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Assessing Fourth Industrial Revolution (4IR) Skills Necessary in Sustaining Education 5.0 in Zimbabwe Higher Education Sector: A case of Chinhoyi University of Technology

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Abstract

The Fourth Industrial Revolution (4IR) is an era that has brought new approaches to education which requires the integration of cyber physical technologies into the teaching and learning. Higher and Tertiary Learning institutions are the nerve centers for knowledge diffusion. These institutions form the heartbeat of an economy as they are the catalysts for sustainable skills development, technological innovation leading gradual knowledge economic growth and prosperity. They constitute the port of call in innovative industrial transformation, as such they are the lead institutions in embracing teaching and learning in a Fourth Industrial Revolution (4IR) era. The implications of 4IR technologies in education are less understood. This study examines the critical technology-related skills necessary for enhancing university services using the Education 5.0 Doctrine which pursues Teaching, Research, Community, Innovation and Industrialisation. A total of 166 responses were both qualitatively and quantitatively collected from academic staff participants. The findings highlight the importance of wholesome 4IR training, big data analysis, simulating ideation to reality, multimedia usage for visualizing future possibilities, appropriate software utilization, virtual platforms and simulations for practical’s, data analytics skills, critical thinking, data science, online teaching and research, innovations, predictive analysis, robotics and simulation software, readily accessible ICT manuals, computer skills, interactive boards, digital technologies, artificial intelligence, interactive online teaching, virtual reality and augmented reality, training on simulation software, ICT skills, 4IR technologies for data collection and analytics, LMS navigation, staff information availability on portals, data analysis technologies,

cloud computing, mechatronics and software integration, nanotechnology sampling equipment, academic entrepreneurship and ICT, computer-aided designing skills, safe data keeping, and emerging technologies. The study emphasizes the need for refresher courses and training on simulation software. It is through integrating these critical technology-related skills in the 4IR era that universities in Zimbabwe can be able to effectively implement the Education 5.0 doctrine and enhance their service offerings.
Keywords: Education 5.0, Fourth Industrial Revolution, Innovation, Modernisation, Skills, Higher Education

Introduction

The Fourth Industrial Revolution (4IR) is an era that has brought new approaches to education which requires the integration of cyber physical technologies into the teaching and learning. Scientific and technical growth has always been the engine of economic and social progress Hossain et al (2023), influencing the possibilities of social and communicative connections in a society and its major subsystems, including science, engineering, and technology (Lazarevich, 2023). Education has been technologically driven to be more individualized (Al Qalhati et al., 2020). High-quality human capital that develops innovations is becoming a critical component in increasing the competitiveness of individual enterprises (Hossain et al., 2022) and the national economy as a whole in the context of the fourth industrial revolution (Balog & Demidova, 2021). This research on 4IR and Education 5.0 (E5.0) aims to unveil the realities in coping with the higher and tertiary education doctrine in Zimbabwe Universities in light of Zimbabwe’s 2030 vision of industrializing and modernizing it to become a middle income economy. The E5.0which is a leap from Education 3.0 (E3.0) doctrine is anchored on Teaching, Research, Community Service, Innovation and Industrialization, the later E3.0 would center on “*Teaching, Research and Community Service*”. In the year 2017, Higher and Tertiary Learning Institutions were challenged to cause industrialization prompting the creation of Innovation Hubs as centers of excellence in incubating, creating start up and spin off companies. In some instances the E5.0 has been used to create industrial parks to steer the economic wheels of Zimbabwe into motion. The global education technology market is expected to grow at a compound annual growth rate of 17% between 2021 and 2025. The report cites the growing demand for advanced technologically driven learning and the increasing availability of digital content as driving factors behind this growth. The doctrine of E5.0 came at the right time, when the industry world over has fast transitioned into the 4IR, a digital / cyber physical systems revolution, a revolution under which business, administration, teaching and learning operations are computer technology enabled. The 4IR is a revolution that speaks to the calls for modernizing societies, which are smart and coupled with seamless communication where automation through Artificial Intelligence and Robotics is replacing human being at the work place. The E5.0 particularly answers to the need for the developments in line with 4IR where the human race is tabled with challenges to solve problems bedeviling societies through technologically and machine enabled innovative thinking. The nature of the 4IR requires taking a pause to traditional approach to teaching and skills development. Digitization poses serious challenges and threats to lecturers as critical human capital. The problems include, but are not limited to, the requirement for constant competency enhancement, rising levels of stress as a result of the increasing information and emotional load on a human functioning in a digital environment. Research in Zimbabwe should be laser-focused on how to make E5.0 a success in the midst of the 4IR putting into consideration that the future work is for digital natives, hence the need to develop proper and fundamental competences foundational to the foreseeable future.

Problem Statement

The rapid advancement of the Fourth Industrial Revolution (4IR) technologies has led to a paradigm shift in the global education landscape, necessitating the integration of 4IR skills into higher education curricula. However, the extent to which Zimbabwe's higher education sector, particularly Chinhoyi University of Technology, has adapted to the demands of the Heritage based Education 5.0 and effectively incorporating 4IR skills remains unclear. Therefore, this research aims to assess the current state of 4IR skills among academic lecturers and investigate the challenges and opportunities in sustaining Education 5.0 at Chinhoyi University of Technology, with the goal of informing policy and practice for enhancing 4IR skill development and ensuring the long-term relevance and competitiveness of the higher education sector in Zimbabwe.

Limitations of the Research

When conducting research on "*Assessing Fourth Industrial Revolution (4IR) skills necessary in sustaining Education 5.0 in Zimbabwe Higher Education Sector: A case of Chinhoyi University of Technology,*" there were several potential limitations to consider. The study limitations are outlined below:

a) The study sample size and the generalisability of the findings. This research was conducted with a more streamlined and specific sample size "*academic staff members who are lecturers at Chinhoyi University of Technology*". While the findings may be very insightful in the case study institution, the results generalisability to other higher education institutions in Zimbabwe and / or beyond may be limited.
b) Response Bias – While the questionnaire was made accessible to all the lecturers via their staff emails. The research's findings are influenced by some response bias, where *only a subset of academic lecturer participants chose to respond to the survey*. This bias can affect the data's representativeness and consequently distort the results.
c) The Single Institution Focus effect- Because *this study employs Chinhoyi University of Technology as a case study, the findings may be limited in their applicability to other universities or higher education institutions in Zimbabwe*. Each institution may have distinguishing features that impact the integration of 4IR capabilities and the long-term viability of Education 5.0.
d) Time Constraints - Conducting a thorough assessment of 4IR skills and Education 5.0 in the higher education sector requires adequate time and resources. *Time restrictions throughout the research process, on the other hand, limited the depth of analysis and the capacity to correctly capture long-term patterns and changes*.

Literature Review

The Sustainable Development Goals (SDGs), Africa Union Agenda and the Zimbabwe's NDS1

Emerging technologies must be properly tapped in order to realize their potential to revolutionize our world, transform people's lives, and open up new avenues for prosperity, which is accelerating sustainable development on a global scale. Companies, industries, nations, society at large, and higher education tertiary institutions have all undergone significant transformation. These fundamental changes, which affect almost every industry and threaten both long-standing business models and completely new ones made possible by

4IR, are speeding up the pace and magnitude of market expansion. Without effort from both, technology will not be scaled to meet the Global Goals. Public and private stakeholders are essential to realizing the full potential of the 4IR. The status quo cannot be maintained; to "wait and see" would subject people and the environment to unsustainable social and environmental pressures (PwC, 2022).

No one in Zimbabwe will be left behind as this vision is pursued, which will result in widespread transformation, new wealth creation, and expanded economic opportunity horizons. In order to implement reforms from 2018 to 2020, the government created the Transitional Stabilization Programme (TSP).The interventions that the Second Republic will carry out through the National Development Strategy 1: 2021-2025 (NDS1), as we march towards reaching an upper middle-income society by 2030, will serve as a guide for the following steps towards accomplishing the goals of Vision 2030. The NDS1 is our first medium-term plan (MTP) that spans five years. It aims to advance Africa Agenda 2063 and the Sustainable Development Goals (SDGs) in addition to realizing the country's Vision 2030 (NDS, 2022).The region has nearly half of the world's mobile money accounts in 2018 and will experience the greatest growth in mobile money through 2025, which has been a major factor in Africa's ICT industry advancements. Conversely, African stakeholders will face significant risks if they fail to recognize and take advantage of 4IR opportunities: Without efforts to go beyond current models of innovation, entrepreneurship, and digital growth on the continent, African businesses run the risk of slipping farther behind, widening the global "digital divide," and losing ground to rivals on the international stage.

The Nature of 4IR

Fourth industrial revolution (4IR) (Robotics, Cloud Computing, Mobile Computing, Virtual Reality, Augmented Reality, Simulations, Data Science) refers to a stage that will completely digitize all economic and industrial flows. Every stage of the production process, in connection with the equipment, demands horizontal integration (Nook, 2022). Machines communicate with one another in the globally connected environment of Industry 4.0. Below are some among the nine pillars of 4IR:

- Autonomous robots: Robots have long been employed to complete difficult tasks, and they now offer a wide range of services and are developing in terms of autonomy, flexibility, and cooperation. They will interact with one another and work securely alongside people (“cobotics” refers to robots that assist operators in carrying out their duties). They will eventually be able to absorb human knowledge(Robotics, 2022). Robots will have a significant impact on the Fourth Industrial Revolution because it is centered on integrating technologies (Hossain et al., 2022).
- Simulation: The use of 3D simulation in product development, material development, and manufacturing processes will increase. It will make use of real-time data to create a virtual model of the physical world, complete with equipment, goods, and people. Operators will, for instance, be able to test and optimize machine settings for the following product even before production begins, shortening setup times and enhancing quality (Twi, 2022).
- Horizontal and vertical system integration: Information systems are not yet completely interconnected. Companies rarely maintain relationships with their suppliers and clients. Rarely does engineering design departments inside a company have direct

production links. But with 4IR, every aspect of the business will be integrated, and businesses will be linked to one another (Investopedia, 2022).

- The industrial internet of things: Currently, not many machines are sensor-equipped or networked. The Industrial Internet of Things will enable an increasing number of items to include intelligence and connect via common protocols (Hossain et al., 2022). As a result, analytics and decision-making will be decentralized, enabling real-time reactions (TechTarget, 2022).The Internet of Things (IoT), which has been dubbed the foundation of 4IR, can be characterized as a network of sensors embedded in items and generates data about how those products are used.
- Cyber security: Operational management systems that are cut off and disconnected no longer exist. Communication and connectivity protocols are becoming standard (Mughairi et al., 2019). It is becoming increasingly important to protect manufacturing processes and information systems from cybercrime attacks. Secure, dependable communications will be provided by sophisticated identity and machine access management systems (UKcybersecuritycouncil, 2022).
- Additive manufacturing: 3D printing for prototyping and mass production has just recently been adopted by businesses. These technologies will be used in Industry 4.0 due to their exceptional performance in the production of bespoke small batches of goods.
- Augmented reality: The development of augmented reality tools is still in its infancy, but they are opening the door for new services. They will, for instance, give operators the real-time data they want for quicker decision-making and for streamlining work procedures (Innoarea, 2022).For firms looking to increase efficiency, augmented reality can provide a number of advantages. One such application is for remotely training employees, which saves on travel expenses and training time by enabling the trainer to communicate with the trainees on the shop floor without requiring them to travel to a specific place.
- Big data and analytics: The industrial world still has vast amounts of unused data. Their study will increase service quality, maximize production quality, and conserve energy. Real-time decision-making is also desired in this situation. Enhancing warehouse operations: With the use of sensors and portable devices, businesses may increase operational effectiveness by spotting employee mistakes, doing quality checks, and displaying the best production or assembly routes. Bottlenecks are removed: Big Data helps manufacturers find the issue by identifying elements that can negatively impact performance at no additional expense.

Education 5.0

The fourth industrial revolution is forcing educators to change their methods of education so that they may devote more time to individualized instruction while also supporting individualized learning for creativity, innovation, and problem solving. Education 3.0 was changed to create Education 5.0. As the fourth and fifth missions of colleges, respectively, it adds "innovation and industrialisation." This was done in order to coordinate national goals to become middle-income by 2030.Klaus Schwab, the founder and executive chairman of the World Economic Forum, created the term "Fourth Industrial Revolution" (4IR) in 2016. (WEF) (EmaraldInsight, 2021).These automated processes are also used in the field of education. Given the anticipated disruptions, adoption of Fourth Industrial Revolution (4IR) methods is currently a hot subject across the globe. Education is viewed as a key tool for providing individuals with the skills they need to prepare for the Fourth Industrial Revolution (4IR).On the African continent, Zimbabwe's educational system was rated as one of the top ten. The results demonstrated that obstacles are standing in Zimbabwe's way as it continues to educate itself in preparation for the 4IR, including challenges with the curriculum and a lack of energy in rural areas, among others (Chinaza, 2022). Nearly all sectors of life seem to be dominated by the 4IR, which has led to several nations preparing for the 4IR (Power, 2021). Manufacturers can utilize digital twins to notice changes, estimate risks, and plan improvements in a virtual environment before acting in the actual world, according to Power's (2021) report on the practical ways the 4IR has supported various forms of progress.

Skills Required Utilize 4IR

Machines won't be able to take the place of humans in tasks that need critical thinking, creativity, sophisticated problem-solving, interpersonal skills, communication, emotional intelligence, and people management.

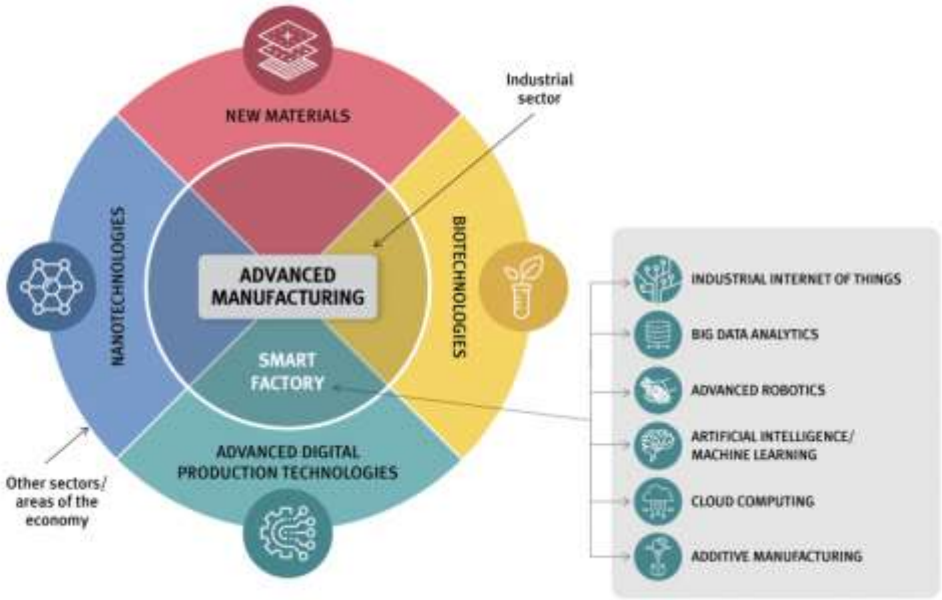

Figure 4.4: Skills required utilize 4IR (Unido, 2020)

The development of the steam engine in the eighteenth century led to the First Industrial Revolution, widespread electrification in the nineteenth, and the development of computers in the 1960s, which led to the Third Industrial Revolution. A blurring of the lines between the biological, physical, and digital domains distinguishes 4IR, despite the fact that it is also a result of technology advancements(UNIDO, The diffusion of advanced digital production (ADP) technologies: a heterogeneous landscape., 2020).Through the internet of things, machines "talk" to one another, algorithms create intelligence for processes, and bidirectional interfaces allow for real-time "conversations" between humans and mechanical processes. Industry 4.0 technologies truly stand out due to the innovative ways in which hardware, software, and connectivity are reconfigured and integrated to achieve ever-more ambitious goals, the gathering and analysis of enormous amounts of data, the seamless interaction between smart machines, and the blurring of the physical and virtual dimensions of production (Madgavkar & Krishnan, 2019).

In any case, a lot of (virtual) ink has been wasted offering advice to various sectors of the economy on how to best get ready. But in order to take use of 4IR, the correct degree and combination of talents and industrial capabilities must be present, together with the availability (and affordability) of ADP technologies. Unless developing economies can meet both of these prerequisites at once, the advancing leading economies are likely to overtake them.The consequences of 4IR are complex and challenging to separate. For instance, automation is sometimes viewed as a chance to close the gender wage gap, but studies indicate that this depends on bridging the long-standing gender disparity in, among other things, STEM education, access to technology, and family obligations. ADP technologies have the potential to contribute to environmental sustainability by using resources more effectively, producing less carbon, and lowering particulate pollution. The realization of this promise has not yet been demonstrated, and the scope of this potential is up for debate (UNIDO, 2020).

Theories

Human civilization advances through two interrelated processes: the deepening of labor division and the progressive advancement of knowledge and technology(Balog & Demidova, 2021) . The following theories were found to be instrumental in guiding this study.

a) ***Technological Determinism*** - technology is the primary driver of social and cultural change. Technological advancements and innovations shape and determine the development of societies, education, and individual behaviour. This theory helped assess the impact of 4IR technologies on the higher education sector in Zimbabwe. The theory provides insights into how emerging technologies, such as cloud computing, internet, mobile computing, artificial intelligence, robotics, simulations and data analytics, influence the skills and competencies required for Education 5.0.

b) ***Human Capital Theory*** - The human capital theory in this context focuses on the 4IR related skills, knowledge, and competencies of Lecturers as valuable assets in the educational context. This theory guided the assessment of 4IR skills necessary for sustaining Education 5.0 by evaluating the investment requirements in human capital.
Research Questions

A couple of questions crop up in the higher education sector:

a) What is the nature of the 4IR?
b) What skills are important in lecturing staff to utilise 4IR technologies?
c) To what extent is 4IR technology being used by Lecturers?
d) What needs to be done for Lecturers to diffuse 4IR in light of Education 5.0?

Research Questions

a) To establish the nature of the 4IR?
b) To determine the skills that are important in lecturing staff to utilise 4IR technologies?
c) To establish the extent to which 4IR technologies are being used by Lecturers?
d) To recommend strategies for Lecturers to diffuse 4IR in light of Education 5.0?

Methodology

Research Design- The study adopted a mixed-methods approach, both qualitative and quantitative data collection techniques were employed.

Sample Selection - The target population for the study were academic staff members / lecturers at Chinhoyi University of Technology. A sample of 250 lecturing staff memberswere selected using a random sampling technique to ensure representation across different academic schools, institutes and academic directorates.

Data Collection (Survey) - A structured questionnaire was developed to collect quantitative data on lecturers' electrical or electronic equipment they use for teaching, research, community service, 4IR skills, tools and approaches they employ in there diverse lecturing fields. The questionnaire had a section with two open ended questions to qualitatively gather and areas they need to be capacitated to better offer better quality lecturing services in the 4IR and Education 5.0 era. The latter two questions allowed for in-depth exploration of lecturers' perspectives, challenges, and suggestions regarding the integration of 4IR skills in higher education.

Data Analysis

Quantitative Analysis - The quantitative data collected through surveys was analyzed using IBM SPSS Statistics software version 27. Descriptive statistics such as frequencies and percentages were calculated to summarize lecturers' responses.

Qualitative Analysis- The qualitative data extracted from the last two open ended questionnaire interviews questions were analysed through would cloud clouding in ATLAS.TI Software. Common words and key findings were identified to provide a deeper understanding of lecturers' perspectives on "technology related skills lecturers think are so critical in enhancing their work" and "technology related challenges theyface in trying to service the University" in the 4IR era while using Education 5.0 Doctrine".

Ethical Considerations – In assessing the 4IR skills in lecturers. Academic lecturers, were provided with a written academic research consent, clear and comprehensive information about the 4IR research objectives, procedures, potential risks, and benefits. They were also encouraged to participate voluntarily and made to withdraw their participation without any consequences. The collected data did not include lecturer identity information for confidentiality anonymity. Data collected was only availed to the research team for privacy and protection.

Data Analysis

Qualifications distribution of respondents

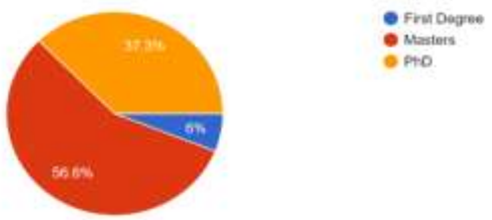

Figure 5.1: Qualifications distribution of respondents

More master's students responded more than other students. This was mainly because of their availability during the time of the research as shown in Figure 5.1.
Electrical or electronic gadgetsused by academic staff for teaching.

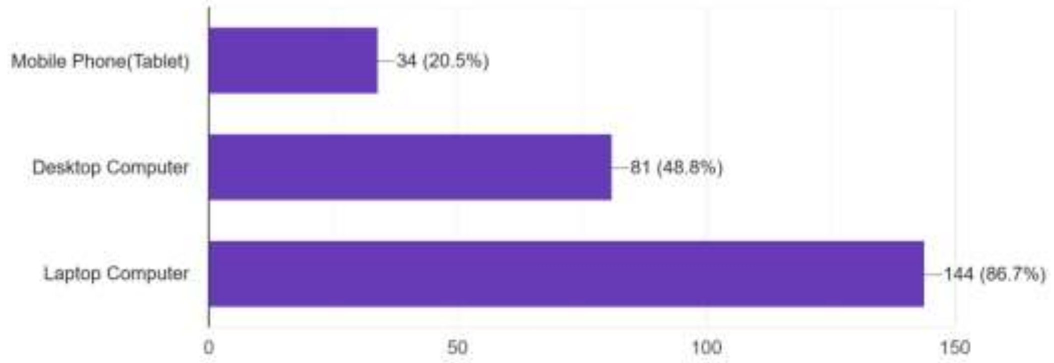

Figure 5.2: Electrical or electronic gadgets used by academic staff for teaching**.**

Laptop is the most used electronic gadget in the teaching process by academic staff with a percentage of 86.7. Laptops are basically portable and flexible in use as compared to desktops. The mobile phone was the least used with a percentage of 20.5 as highlighted in Figure 5.2.

Which platform(s) do you often use for online teaching

Figure 5.3: Teaching online platforms
The teaching online platforms which are used at the Chinhoyi University of Technology are highlighted in Figure 5.3**.**

IR Technologies used by Lecturers in Teaching

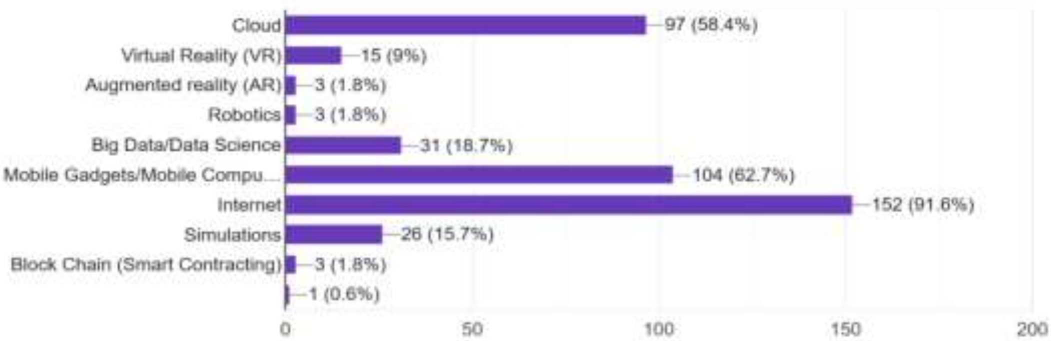

Figure 5.4: 4IR Technologies used by Lecturers in Teaching

In terms of usage of teaching, the internet is the most popular as compared to the others. Robotics and augmented reality are not yet popular in the teaching field mainly because of their complex mechanisms and costs of maintenance and operations. Most students and lecturers have smart gadgets in form of mobile phones, so it is a bit easy to use it in the teaching field. Cloud computing and mobile computing work hand in hand that is why their numbers are in tandem as highlighted in Figure 5.4.

IR Technologies used by Lecturers in Research

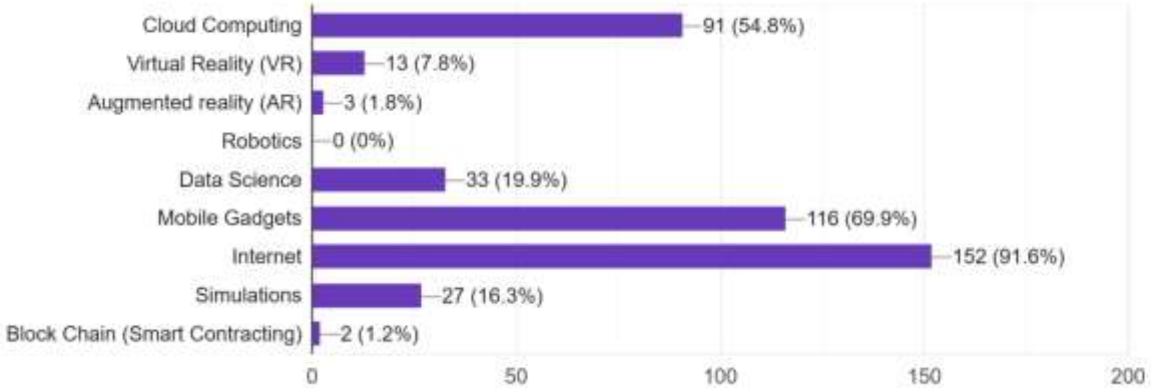

Figure 5.5: 4IR Technologies used by Lecturers in Research

Research is most vital in the teaching arena especially focusing on the 4IR paradigm, the internet and mobile gadgets proved to be the most used. The internet with a percentage of 91.6 and mobile gadgets with the percentage of 69.9. The lowest percentage came with robotics which had a 0 followed by augmented reality. This shows that these two resources are not yet popular and because of their expensive nature it is difficult to acquire such resources. Block chain had a percentage of 1.2 proving that its popularity is still on the low, in terms of research it is not being incorporated as highlighted in Figure 5.5.

IR Technologies used by Lecturers in Community outreach

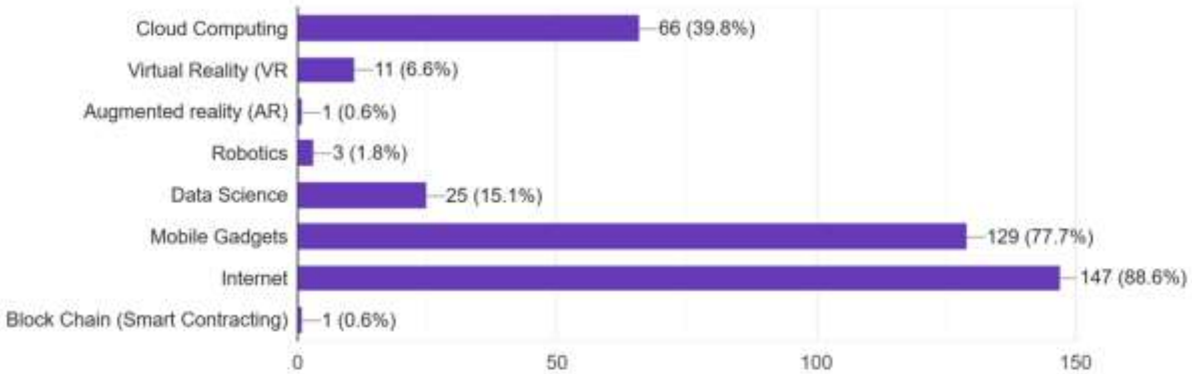

Figure 5.6: 4IR Technologies used by Lecturers in Community outreach

Community outreachs' requires lecturers to engage with the general public, so most of them used the internet with a percentage of 88.6 and mobile gadgets with a percentage of 77.7. However data science had a very low percentage of 15.1 proving that most community engagements does not require analytics but it is used after on the analysis side. Block chain, augmented reality and robotics came with very low percentages as highlighted in Figure 5.6.

IR Technologies used by Lecturers in Innovation

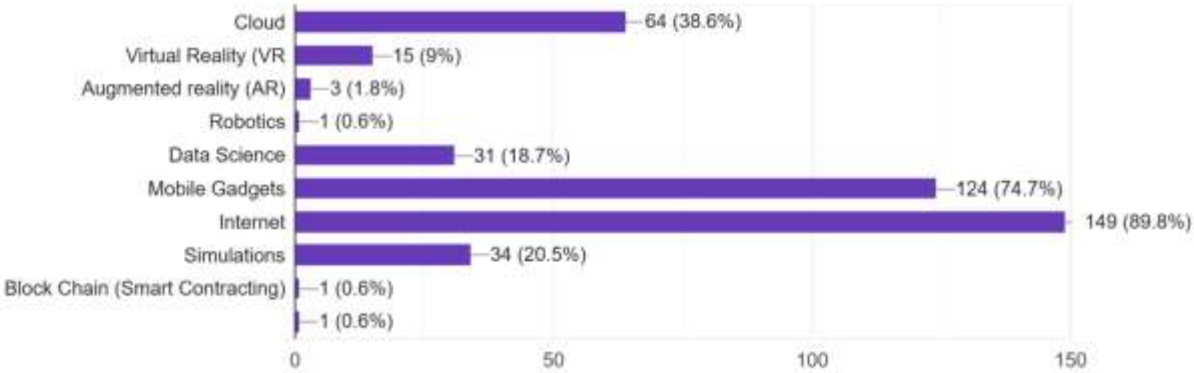

Figure 5.7: 4IR Technologies used by Lecturers in Innovation

Innovation involves the reaction of new ideas, new projects, new creations and new designs. The internet, mobile gadgets and cloud for storage proved to be mostly used during the innovation process. The lowest technologies were block chain with 0.6%, robotics with 0.6%, augmented reality with 1.8%. Internet and mobile gadgets have higher percentages as compared to other technologies.

Technology related skills which are critical in enhancing Lecturers work using Education 5.0 Doctrine in the 4IR

Figure 5.8: Technology related skills

The figure above a world cloud analysis of the skills that academic staff members highlighted as requirements for education in the 4IR era. These skills reflect the diverse range of technological competencies and knowledge necessary for effective university lecturing services in the context of the Fourth Industrial Revolution (4IR). Lecturers highlighted the need for ***Data analysis*** skills, including big data analytics, machine learning, and data science. These will allow them to collect, analyze, and interpret data to improve your teaching and research. They also highlighted the need for competence in the ***use of digital technologies***, such as simulation software, virtual reality (VR), and augmented reality (AR). These technologies can help them to create more engaging and interactive learning experiences for students. Some lecturers indicated that they are dire need ***of Programming skills*** as highlighted in Figure 5.8. This will allow them to develop their own educational software and tools, or to customize existing software to meet your specific needs. Use of cloud computing came out prominent in the skills set requirements. This will allow them to access and store data and resources from anywhere in the world, and to collaborate with other lecturers and researchers more easily. Due to increased private content which is being generated using application software, lecturers expressed keen interest in cyber security skills. This will help them to protect your own data and the data of your students and colleagues from cyber-attacks. There was also strong mention of Simulation software, Virtual reality and augmented reality, big data analytics and machine learning and Artificial intelligence. These technologies have the potential to transform university education and research. Simulation software, for example, may be used to construct virtual labs and environments in which students can learn about complicated subjects and practice their abilities safely.

The technology related challenges that Lecturers have faced in trying to service the University using the Education 5.0 Doctrine in the 4IR.

Figure 8.9. Technology related challenges

The following technology-related challenges have been faced by lecturers in trying to service the University using the Education 5.0 Doctrine. ***Lack of adequate gadgets and software***. This includes laptops, tablets, VR headsets, and other equipment needed to teach and learn using new technologies thereby hindering the implementation of practical learning experiences. Lectures have also identified ***Poor internet connectivity*** as a barrier to delivering quality service. This is a major challenge for both lecturers and students, especially when trying to access online resources or trying participate in online activities from remote places. ***Unstable power supply*** as also been cited as a challenge to delivering quality service using 4IR Technologies as highlighted in Figure 5.9.

Findings and Conclusions

Lecturers face various technology-related challenges when trying to implement the Education 5.0 Doctrine in university teaching, research, community service, innovation and industrilisation in the 4IR.

a) Electricity challenges and power outages disrupt the use of technology and hinder online teaching activities.

b) Lack of university support in terms of providing necessary gadgets, software, and resources adds to the challenges faced by lecturers.

c) Insufficient internet connectivity, limited bandwidth, and network issues impact the seamless delivery of online content and resources.

d) Inadequate funding and financial resources restrict the adoption and implementation of technology in teaching.

e) Limited access to appropriate equipment, devices, and software impedes the integration of technology into the learning environment.

f) Technical support and training programs are often insufficient, making it difficult for lecturers to navigate and address technology-related issues.

g) Storage limitations and the unavailability of software and resources hinder the effective delivery and management of online learning materials.
h) Incompatibility of laptops and devices with required software or platforms creates additional challenges for lecturers.

Universities need to address infrastructure limitations, such as electricity challenges and power outages, to ensure a reliable and uninterrupted technology environment (Hossain et al., 2023). Providing adequate support and resources to lecturers, including gadgets, software, and training programs, is crucial for successful implementation of the Education 5.0 Doctrine. Improving internet connectivity and bandwidth capacity on campuses is essential to facilitate smooth online teaching and learning experiences. Securing sufficient funding and financial resources for technology initiatives is necessary to overcome financial barriers and enhance the integration of technology into teaching. Universities should prioritize the provision of necessary equipment, gadgets, and software that align with the requirements of the Education 5.0 Doctrine. The findings highlight the importance of wholesome 4IR training, big data analysis, simulating ideation to reality, multimedia usage for visualizing future possibilities, appropriate software utilization, virtual platforms and simulations for practicals, data analytics skills, critical thinking, data science, online teaching and research, innovations, predictive analysis, robotics and simulation software, readily accessible ICT manuals, computer skills, interactive boards, digital technologies, artificial intelligence, interactive online teaching, virtual reality and augmented reality, training on simulation software, ICT skills, 4IR technologies for data collection and analytics, LMS navigation, staff information availability on portals, data analysis technologies, cloud computing, mechatronics and software integration, nanotechnology sampling equipment, academic entrepreneurship and ICT, computer-aided designing skills, safe data keeping, and emerging technologies.

Conclusion

The Fourth Industrial Revolution (Industry 4.0 or 4IR) has given teachers what may be the greatest responsibility of our time: to develop teaching strategies so they can maximize the potential of each student and equip students with the knowledge and abilities necessary to shape the future through technological innovation(Intel, Teaching the 4th industrial revolution, 2020).It is crucial to consider how education and workplace requirements have been related in previous industrial revolutions. Physical labour was necessary during the First Industrial Revolution to produce commodities using the power of water and steam. Electricity and assembly lines were utilized during the Second Industrial Revolution to facilitate mass production, which was carried out by skilled workers with advanced educational training at different centres (Intel, Teaching strategy takeaways, 2019).

The growth of intelligent machines and the development of those with the skills to program them during the Third Industrial Revolution allowed for the automation of manufacturing. Nowadays, repetitive, boring, dangerous, or regular work is delegated to computers and robots. This enables employees to concentrate on management, communication, and strategic decision-making tasks. As a result, workers on both sides of the technology divide collaborate. Technology and creativity are creating new jobs. It will be more crucial than ever for humans to be certified for and skilled at using technological systems as machines help human jobs (Love et al., 2022).Teaching needs to evolve so that students learn how to apply, evaluate, and create utilizing the material they learn in the classroom rather than just remembering and understanding it (Javed et al., 2020). Not as a means to these ends, but rather as a means to them, is personalized learning (Zim.gov.zw, 2022). Using the technology tools at their disposal, which enable them to solve problems in ways they had never imagined before, the objective is to develop students' talents and problem-solving abilities. Teachers need to make the shift to learning facilitator roles in order to help students study outside of their areas of specialization in the Fourth Industrial Revolution (Hossain et al., 2018). The freedom of students in developing their talents and pursuing their hobbies should be supported by technology. A restricted teaching strategy today is giving a lecture to a class of students and expecting them to learn something from a thorough presentation. Teachers should switch to facilitating learning that meets students where they are in their involvement and thought processes (Mhtestd & Jonathan, 2020).

Recommendations

- Building a framework for policy makers to create policies which support the integration of 4IR skills into higher education curricula.
- Creation of a curriculum for Universities which offer courses that focus on 4IR skills, such as data science, AI, and robotics.

Acknowledgements

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