoric solution development by Harwood et al. (2005) was done by identifying metaphors used by scientists and technologists to help the public understand science and attract young people to learn and practice science and technology. The study collected metaphors by interviewing 52 university science, academic faculty scientists. The metaphors obtained were: SCIENTIST IS AN ARTIST from the physicist, SCIENCE IS COOKING from medical scientist, SCIENCE IS BRICK BUILDING from a geologist, SCIENCE IS PLAYING A GAME from biologists, SCIENCE IS LEARNING A FOREIGN LANGUAGE from the chemist, SCIENCE IS GARDENING, SCIENCE IS FARMING, SCIENCE IS POETRY, SCIENCE IS A BAG OF TOOLS Harwood et al. (2005). Theory metaphors compiled from the literature review are: THEORY IS PUZZLE SOLVING, THEORY IS A MAP and theory makers are QUESTION MAKERS, MAP MAKERS and PUZZLE MAKERS and THEORY IS INQUIRY (Nastasia & Rakow, 2010). These are a significant number of pieces of science problem-solving puzzles. Another metaphor found in literature is BIOLOGY IS INTERVIEWING ORGANISMS. DESIGN or INNOVATION IS STORYTELLING Beckman & Barry (2009) from two metaphors it can be inferred DESIGN IS INNOVATION and INNOVATION IS DESIGN. More metaphors should be collected from science and technology literature and from a larger and more diverse sample of people to get all pieces of the science puzzle.

The science puzzle is the system of solutions pieces of widely used design patterns. System of patterns consists of interrelated, frequently and widely used technology development patterns (Bushmann, Meunier & Rohnert 1996). Creating a transdisciplinary metaphor collection that can be used across disciplines Harwood et al. (2005) would enable wider sharing of experience. The proverb "knowledge is building to which everyone brought a brick" directs that everyone should be provided with enabling environment to be a knowledge creator and builder. Another proverb "one who doesn't travel thinks his/her mother is the best cook", combines JOURNEY and COOKING metaphors for discovery and innovation. Proverb applies to learning skills and building capabilities. LEARNING AS GARDENING is the metaphor used by some preprimary school paradigms. RIDDLES ARE GAMES (Kaivola-Bregenhøj, 2001). Since both riddles and science are games, then a new metaphor can be derived RIDDLES ARE SCIENCE by segmenting and merging two metaphors. Proverbs weave metaphors into systems.

Metaphors like CITY IS A CELL and proverbs" the snake that cannot fly caught the bird that flies" apply to technology innovation. Others like JOURNEY metaphors have become standard metaphors and universal because of their wide usage. Some metaphors like CELL IS A CITY is often used by some professional communities and have the potential to become universal. The snake proverb is widely used by some communities and has the potential to become universal.

Being frequently used and having the potential to become universal is categorized as semi-standard. Less used proverbs and metaphors or widely used but with no potential of becoming universal are classified as non-standard. This also includes metaphors created on the fly when solving problems. Artificial intelligence (Korecki 2008) and Bioinspired design are transdisciplinary, use metaphor and analogy based techniques to create knowledge, solutions and technologies across, between, beyond global and indigenous disciplines. Metaphors that can be derived from this are TRANSDISCIPLINARITY or ARTIFICIAL INTELLIGENCE or BIOINSPIRED DESIGN IS BUILDING TECHNOLOGY INNOVATIONS; these are non-standard with the potential to become standard and universal.

The proverb "one who knows proverbs gets what he wants" is visionary. The proverb vision requires continuous creativity, the creation of new proverbs and ways to apply them for vision to remain relevant. Transdisciplinary reasoning using proverbs across cultures is a new way of getting what one wants. For example reasoning with Japanese proverb "vision without action is daydreaming, action without vision is a nightmare", Western proverb "Rome was not built in a single day" and African proverbs "to say and do" and "trying is succeeding" and "one way is no way at all". The Japanese proverb provides the vision, the Western proverb the strategy and the African proverbs the tactics.

Japanese Vision action proverb takes the extremely negative view of dreaming and nightmare ignoring the positive view. Design and science fiction may be viewed as forms of dreaming. Dreams are the origins of some great wonderful ideas that changed the world. What is harmful is the emphasis on the extreme, dreaming as the end. A dream should be transformed into a realistic vision, plan or action to be taken. The vision of visions and dreams of dreams are necessary for building indigenous and global technology catch-up strategies and systems of innovation cultures (Urama, Ogbu, Bijker, Alfonsi, Gomez, & Ozor, 2010). Design fiction is a technology invention dream used for mental experiments and virtual learning to discover prerequisites for creating invention vision. Science fiction can be used to advance science (Lee, 2019). Early explorers were driven by their dreams that they transformed into visions and took actions to actualize their visions. Pioneer researchers and inventors sometimes can only dream as necessary basic inventions and infrastructure to build their dreams with doesn't exist.

The proverb "the snake on the ground caught the bird that flies" is an example of competitive strategy. The snake uses catching strategies while the bird uses escaping strategies, sometimes the snake wins other times bird wins. This can be used as inspiration to invent bioinspired business competition strategies and methods. "An old man sitting on a stool can see further than a young on top of a tree" proverb shows the advantage of possessing the wisdom that enables substituting hard work with the knowledge to produce better solutions. Wisdom is acquired through reasoning, systematizing and applying knowledge and experience. The snakes cannot fly but wisdom about bird's behaviour enables them to win against competitors they cannot

compete with using flying capabilities. The proverb codifies knowledge about snakes from nature in the way it can be used by people. Creating animal proverbs like this is an example of indigenous bioinspired design. Bioinspired designed proverbs and proverb systems can be used to create commercialized innovations inspired by transdisciplinary, artificial intelligence and bioinspired disciplines. Per-Poor system of innovation proverbs Mambo (2020b) and Story design thinking method Beckman & Barry (2009) provide proof of concept that this can be done using inspired design. Snake uses genetically inherited knowledge from its ancestors and knowledge and capabilities it acquires from learning and doing. People were born with knowledge and capabilities; and also acquire, build knowledge and capabilities. Newton saying "if I have seen far, it's by standing on shoulders of giants (great/wise men)" provides guidelines for researchers and learners to build their greatness Newton's way. Snakes are designed by nature to stand on the shoulders of their ancestors. Not being able to understand something completely doesn't mean partial understanding is useless.

"When in Rome do as Romans do" proverb was cast into JOURNEY metaphor and generalized to create the theme "wherever you go do as they do" that used as a theme for the article on how American lecturers would use Spanish proverbs to teach finance to Hispanic students (Biktimirov, 2009). In applying the proverb GENERIC IS SPECIFIC metaphor symbol substitution technique was used to substitute generic concept do with more specific teach concept. The transdisciplinarity strength of the article was unifying everyday knowledge (proverbs) with academic knowledge-making finance relevant and easy to understand as proverbs are simple, well known to students. The students can use their indigenous knowledge to drive learning vehicle to the land of mastery. This proverb metaphor has two sides the Spanish students have to learn like Americans learn the American way, while the lecturers had gone to "South America" by teaching Hispanic students had to teach the Hispanic way. This allows two groups to experience each other's world and meet each other halfway

Proverbs are based on symbolic and metaphoric structures that are an important aspect of teaching methods that are powerful and effective aids for conceptualizing new ideas (Costandius 2007). Proverbs are pieces of advice to be followed, that remain relevant for a long time, are widely and frequently applied due to their focus on issues people consider important (Buja 2018). The beauty of proverbs is their simplicity and ease for novices to learn and apply. Innovation self-learning can be abstracted to deal with different levels of complexity and different capabilities of learners Mambo (2020a). Proverbs abstract solutions development to create simple techniques that can be used by everyone from school children, elders and professionals. Proverbs are SMARTPHONES OF INNOVATION. This is because smartphones are powerful, easy to use and learn by everyone compared to other types of computers. Creativity is the best-known way of realizing what is possible but hasn't been realized.

Cross-cultural researchers being social scientists and cultural scholars are well suited to understand the interaction of culture of science and other indigenous cultures (Bhawuk, 2008) by being transdisciplinary interpreters between two cultures. Natural scientists practice natural science culture and those that apply indigenous culture in some scientific activities can become transdisciplinary interpreters between natural science and the indigenous cultures. Teams with both social and natural scientist interpreters can deal better with broader issues than those with either of the groups. There are numerous examples of professionals and practitioners who use scientific methods but for problems, scientific methods are unable or don't solve well, they turn to indigenous knowledge (Bhawuk, 2008). Whatever knowledge does best should be used.

Examples of African Grassroots innovation movements are African Jua Kali and Kenyan Harambee. Harambee spearheaded building schools and social institutions in Kenya by combining science, technology and indigenous culture. The mission of the Honeybee grassroots movement is to spread innovation and creativity across the world by scouting and documenting grassroots innovations by common people (Shinde, Dey, Patel, Patel, Kumar, & Patel, 2019). While movements like honeybee grassroots have been systematizing their activities through research and development, African indigenous grassroots movements have mainly focused on basic research largely ignoring applied research and development. African grassroots movements' research, therefore, doesn't benefit from practice feedback making it unsustainable due to not generating revenues for self-sustenance. For example, no research and development has been done on how Harambee can be used to develop other technologies apart from building schools. Research has been done on Ethiopian culture and indigenous knowledge but has not been used to direct development (Kebede & Belay 2017). When knowledge is put to practice and lessons learnt applied it becomes wisdom, self-sustaining, grows faster and generates value in forms like revenue that support its further development. Basic research provides seeds for applied research and development.

"Unity is strength" strategy proverb is complementary to the tactical proverb "if cobwebs unite they can tie a lion". Uniting cobwebs is easier if done creatively and skilful by uniting one cobweb with another at a time as guided by the proverb "a little a little becomes much". Cobwebs tied lack employment and industries lions when they united into silk clothes. The latest giant lion to be tied with cobwebs is the Covid-19 lion by uniting vaccines knowledge cobwebs (ideas) into a vaccine. The Covid-19 vaccines were developed by repurposing existing resources by pharmaceutical companies to develop new products an approach has been adopted by other industries and innovators (Von Krogh, Burcu & Ben-menahem, 2020). This study is combinatorial innovation where existing proverb and other knowledge is combined in novel ways (Boden, 2009) the same approach used in Covid-19 vaccine invention and commercialization.

4.4 Proverbs Categories and Bridges

Proverbs can be categorized as visions, strategies, tactics and operational heuristics. Sri-Lankan vision 2025 is modelled by the vision proverb "vision without action is daydreaming, action without vision is a nightmare" (Samarajiva n.d.) making countries vision understandable by young school children at the basic understanding level and at the more advanced level by professionals. Kaizen philosophy is a steering wheel (Chung, 2018). Casting vision proverb into JOURNEY metaphor Sri Lankan vision is wheel's hub that unites all stakeholders (Samarajiva n.d.). A country's vision is a journey of 1000 strategic journeys. The strategic journey is a journey of 1000 tactical journeys. Each tactical journey is a journey of 1000 operational heuristics journeys. Each operational heuristics journey consists of 1000 steps that actualize a tactical step and 1000 tactical steps actualize a strategic step. The Japanese vision proverb and African proverb "one who knows proverbs gets what he wants" can model a country's vision and philosophy steering wheel like Ubuntu can steer a country effort vehicle in the right direction.

Proverbs are bridges for crossing cultural boundaries (Buja, 2018) using symbol substitution mechanisms. Metaphors and proverbs enable leaders to cross-cultural boundaries, create visions, take risks, and enable adaptability; by leveraging knowledge and creativity (Grisham, 2006), which is complemented by transdisciplinarity.

5.0 RESULTS AND DISCUSSION
Proverbs were found to be within, across, between and beyond a variety of boundaries. They are applied in all aspects of life: professional and daily life. Proverbs use of metaphors means they can easily be connected to and by analogies and metaphors. Analogy and metaphors being widely used in invention and proverbs heuristics community-wide usage implies hybridizing them with global knowledge can be a means to unlock indigenous technology innovation. Current usage of the proverb has not leveraged creativity an important aspect and possibly the most critical success factor for technology innovation

Proverb technical writing system will help build the capability of using proverbs in technical applications and also create synergy with proverb intensive songs, stories and poems writings. Developing a metaphoric conceptual system is creative means for enabling collaboration especially between technology professionals, informal and indigenous sector actors. Emerging human computation and bioinspired design are complementary to the metaphoric conceptual system. The indigenous metaphoric system can also be the foundation of teaching computational thinking.

6.0 CONCLUSION AND RECOMMENDATIONS
Proverbs were explored with transdisciplinarity, metaphors and analogies to discover new proverb relationships with other structures and new potential applications. An innovative conceptual metaphoric system and higher-order proverb reasoning were discovered as potential

new proverb applications. The study took the first step of the long complex journey into the unknown with good results; the next 999 steps if fruitful will create a powerful proverb language. Travelling the journey of thousand steps was by applying strategic, tactical and heuristic proverbs.

A major limitation observed in exploration was the lack of systematic ways of creating new proverbs. Learning from the way current proverbs and sayings are being improved and extended provides clues for creating new proverbs. Language main function is communication and is used in all domains. This implies proverbs as part of language have the potential for more applications. Increasing the intensity of proverbs in science technology and innovation, research and practice writing inappropriate situations and finding a faster way of creating new proverbs will help in making proverb language more powerful.

Future research should create indigenous methods that enable professionals to collaborate with traditional technology developers to exploit the synergy between indigenous and global knowledge for technological innovation. Indigenous conceptual metaphoric reasoning systems should be codified.

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