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RESEARCH ARTICLE

THE REALITY OF 4TH INDUSTRIAL TECHNOLOGY ON HIGHER EDUCATION LEARNING

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Abstract

The fourth Industrial Technology describes a world where the use of digital technology is ubiquitous in all spheres of human life. The higher education sector has faced its challenges in terms of transformation impact, which seems to be a two edged sword. On one hand, as the faculty is struggling on how best to maintain quality of education with the demand to adopt and use technology in class. On the other hand, students seem to struggle in concentration if the faculty does not give due attention to them whether on online learning or blended learning. This knowledge gap needed an address, not to jeopardize higher education learning bid to attain the fourth industrial technology. The purpose of the paper was to evaluate the reality of the fourth Industrial technology on higher education learning with an objective to identify the major realities of fourth industrial technology, and to explore those realities on higher education. The foundation of the paper was on the technological singularity theory that anticipated the evolvement of artificial intelligence. Qualitative research approach with multi-stage sampling was conducted and interpretive phenomenological analysis. Time series experiential data employed in 2003 - 2023 and systematic non-random data 2016-2023. The findings showed that three technological trends of physical, digital, and biological are becoming a reality. Artificial intelligence showed to be unlike any other technology but not a fundamental competitor. Further, fourth Industrial technologies are educational technologies that enhance learning. In conclusion, higher education learning is the stimuli and an incubator of the fourth industrial technology. Therefore, the paper contributes to knowledge, with suggested ways that could be useful to policy makers, governing councils, faculty and students to harness the fourth industrial technology.

Key Words: Fourth Industrial Technology, Higher Education Learning, Emerging Technologies.

Introduction:-

The 4th Industrial technology (4IT) commonly referred to as fourth industrial revolution (4IR) has created a sense of mystery in the world that few countries can match especially in Africa. Although launched in rich countries, where adoption has been rapid, the fourth industrial technology wave has already begun washing up on Africa's shores (Ndung'u & Signé, 2020; Fox & Signé, 2021). The overwhelming convergence of the 4IT (World Economic Forum, 2016 citing Schwab, 2016, p. 7) has been in the area of artificial intelligence, robotics, the internet of things, autonomous vehicles, 3D printing, nanotechnology, biotechnology, material science, energy storage and quantum computing. Nonetheless, the hallmark of this technology is in the integration of technology into a blockchain development. Today, that sense of mystery has become more frustrating with much of Africa regressing in transformation (African Development Bank Group, 2023). In agreement, Mavis Owusu-Gyamfi, Executive Vice-President of the recently launched African Center for Economic Transformation (ACET) covering 30 countries representing 86.5% of the continent's Gross Domestic Product (GDP) sensitized the African regressing in transformation as driven by a "mismatch between skills and education systems, and what companies need" (African Economic Conference, 2023). Nonetheless, transformation impact was taking place from domestic and national levels of Thailand and Singapore as an evident even to regional levels (Menon & Fink, 2019).

Problem Statement

Universities give emphasis to their role in modelling 4th industrial technology by being the testbeds for innovation and educating future generations (World Economic Forum, 2016). The current population of students in the Universities, majority are pro-SUVers in the use of Internet, a generation that has been termed as "iGen and GenZ (Cowin, 2021; University of West Indies, 2020). However, the students lack self-directed learning and meta-cognitive awareness skills set needed for 4IT implementation. While, the faculty is still "playing catch up" with skills needed in the workplace and their inherent bias in embracing teaching methods that rely on science of learning (Latif, Pervin & Karim, 2021). On one hand, as the faculty is struggling on how best to maintain quality of education with this demand of technology in class. On the other hand, students seem to struggle in concentration if the faculty does not give attention to them. If not addressed, these challenges will continue to jeopardize higher education learning's bid to attain 4th industrial technology both in Africa and the world. Yet, holistically, Bill Gates argued that: "Five years from now on the web, free you'll be able to find the best lectures in the world…It will be better than any single university…" that tailor learning by having customized class tasks and assignments through the software applications or platforms (Sieger, 2020).

Previous research on the disruption of digital technology is an undeniable fact that the 4IT has largely influenced higher education learning and will continue to disrupt (Wachira & Ombati, 2020; Wangenge-Ouma & Kupe, 2020). Other studies show that 89% of students in sub-Saharan Africa do not have access to household computers and 82% lack internet access (Coman et al., 2020; Namale, 2021; World Economic Forum, 2020). Many of these studies associate higher education learning with 4IT disruption and challenges. Unfortunately, fewer studies have questioned this disruption reality on the use of 4IT. While, coronavirus pandemic (COVID-19) exposed the unpreparedness of many higher education institutions in Africa to migrate to online learning (World Economic Forum, 2020), there has been a significant shift in higher education

learning with recent development that indicate a recognition of leadership and managers of higher education institutions across Africa on the need for online learning (Coman et al., 2020).

The contribution of this paper will be valuable to the higher education Governing Councils that make decisions on digital infrastructure investments such as e-learning management system and internet to learn the 4IT and use them successfully. According to Kashorda (2024), the major decisions of the management should not be on "bread and butter" purposes but for commercial research that is available for collaboration. The Senate members can draw insights from the results to assist on embrace of the 4IT for effective use. Further, the faculty may use these results to engage in collaborative research in multi-disciplines, seek greater regional integration and ways to maintain quality education, and the students can learn from the results and use the 4IT responsibly. The policymakers may support higher education institutions in their development and implementation of new curriculums that enhance 4IT in Universities.

The paper sought to answer two questions relating to the fourth industrial technology. First, which realities of the fourth industrial technology are in application in the world? Second, can we explain these realities on higher education learning? A statement that motivated this paper was from a colleague: "With the advent of the artificial Intelligence especially this ChatGPT application, our work will be replaced by robots". Hence, the need to conduct the research to find out the basis of such a statement whether it was valid or not.

Objectives:-

General Objective

The purpose of this paper was to investigate the realities of fourth industrial technology on higher education learning in the world.

Specific Objectives

1. To identify the major realities of the 4th industrial technology
2. To explore the realities of 4th industrial technology on higher education learning.

Literature Review: -

Technological Singularity Theory

In reference to technological singularity theory Vinge (1993), anticipated the improvement of the computer hardware in the early years of artificial intelligence (AI), thought to be slow. The digital computers were incredibly primitive and memory forbiddingly expensive by today's standards (Sejnowski, 2018). The theory's basis was on four aspects: Firstly, computers will become "awake" and will advance to superhuman intelligence. Secondly, large computer networks may someday "wake up" and become superhumanly intelligent. Thirdly, computer and human interfaces will become so intimately entangled that superhuman intelligence will occur. Fourthly, advancements in biological science result in dramatic improvements to human intelligence. At a glance, there seems to be a conflict between the artificial intelligence (AI) and the intelligence amplification (IA). Vinge (1993) gave a clarification that artificial intelligence dealt more with computer networks and human-computer interfaces while intelligence amplification was a faster way to superhumanly intelligence. Intelligence amplification seemed to be proceeding naturally while the artificial intelligence needed to be applying more machine

learning. Hence, Vinge based his work on Von Neumann - a mathematician, who expressed both surprise and concern that there was an ever-accelerating progress of technology and changes in the modes of human life. This was in agreement with the Synthetic Smart Teams (2018) as "ever increasing technology".

Although it appeared that Von Neumann was thinking of normal progress of a human with machine learning, and not the creation of superhuman intellect, Vinge (1993) was quick to explain that, artificial intelligence advances will often have applications in intelligence amplification and vice versa. Conversely, the reality is that AI and IA are completely different. For the purpose of this paper, artificial intelligence proposition takes root of the discussion.

Empirical Literature: -

According to World Bank (1994, pg. iv: cited in Barrow, Didou-Arpetit and Mallea, 2003), defined higher education as "all post-secondary institutions with degree, diploma, and certificate granting programs…that produce new scientific and technical knowledge through research and advanced training as they serve as conduits for the transfer, adaptation, and dissemination of knowledge". Higher Education Institutions have commonly been the foremost places that pursue forward-thinking ideas commonly referred to as "think tanks". Currently, 4IT has disrupted research not only been conducted by universities, but also "separate" institutions that are not necessary established by universities because of: firstly, universities have concentrated mostly in teaching which in many cases, actually crowd out students; a phenomenon referred to as "massification" (generators of knowledge) (Mohamedbhai, 2014; Mwirichia, Jagero & Barhok, 2017; Owuor, 2012). Secondly, a feature that distinct 'think tank institutions' from universities is that they are small in size and flexible in their decision making unlike universities that are rigid, highly regulated and apply a lot of bureaucracy (Odhiambo, 2011). Thirdly, when universities conduct research, it is all for the purpose of theory development rather than towards local policy development (Deloitte, 2018). However, the private universities have mastered the art of providing high-quality teaching that attracts students who are able to pay high tuition fees, sliding research as a priority (Owuor, 2012). The need now is for the call for commercial research. This is because career incentives and funding conditions in universities today favour incremental conservative research over bold and innovative programs (Naidoo, 2019). Higher education learning institutions will have to encourage "more commercial form of research (Foster, Rzhetsky & Evans, 2015).

Materials And Methods:-

This paper used exploration and explanation research design because of the nature of belief on reality. According to Rehman and Alharthi (2016, p.52), researchers "have assumptions about reality, how it exists and what can be known about it" which should not eschew the possibility of subscribing different designs but instead seek the necessities of a research study requirements. Qualitative research approach was used with interpretative phenomenological analysis (IPA) due its flexibility to select the most appropriate data collection method and analysis. Researchers have argued IPA aims to provide detailed examinations of personal lived experience in the context of a social world to show realities that are accurate though subjective (Smith & Osborn, 2015; Smith & Nizza, 2022; Zahavi, 2021).
For validity and credibility, IPA requires an investigative attitude of a personal lived experience known as ethnographic study. Further, Turley (2023) explained that interpretive analytical

approaches includes critical narrative analysis, based on placing the interpretation of text as the central focus in order to deepen the acuity they bring to the analytic task. Smith and Nizza (2022, p. 6 citing Reicher, 2000), claims that, "a helpful way of understanding the different qualitative approaches is to subdivide them into two large categories: experiential and discursive. In this paper, experiential method was used with a focus on what people do (or have done), think, and feel about the experience. The process involves going back to and reflecting on the phenomenon itself rather than attempting to fix experience in predefined categories. After, idiographic implored the sense of detail, with a thorough and systematic depth of analysis.

The paper extracted experiential data in 2003-2023, from the School of Business and Economics, Daystar University. Then, systematic non-random review of secondary data conducted between 2016-2023 from the World Economic Forum website where the term 4th Industrial Revolution (4IR) was first coined by Klaus Schwab to denote "the onset revolution of digital revolution..." (Cowin, 2021). The researcher is a member of the World Economic Intelligence Forum since 2016 to current.

Results:-

Experiential Data

Experiential data collected from Daystar University, School of Business and Economics (SBE) among five other schools of the university. The Deputy-Vice Chancellor in charge of Academics, Research and Student Affairs validated the data as true and accurate (See Appendix 2).

Daystar University is one of the earliest accredited private university in Kenya, with two campuses in Nairobi and in Athi-River. The university is in partnership with Council of Christian Colleges and Universities (CCCU), in the United States of America (U.S.A). In 2003, the School of Business and Economics at Daystar University offered selected undergraduate courses online via the learning management system (LMS). The lecturers/faculty were trained on how to coordinate the students and began by uploading "free-elective courses" that were available only for third and fourth year students. Online orientation deliverables and outcome of the students were stipulated, together with other students drawn from the U.S.A. The students had to use their official Daystar email anytime they did communication.

Access of internet was only from the University's computer laboratories in either Nairobi or Athi-River Campus. The online students were required to do their readings prior to class time to allow discussion with the rest of the students enrolled in the same course from other countries. Uploading of assessments was done in the Moodle platform at real time basis. Scheduled multiple-choice questions (MCQs) where students had to attempt the same platform on a weekly basis. Then, a final class project was scheduled at the beginning of the course and had to be submitted a week before the end of the course. During the class discussion, the online faculty from the U.S.A would guide the discussion online and allow the students to comment on each of the posted response objectively. That kind of learning required discipline of logging in time to the LMS in time, commitment to prior reading because the international students challenged the material. The approved students who were taking the online class organized themselves into a group and would meet on Saturdays for their discussions before posting their materials online. The advantage of this kind of learning helped the students to complete their studies in exactly four years. It also introduced them to international networks that enhanced critical thinking due

to the interactive discussion from the American students. The downside of the online courses was that sacrifice of being away from family in the evenings due to difference in time. Later, in 2010, some lecturers in the School of Communication adopted the online learning for in house students who were doing projects in some selected courses. Due to the COVID – 19 pandemic, all the Schools at Daystar University were trained on how to use software applications, tools and methodologies of online learning in all the courses of their programmes. Currently, the University is an accredited Open Distance and Electronic Learning and has continued to spur faculty in higher education learning to a life longing offering of a blended learning.

Systematic Non-Random Review

A systematic review from World Economic Forum and selected journal articles on emerging questions around higher education learning were examined (See Table 1).

Table 1:
Review on Higher Education Learning on 4th Industrial Technology between 2016-2023

Author/ Organisation	Emerging Questions	Higher Education Issue	Solutions Suggested
World Economic Forum (2016)	What role will education play in the fourth industrial revolution?	The issue of refugees and immigrants on lack of official documents for verification.	Use of a digital identity that is trusted, portable and secure across countries.
World Economic Forum (2017).	Is education able to keep up with the fast-moving world?	Planning for something that is unpredictable is a challenge.	Focus on new skills such as emotional intelligence, intercultural sensitivity, creativity, problem formulation (rather than problem solving).
Alvarez (2018)	Can character solve problems?	The use of AI and ???	Adopt new methods and roles to prepare students to live and collaborate with new forms of intelligence.
World Economic Forum. (2018)	Does higher education need dusting off for the 21st Century?	The Higher education learning systems built for the needs of the 20th Century and not for the new jobs of the 21st Century.	Education system must change and innovate and every university needs to find solutions that fit their problems.
Katzman & Stanton (2020)	How integration of social emotional learning and cultural education into online distance learning curricula?	Lack of secure broadband access in rural and underserved regions, the importance of social emotional learning in online distance education platforms.	Technology has the potential to transform the educational platform and make education accessible for all, with teaching of social emotional intelligence skills

World Economic Forum (2020)	How higher education can adapt to the future of work?	The breathtaking advances in automation and artificial intelligence, on unprecedented access to data and computation.	Higher education is unique in its power to catalyse social mobility, serving to bridge social, economic, racial, and geographic divides.
World Economic Forum (2022)	How to motivate Educators all over the continent to use digital tools efficiently to deliver their courses?	Lack of motivation for Educators to use digital tools efficiently to deliver their courses but are all compelled by current circumstances to adopt.	Use of hybrid learning not just combining a virtual and physical classroom but allowing for truly immersive and experiential learning.
World Economic Forum (2023)	How universities can adapt to the future of learning and work?	Employers are "ripe" for innovation but are Universities ready for their graduates' employability?	Universities must capitalize on skills and experience.

Based on Table 1, the fundamental information emanating from these excerpts can be developed into five themes: (1) the role of education, (2) the use of AI, (3) role of AI, (4) social emotional learning, (5) digital tools in education.

Discussion: -

To Identify the Major Realities of 4th Industrial Technology

It was pertinent to identify the major realities of the 4IT in the world, before delving into how it has influenced higher education learning. Based on Figure 1, the first industrial revolution in 1784 concentrated with mechanical production in steam and water. Second industrial revolution in 1870 moved to mass production with electric and division of labour. The Third revolution in1969 concentrated with automate production in electronic and information technology. The fourth revolution seems to an overlap the third and not known with certainty when it began on cyber-physical systems using digital and fusion of it (Schwab, 2016; Smith 2023; WEF, 2016).

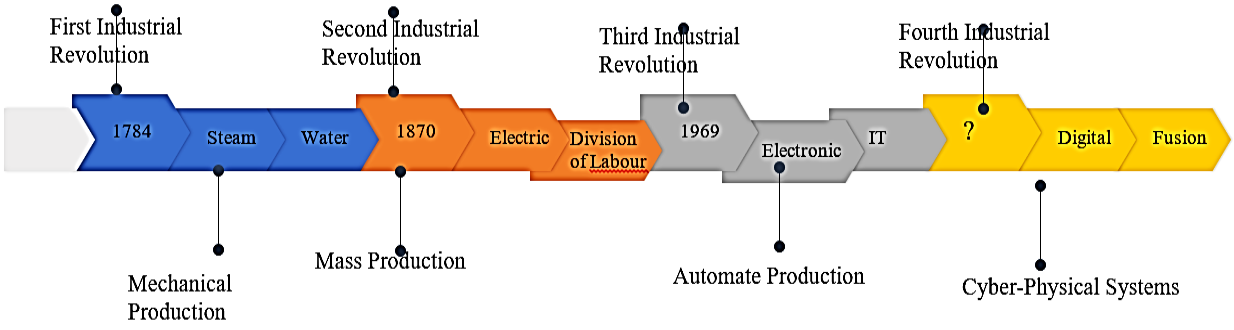

Figure 1: *The Industrial Technology Trend*

From Figure 1, three realities emerged that were identified as follows: First, physical mega-trend such as "autonomous vehicles in form of drones, aircrafts, trucks, boats, 3D printing in

automotive, aerospace, medical industries and advanced robot that access information remotely via the cloud or other robot network" (World Economic Forum, 2016 citing Schwab, 2016, p. 7). Second, digital mega-trend such as internet of Things (IoT) to include Radio Frequency Identification (RFID) that has been used in supply chain industries and will soon be used in tracking of people (Sun, 2012; Tao, Shaik, Higgins, Gururajan & Zhou, 2021). Blockchain that has brought about the bitcons, cryptocurrencies, digital currencies, central bank digital currencies and smart contracts, and shared economy such as Uber model, Facebook, Alibaba and Airbnb (Cohen, 2018). Then, the recent adoption of Chat Generative Pre-Trained (ChatGPT). Third, biological trend such as human neural versus digital neural with the greatest example of how the COVID-19 drug was developed in four months unlike the four-year drug discovery that existed. Today the talk is about drug design because of the use of artificial intelligence.

According to Vinge (1993) theory, intelligence amplification (IA) would be able to create superhumanly intelligence in a faster way, which has become a reality in the genetics sequencing and synthetic biology. This theory was supported by Schwab (2016), explaining how National Academy of Sciences and National Academy of Medicine of the US, the Chinese Academy of Sciences and the Royal Society of the UK, had convened in the International Summit of Human Gene Editing and stated that it was possible to manipulate with precision the human genome. That research breakthrough would give to the advent of designer babies in the future who would be resistant to specific diseases (Gaj, Sirk, Shui & Liu, n.d), with the use of 4IT.

To explore on the Realities of 4IT on Higher Education Learning

Based on the five explored themes from systematic non-random review that included: (1) Role of education; (2) the use of AI; (3) role of AI; (4) social emotional learning and, (5) digital tools in education, experiential data collected complimented a discussion those specific themes. To begin, the role of education had slowly started changing from face-to-face learning to online learning as showed in the experiential data provided. Technological innovations such as the Learning Management System (LMS) implemented at Daystar University among other universities in the US by the start of 2003 is a reality. According to Schuetze and Slowey (2002), higher education learning had evolved from fulltime learning to continuing education learning, part-time learning, modular-based curricula, student-centred learning and competence–based learning. The experiential data showed that delivery mode of learning had also changed from face-to-face learning to online learning of which some elective undergraduate courses had started through internet-based technologies. The emergence of Massive Open Online Courses (MOOCs), opened doors with similar technologies of leading universities to provide course-by-course access to students worldwide (OECD, 2012, p.22). Today, "hybrid" learning which is also known as blended learning has balance between face-to-face learning together with online learning. For example, Universities in Europe are already implemented use of technology in class, and that the "training programmes and curricula" are efficient enough for their workers (Global Initiatives & Higher Education in the 4th Industrial Revolution EC, 2017, p.3). In Asia, too they have heavily invested in higher education especially, Taiwain, South Korea and Singapore (World Economic Forum, 2023 citing Times Higher Education Young University Rankings).

The use of AI theme – it has permeated all domains of life and has been used for many purposes. However, it is unlike any other technology (Schmarzo, 2022). Faculty have used AI technology

in online teaching and in everyday life such as deciding which stock to invest in, trip planning, plagiarism check and such like areas. The experiential data showed that the online assessments included use of AI in MCQs that the system marked instantly, while the final project had a rubric attached and a requirement for anti-plagiarism check. The idea that machines can act as humans and make decisions on behalf of individuals scares many people and raises many concerns and controversies. However, Milligan (2023) articulates that among these 4IT is the artificial intelligence that most people may be tempted to frame it as a "fundamental competitor" to human endeavor. The fact that the recent innovative Generative Pre-Trained Transformation (GPT)-3.5 gained 100 million users in just 2 months and the ChatGPT passed the final exam for the University of Pennsylvania Warton School's Master of Business Administration (MBA) program (The Robot Report, 2023). This caught people's attention on its complex knowledge to function. Walton Family Foundation (2023) argued that faculty could seek technology-enhanced approaches addressing the use of AI that would be safe, effective, and scalable. However, faculty had used artificial intelligence in tools that could correct grammar, check plagiarism rates, completeness of sentences, and write research (Khan, Shah & Gul, 2020; Kivimäki & Merikko, 2022; World Economic Forum, 2020; 2021).

The role of AI theme is to assist change of the students' mindset on the ultimate goal of formal education, which should be to develop self-sufficient independent learners (Yang, 2021). Research has shown that higher education learning is taking the concept of learning, un-learning and re-learning (Dunlap & Lowentha, 2011; Klein, 2008; Oliver, 2022) in order to create an environment of long-life learning and intellectual curiosity. The role of AI is to assist students in their personal learning. Buckley introduces a theory of personal learning categorized into two: First, "personalization for the learner" where "teachers create the learning experience for the student. Second, "personalization by the learner", which is the students acquisition of skills to adjust his/her learning better" (Akyuz, 2020; Maheswara & Rifai, 2023). Personalized learning is the underpinning of multiple intelligences.

Social emotional learning theme was exhibited in the experiential data where the online students had to apply on self-directed learning in research, online class discussion that were timed family and family sacrifice was not a choice. Critical thinking, independent learning and writing skills were improved. Therefore, the outcome of online learning from experiential method was the achievement of completion rate. The use of blended learning helped the online students take online classes in the evening creating time to do other face-to-face class term papers and projects during the day. Social emotional learning (SEL) defined as a wide range of skills, attitudes, and behaviors that can affect a student's success in school and life (Smith, 2023; Wang, Wang & Wei, 2023). These skills may influence student's academic success, employability, self-esteem, relationships, as well as civic and community engagement (Phipps & Kelly, 2016; Social & Emotional Learning, 2018). Universities have traditionally offered mere knowledge-based learnings and information-delivery that was not education (Cowin, 2021), despite the "good job" offer. The reality of the matter is that: "There are so many graduates in the market whose grades are top notch but in terms of skill, proficiency, and ability or knowledge contribution, they are wanting" (Hatakenaka, 2015). While the degree still rules, the Universities are slowly moving towards a reality with more focus on acquiring skills not degrees (See Appendix 1). Today, 4IT has enabled students to navigate skills to enter the workforce in the years ahead (Katzman & Stanton, 2020).

Digital tools in education theme are the technological tools such as software, learning management systems and even AI tools. Walton Family Foundation (2023) explained these tools are educational technology (edtech) that include both (a) technologies specifically designed for educational use, as well as (b) general technologies that are widely used in educational settings. However, with ChatGPT tool, it requires faculty to be keen in students capturing data and detecting patterns in data…Mere information-delivery is not and will not be education (Cowin, 2021). This theme can be viewed as a "double edged sword" because in 2022 and early 2023, the public became aware of new generative AI chatbots and began to explore how AI could be used to write essays, create lesson plans, produce images, create personalized assignments for students, and more. The disruption of the ChatGPT was the reason for the concerns raised on quality learning. The faculty is also aware of new risks of data privacy and security that has emerged. For example, a student would want to use MathGPT to prove to their faculty that he/she is a smart student.

According to Professor Christian Terwiesch, who authored the research paper: "Would Chat GPT3 Get a Wharton MBA? argued that there are important implications for business school education, such as the need for examination policies, curriculum design focusing on collaboration between human and AI, opportunities to simulate real world decision making processes, the need to teach creative problem solving, improved teaching productivity, and more" (Rosenblatt, 2023). The solution for faculty is to be keen in ways of engaging students in their assessment methods rather than their old ways of "write a five-page essay" to minimize unwanted biases from the question at hand (Rosenblatt, 2023; U.S. Department of Education, Office of Educational Technology, May 2023).

While most debates are around the future of education, the World Economic Forum (2024) declared that the 4IT in NOT replacing humans because of the hurdle of trusting the digital world but it is actually "augmenting" human. The focus is on the emotional team skills, to assist in accessing a lot of more capability as the future will speak to "digital people". It is imperative to reskilling and reflect on the inevitable structural transformations of higher education such as life-long learning (Yang, 2021; World Economic Forum, 2016a). In agreement with Kuria (2020), the Deputy Executive Secretary of the Inter-University Council for East Africa (IUCEA), the "Cataclysmic" pandemic taught higher education learning cannot afford spending inordinately long periods of theorizing but must shift from theory to practice. Further, abandon old ways of doing things and to embrace new methods of teaching, learning, assessment and certification of the 4IR by moving away from brick and mortar university to students who are technology gurus.

Conclusion(s): -

Higher education learning is the stimuli and an incubator for 4th industrial technology but with an overlap of third and fourth revolution. It is still a bridge to producing competence, information, knowledge to the growth of all the prior industry revolutions There is no straight jacket all-size-fit for higher education learning. Nevertheless, higher education learning has been preparing for such a paradigm shift of predominant online teaching from fulltime learning to competency based and from face-to-face learning to blended learning. 4IT is a tool that lecturers and students could use to improve quality of learning in the universities and not commiserate but assist them.

Recommendations: -

To the unprepared, there is no other way than to embrace the fourth industrial technology as the future is going to be "scientific renaissance". Despite, the fact that degree attainment still rules, it is slowly moving towards a reality with more focus on acquiring skills. The focus is on "human" skills, not just digital competencies. Students need to be more self-directed in their learning invest in social emotional learning and conduct research using the digital tools responsibly. Students need to devote time in personalised, technology-enhanced learning, while faculty rethink new methods and roles to prepare students to live and collaborate together with new forms of intelligence. Faculty need to use formative assessments rather than high-stake assessments by determining what is being taught (curriculum), how (pedagogy), when and where (technology and the real world) and whom is being taught (access and inclusion). Therefore, all faculty and students have been called to the reality of the fourth industrial technologies that is disrupting the higher education learning. Education is increasingly becoming "just in time" rather than "just in case".

Caveat and Area of Further Study: -

This paper used qualitative method of inquiry with interpretative phenomenological analysis to provide the realities of 4IT on higher education learning. Critical thinking in managing emotions, working through conflicts and teamwork are skills not necessarily measured by quantitative tests, though they are crucial components of a student's education. An area for further research would be to adopt a quantitative research approach and seek to determine students' new models of learning engagement and faculty need to deliver formative assessments.

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