

EDUCATION IN A RAPIDLY CHANGING WORLD

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Chapter Nineteen

Convergence of Artificial Intelligence and Technical-Vocational Education for Workforce Development

Oladiran S. Olabiyi

Introduction

The industrial revolution and business development during the mid-nineteen centuries have been traced to Information Technology (IT). However, the productivity effects of traditional types of Information Technology were exhausted by the mid-twenty century (Fernald, 2015). Today, the impacts of artificial intelligence and robotic engineering on the future economy and society are attracting attention, and many academic arguments have come up vis-à-vis the possible effects of artificial intelligence on workforce development. In particular, the substitution of human labour by artificial intelligence and machines is strongly debated. Some claim that a substantial share of employment is at risk, while others argue that computers and robots will lead to product innovations and hence to unimaginable new occupations. Artificial intelligence according to Stuart and Peter (2009) is a branch of computer science that attempts to understand the significance of intelligence and produce a new intelligent machine that reacts in a way comparable to human intelligence. United Nations Educational, Scientific, and Cultural Organisation (UNESCO, 2019) emphasised that Artificial Intelligence is a successful technological field capable of altering every aspect of our social interactions. In Technical Vocational Education and Training, Artificial Intelligence has begun producing new teaching and learning solutions that are now undergoing testing in different contexts.

Research in artificial intelligence includes robotics, speech recognition, image recognition, natural language processing, and expert systems. From the time when artificial intelligence has been introduced, its theory and practice have become more and more innovative, and the application areas have been increasing. Artificial intelligence can simulate the information process of human consciousness and thinking. Artificial intelligence is a creation of humans, and it can act like human thinking and it may exceed human

intelligence. (Mokyr, Vickers & Ziebarth, 2015) artificial intelligence is rapidly becoming part of businesses and industries and is streaming into TVET institutions. The possibilities for students and teachers are mind-boggling. TVET plays a critical role in the efforts of making future workforces artificial intelligence equipped. Bridging the artificial intelligence skills gap goes beyond the adoption of increasingly powerful technologies to facilitate learning. It also means rethinking the content and methods used to deliver instruction at all levels of TVET.

Meaning and description of Artificial Intelligence

There are diverse understandings of what describes artificial intelligence; artificial intelligence given by some researchers denote intelligence demonstrated by machine in comparison to natural intelligence exhibited by a human, while some describe artificial intelligence as computers that imitate cognitive functions that are associated with the human mind, such as learning and problem-solving (Russell & Norvig, 2009), Artificial Intelligence is the development of computer systems that can perform tasks that would require human intelligence, examples of these tasks are visual perception, speech recognition, decision-making, and translation between languages. Artificial intelligence according to Negnevitsky (2002) is the science of making machines do things that would require a high level of the mental process such as perceptual learning, memory, and critical thinking which are often done by men. In other words, artificial intelligence is the science of building computer programmes that aim to perform tasks that would require some intelligence if they were done by human beings. Therefore, no human activity seems to be out of reach, moving from one place to another, learning, reasoning, socializing, creativity among others. Nevertheless, it could be inferred that we are still far from creating a machine that would be able to match or outperform human capabilities in all fields (Negnevitsky, 2002).

Artificial intelligence is concerned with the development of computing machines that will be able to engage in human-like thought processes such as learning, reasoning, and self-correction (Joost, Egbert, Peter, & Mannes, 2018), application of artificial intelligence gives machines the ability to learn and improve without the help of humans or new programming. Artificial intelligence as an aspect of computer science emphasises the creation of intelligent machines that will work and reacts like a human being, some of the

activities artificial intelligence is designed to perform will include speech recognition, learning, planning, and problem-solving, thus, artificial intelligence has become an essential part of the TVET (Castrounis, 2017). Research associated with artificial intelligence is highly technical and specialised; the essential problems of artificial intelligence include programming computers for certain traits such as knowledge, reasoning, problem-solving, perception, learning, planning, and ability to manipulate and move objects (Marcin, 2019). Knowledge of engineering is a major feature of artificial intelligence study, artificial intelligence must have access to objects, categories, properties, and relations between them to implement knowledge engineering, initiating common sense, reasoning, and problem-solving power in machines is challenging and tough.

Machine learning is another fundamental aspect of artificial intelligence, learning without supervision requires an ability to recognise arrangements in streams of inputs, whereas learning with adequate supervision involves classification and numerical regressions. The primary goal of artificial intelligence is to make lives easier by taking care of complex and repetitive daily tasks and to reduce human casualties in wars, dangerous workspaces, car accidents, natural disasters or to just make everyday life easier by helping with tasks such as cleaning, shopping, and transportation (Brynjolfsson, Rock & Syverson, 2017). Today, TVET educators, whose major job is the development of human intelligence, must turn their attention to the advances in artificial intelligence. Their attention is necessitated for two major reasons: firstly, in understanding what machine intelligence is and what is not, technical vocational teachers should be in a better position to explain the meaning of human intelligence and focus on its enhancement and development, and secondly, artificial intelligence should be seen as tools that can help TVET educators to teach by providing a pedagogical approach that enhances learning. Perhaps the best way to understand artificial intelligence systems and their potential impact on TVET is to focus on the two types of artificial intelligence which currently provide direction for computer hardware and software development which are expert systems and natural language (Ahmed, 2017).

Artificial intelligence as used describes technologies that are performing human-like cognitive processes such as learning, understanding, reasoning, intellectual, thinking, and interacting, which can take many forms, including

technical infrastructure (systems), a part of a (production) process, or an end-user product. Artificial intelligence is increasingly expressing deeply and transforms how modern societies live and work. Already today, smartphone smart assistants, perform a variety of tasks for users, unless one chooses to live remotely and never plans to interact with the modern world, life will be significantly impacted by artificial intelligence. While there will be many learning experiences and challenges to be faced as the technology rolls out into new applications, the expectation will be that artificial intelligence will generally have a more positive than negative impact on society.

TVET and workforce development

Economic development determines the demand for capability and high-quality workforce required in various occupations, the training function, therefore, proceeds from the assumption that the gap between the required and actual performance-which calls for a bridge via training is the result of the inadequacy of knowledge, skill, and attitudes, leading to a new round of development of Technical Vocational Education and Training (TVET) programmes. In the globalised market, a skilled workforce is key to competitive prosperity. The development of TVET has become one of the most important strategies in both developing and developed countries (Olabiya & Chinedu, 2018). TVET is particularly important for promoting economic development, expanding employment size, and improving the quality of employment. Governments around the world are currently undertaking reforms on their education and training systems to meet the demand for an appropriately skilled workforce in an evolving global economy. TVET, therefore, is understood as comprising education, training, and skills development relating to a wide range of occupational fields, production, services, and livelihoods. TVET also includes a wide range of skills development opportunities attuned to national and local contexts. Learning to learn, the development of literacy and numeracy skills, transversal skills, and citizenship skills are integral components of TVET (UNESCO, 2015).

TVET is that part of the education system that provides courses and training programmes related to employment to enable the transition from school to work for young learners (social objectives) and supply of the labour market with the competent learners (economic objectives) Preparing TVET students to succeed in an artificial intelligence saturated future workplaces requires that TVET

employment; developing the advanced specialists to work in the artificial intelligence industry; and creating a pool of informed users to engage with the specialists (European Union, 2019), Artificial intelligence creates a new virtual workforce described as intelligent automation that capable of solving problems and self-learning, and the economy will also benefit from the diffusion of innovation, which will affect different sectors and create new revenue streams, innovative technologies empowering more efficient workforce-related time management, TVET institutions, therefore, should be prepared to make use of artificial intelligence in training their students, to ensure that workforce acquire the training they need and when they need it (Olabiya & Chinedu, 2018). TVET institutions also should recognise that there is great potential in artificial intelligence and machines to support trainees throughout their course of study with just-in-time learning individualized to trainees needs, accessible through multiple interfaces from voice-activated technology to virtual and simulated environments and physical computing embedded within our world (Gries & Naudé, 2018). Artificial intelligence has the potential to revolutionize production and contribute to addressing major global challenges in developing the workforce, the development of the workforce through TVET institutions in the 21st-century will involve the use of digitization and automation through education and training. Artificial intelligence technologies are increasing, with a lot of potential benefits for TVET institutions and industries across various professionals, artificial intelligence technologies offer the capacity of increasing productivity and creating new products and services through the skilled workforce (British Academy, 2018).

Furthermore, TVET institutions according to Chakroun and Daelman (2018) should encourage the use of artificial intelligence, by allowing their students to get access to their courses through machines, for instance, instructors should help their students to have access to designed courses from their smartphone, tablet, or computer. Frey and Osborne (2013) emphasised that TVET institutions must recognise and value human intelligence, to develop students' intelligence and therefore need to focus on how to blend artificial intelligence with human intelligence to solve educational challenges that need to be solved towards ensuring that every individual has access to the training they need towards acquiring needed skills for industry and education. Meanwhile, Mokyr, Vickers, and Ziebarth (2015) stressed that both students and teachers in TVET programmes should have adequate information about artificial intelligence to

ensure that they make effective use of it and also make a well-informed decision concerning how and when they engage with artificial intelligence and what they expect to do with it. Mokyr, Vickers, and Ziebarth added that TVET institutions need to train individuals who shall understand the technical details and skills to develop the next generation in the use of artificial intelligence systems and to also develop the ethical and regulatory frameworks and legal mechanisms that will help to protect society.

The curriculum developer in TVET programmes must, therefore, show clearly and explain artificial intelligence competencies needed by TVET students beyond basic ICT proficiencies, which will assist in defining artificial intelligence skills when incorporating 21st-century skills in respective TVET educational programmes, TVET programmes concerns will evolve from the developing capabilities of artificial intelligence systems in society. A key question for vocational educators is how can artificial intelligence be used to help students think through problems they will encounter in a workplace that thrives on processing information? OCED (2017) opined that there is a need to devise a strategy to ensure TVET students develop both human and artificial intelligence. The strategy suggested include: teaching key concepts in the technologies behind artificial intelligence and their principled implications for workforce development; help students become digital citizens by ensuring access to a broad curriculum required for developing workforce skills and investing in TVET programmes and research funding to increase numbers of artificial intelligence specialists that will equip them with a wider range of skill and the ability to think, interpret and understand across several disciplines and provide a stronger basis for lifelong learning.

Artificial Intelligence and workforce development

Workforce development is driving the need for more high-level skilled training and TVET institutions are in a distinct position to provide quality and rigour to a variety of academic and employable credentials. The term workforce refers to a group of people who work or are available to work either in a country, area, or in a particular business or industry. It is the total number of workers actively employed in, or available for work in, a country, state, organisation, industry, among others. (Olabiyi, 2012) Preparing the workforce for the 21st-century implies that students must be exposed to artificial intelligence and machines that are the most relevant, useful, in-demand, and universally applicable skills in

institutions and governments at all levels will explore different means to change and modify learning programmes to prepare learners for the increasing presence of artificial intelligence in all aspects of human activity. TVET is particularly important for promoting economic development, expanding employment size, and improving the quality of employment. (Cong & Wang, 2015) The objective of TVET is to bring up application-oriented talents that have related technical theoretical knowledge and practical ability. Training should be provided so that the country can advance towards satisfying its workforce needs who are artificial intelligence skilled.

TVET is otherwise regarded as workforce education, particularly, in a more traditional role, it facilitates the adjustment of the skills and knowledge of man to the changing demands of the workplaces. It emphasises the skill development of the individuals in a chosen occupation (Manfred & Jennifer, 2004). TVET, therefore, has an important role to play in raising the quality of work and competency of TVET workforces, increasing job satisfaction, and motivating workforces as well as enhancing their productivity (Olabiyi & Chinedu, 2018). Put succinctly, TVET prepares individuals for the ever-changing world of work. Effective participation in the world of work is made feasible with the adoption of artificial intelligence in TVET institutions. TVET institutions should also be capable of offering programmes that incorporate AI-related competencies, especially if they intend to produce graduates whose skills are attuned to changes in the labour market (Chakroun & Daelman, 2018). TVET was considered appropriate for workforce development in professions like automobile mechanics, electrical/electronics, woodwork, building, plumbers, electricians, and other similar professions. It is geared towards the practical needs of a specific occupation.

Artificial Intelligence and TVET

Education and training in TVET are central to the achievement of economic and industrial development, the development of technical and vocational skills is vital to economic development for two important reasons. First, technical, and vocational skills are needed for enterprise productivity and profitability, and secondly, for national productivity and wealth creation, TVET has a role both in driving artificial intelligence adoption and in combating inequality in workforce development. Artificial intelligence is central to equipping all workers to be digital citizens; providing training in skills to take on new

today's schools. The basic idea is that students, who will join the workforce in the 21st-century, need to be taught different skills than those learned by students in the twenty centuries, and that the skills they learn should reflect the specific demands that will be placed upon them in a complex, competitive, knowledge-based, information-age, technology-driven economy and society.

Glossary of education reforms perceives that while that there is an agreement that today's students need different skills than were perhaps taught to previous generations, and that cross-disciplinary skills and technological literacy are essential to success in modern workplaces, and adult life (Glossary of Education Reform, 2018) knowledge in the exploitation of artificial intelligence is critical in present-day workforce development. One of the possible means for transforming TVET to develop a sustainable workforce for the ever-dynamic world of work is to focus on the use of artificial intelligence and machine in the curriculum implementation process (Olabiyi & Chinedu, 2018) the need for artificial intelligence in TVET remains a great challenge, considering the impact it can make in the training and development of knowledgeable workforces. In other words, the use of artificial intelligence in the training, up-grading, and re-training of workers is of paramount significance and an essential aspect of teaching cultural toolkit for the 21st-century, as this affords new and transformative models of development.

Artificial Intelligence has become an essential part of workforce development and technology for industry and the business world at large. Artificial Intelligence according to Roth & McEwing (2018) is expected to create new employment opportunities in the areas of engineering, science, technology, business, and education. For instance, software engineers creating systems can enable automated systems as opposed to just following human-prescribed programmes. Artificial intelligence software can effectively instruct TVET students in technical vocational subject areas, and those that are part of the regular school curriculum. These systems can provide highly adaptive and personalized learning tools that help TVET students to improve an understanding of the basics of a subject in a way that aligns with each learners' ability. Artificial intelligence according to Fernald (2015), is always ready for preparing TVET students to go through areas of difficulties repeatedly until a qualified workforce is developed, and artificial intelligence can also help students who can move forward quickly to progress with speed.

Much of the focus on artificial intelligence has been on the impact that task automation will have on employment. Lombardi (2017) observes that the nature of occupations will change and that some will be susceptible to automation, and that AI-driven products and services will also generate significant economic value, offsetting job gains, as well as boosting productivity and average wage levels. TVET institutions need to develop approaches to entrench artificial intelligence in their curriculum responsibly to prepare the workforce for industry and to secure the right talent to make the most of the opportunities created. Therefore, TVET institutions should be concerned with the preparing workforce that will combine artificial intelligence with a human that will give them more opportunities to update their skills, investing in artificial intelligence and automation according to Marcin (2019) is not enough to build a sustainable or creative crossbreed workforce, rather TVET institutions similarly need to ensure they have the skills, cultures, and processes in place to work together with this technology towards developing the right workforce needed.

The concern here should be how workforces who presently have not received enough education opportunities that will help them work with artificial intelligence and automation machines need to be skilled in the use of artificial intelligence. Therefore, TVET institutions, industries as well as governments, have to work together to develop a workforce that will be skilled in the use and management of the machines. TVET institutions should also look forward and make sure programmes are very clear about the future skills workforces will need and start acting now. A well-structured TVET system will enable productivity, enhance competitiveness, and promote entrepreneurial activity. The purpose of TVET is to prepare the workforce and to serve as a medium of evolution for people in the world of work; by enabling individuals to develop a sense of belonging in their communities (Olabiyi & Chinedu, 2018).

Impact of Artificial Intelligence related technologies on workforce development

Artificial intelligence, deep learning, machine learning, and neural networks represent very stimulating and powerful machine learning-based techniques that can be used to solve various real workplaces problems, there have been remarkable gains in the application of artificial intelligence techniques (Acemoglu & Restrepo, 2016) for instance through deep learning many practical applications of machine learning can be carried out in TVET. Deep

learning can be used to break down difficult tasks in ways that make different kinds of learning in TVET possible. Machine learning enables computer programmes to acquire knowledge and skills, and even improve their performance; information provides the raw material for machine learning and offers examples that computer programmes can use for practice to learn, exercise, and ultimately perform their assigned tasks more efficiently (Acemoglu, & Restrepo, 2017). The adoption of artificial intelligence demands a new way of thinking about education, business, and technology. Artificial intelligence according to Flu (2019) will improve a process, service, or delivery, and not replace the humans that use the machines as it will augment everything that is applied to. Artificial intelligence makes an increasingly important part in various areas of our lives such as education, industries, transport, manufacturing, and the economy presently, which is having an impact on our world in different ways.

Artificial intelligence is perceived by many as an engine of productivity and economic growth that can increase the efficiency with which things are done and vastly improve the decision-making process by analysing information. Learning without any kind of supervision requires an ability to identify patterns in streams of inputs, whereas learning with adequate supervision involves classification and numerical regressions. Artificial intelligence gives rise to the creation of new products and services, markets, and industries, thereby boosting consumer demand and generating new revenue streams (Marcin, 2019). UNESCO (2015) points out that to achieve sustainable development goals, there is a need for TVET institutions to harness artificial intelligence towards skills that would allow learners to identify and solve problems using computing techniques, methods, and technologies. The ability of individuals to use artificial intelligence for the benefit of their work requires developing particular digital skills through well-designed policies. This underlines the importance of using appropriate instruments to ensure that workers are well prepared to harness the disruptive forces of digital technologies.

With the preparation of workforce for the 21st-century, TVET institutions must emphasise training on the use of artificial intelligence that will focus on scaling up artificial intelligence skill development for students, that will target to support and foster the capacities of instructors/lecturers towards empowering their students in developing innovative artificial intelligence applications, this

ten years. However, the result further reveals that those in the media and assembly line/manufacturing jobs were the most fearful that artificial intelligence will take their job. The key is that human being and technology must align together when employed purposefully and well-adjusted with the human touch, artificial intelligence can promote the workforce by enabling workers to be more productive, accurate, and fulfilled as they are positioned to appreciate the more complex aspects of their work (Geneysis, 2019).

Benefits of Artificial Intelligence

Artificial intelligence plays an important role in our lives and economy and is already having an impact on our education in various ways. Artificial intelligence according to Castrounis (2017) can increase the efficiency with which activities are carried out and enhance the creation of new products and services, markets, and industries, thereby boosting consumer demand and generating new revenue streams. (European Union, 2018) Owing to innovative technologies, artificial intelligence leads to a strong increase in labour productivity thereby enabling more efficient workforce-related time management. Artificial intelligence will create a new effective workforce called intelligent automation that can solve problems and self-learning, and, the workplaces will benefit from the diffusion of innovation, which will touch various sectors and create new revenue streams. Also, artificial intelligence can help TVET educators teach by providing a pedagogical approach that reinforces learning and understanding what artificial intelligence is will help technical vocational teachers to have a better view of human intelligence and focus on its enhancement and development. (Marcin, 2019).

OECD (2019) observed that the use of artificial intelligence can be applied to most industrial activities from optimizing multi-machine systems to enhancing industrial research', utilization of artificial intelligence in production is likely to increase over time, due to the development of automated learning processes. Since employment opportunities according to International Organisation for Migration (2015) are central in people's decision to relocate and skill matching is essential to the job matching process, understanding the essential arrays of skill required can inform models for the spatial mobility of workers and improve our understanding of career mobility and career incentives, automation, and advanced machine-learning techniques, in which intelligent machines are increasingly capable of carrying out high-skill and possibly non-routine tasks.

Moving from the efficiency gains in online trading to the extensive use of artificially intelligent systems in our industrial production, concerns about the potential displacement of labour emerge.

The knowledge of experts' systems programmes that do the work of human experts by codifying the knowledge and rules human experts use are essential to reach conclusions. Expert systems may benefit nearly all technical and vocational education programmes because vocational education careers stress problem-solving, expert systems may be used as ready sources of information for students. In architectural drawing, students can use an expert system that recommends building materials based on the specifications of the construction job. A woodwork technology student can utilise an expert system that supplies constructional data for building an article. Technical vocational education instructors can use an expert system to provide details on roof design and construction. The application of artificial intelligence in technical and vocational education curriculum is just one issue. Frequent recommendations by various commissions and study groups have emphasised three curricular and instructional areas for reform: problem-solving, information handling, and communication skills. This is a critical message to those who plan and implement computer-based curricula and instruction. Technical vocational education programmes of the future should adopt the use of artificial intelligence to develop workforce skills required in our workplaces (Scheinkman, 2019).

Frey & Osborne (2017) argue that the impact of technology leads to rising relative demand in well-paid skilled jobs, which typically require non-routine cognitive skills, and rising relative demand in low-paid, least-skilled jobs, which typically require non-routine manual skills. Bessen's (2017) perceive that computer technology is associated with job growth that is particularly observable in non-manufacturing industries. The impacts of new technologies depend not only on the industries in which they function but also on adjustment in other parts of the economy. By preparing human labour to interact effectively and efficiently with machines, we can maximize the productivity gains from the interrelated tasks. That could potentially lead to the development of new jobs or occupations that will result from this cooperation and the advancements of technology. Initiatives to prepare effectively human labour for this new era will require the close interaction of authorities and institutions with major

technological firms which have both the knowhow and the capacity to contribute to the training.

Challenges facing TVET educators in utilising Artificial Intelligence

Considering the growing interest in and relevance of artificial intelligence in developing the workforce, there is an urgent desire to understand the challenges and obstacles to developing and adopting artificial intelligence towards preparing the workforce. Challenges as viewed by Pearson (2009) and Olabisi (2014) are difficulties in an undertaking; that is stimulating for one engaged in it. Something that, by its nature or character, serves as a call to battle, a tasking activity, or a special effort is a challenge. Challenges in preparing TVET students for the future workforce via artificial intelligence cannot be avoided but can be managed and improved for the effective functioning of TVET programmes, there will be qualified workers for industries. As such, the need for preparing STEM graduates for an effective workforce remains a great challenge. Preparing students to succeed in a completely different job market is a responsibility we cannot ignore even though it may feel impossible to keep up with such rapid change, what makes this task particularly challenging is that today's youth will likely face challenges that the adults around them can barely imagine, it is, therefore, critical to prepare our students to navigate a world that is volatile, uncertain, complex, and ambiguous.

Artificial intelligence has the potential to reshape skill demands, career opportunities, and the distribution of workers among industries and occupations. However, researchers and policymakers are underequipped to forecast the labour trends resulting from specific cognitive technologies, such as artificial intelligence. Typically, technology is designed to perform a specific task that alters demand for specific workplace skills. The resulting alterations to skill demand diffuse throughout the economy, influencing occupational skill requirements, career mobility, and societal well-being (e.g., impacts on workers' social identity). Identifying the specific pathways of these dynamics has been constrained by coarse historical data and limited tools for modelling resilience. This challenge can be overcome by prioritizing data collection on workforce development required for different careers that are detailed, responsive to real-time changes in the labour market, and respects regional variability (Scheinkman, 2019).

Furthermore, TVET institutions that are saddled with responsibilities of developing workforce must develop better access to data that is not structured on skills from resumes and job posting along with a new indicator for technological change and model for direct change that will enable new and promising techniques and forecasting the future of work, improved data collection will enable the use of new data-driven tools, including machine learning applications and systemic modelling that more accurately reflects the complexity of workplace systems. New data will lead to new research that enriches our understanding of the impact of technology on modern labour markets. Kirchhoff (2001) observed that TVET institutions that train workers to possess valuable skills that lead to higher wages must have data that will reflect the need for the workforce required in workplaces. Kirchhoff added that looking at education and wages alone is not enough to explain the lack of technical skills required by the workforce.

TVET educators teach students who have access to powerful computer hardware and software. The challenge for the instructors is that they need to update their knowledge and skills in adopt artificial intelligence to be relevant in carrying out their responsibilities as it is likely that management and manipulation of data will replace the use of textbooks as the foundation of vocational curriculum materials. (Royh & McEwing, 1985) Furthermore, technical vocational educators need to accept the fact that technologies will be packaged in powerful and different forms and this technology will have relevant applications for different vocational areas. TVET educators will, therefore, need to reposition themselves, their students, and the programmes to work with the state-of-the-art of artificial intelligence to achieve the objective of workplaces. ((King & Persily, 2018) TVET programmes must support the use of artificial intelligence. TVET instructors must develop aggressive attitudes toward technological developments by learning about new technologies systems, which will have an impact on their vocational disciplines.

Strategies for improving quality workforce for 21st-century using Artificial Intelligence

Improve the quality workforce for the 21st-century will require effective use of artificial intelligence and related technology to develop the capacity of students in the subset of core job tasks, causing substantial change. The ability of individuals to use technological advances for the benefit of their work in the

to be suitable for automation. By preparing the workforce to interact effectively and efficiently with machines, will maximize the productivity gains from the interrelated tasks. That could potentially lead to the development of new occupations that will result from this cooperation and the advancements of technology. Initiatives to effectively prepare workforce for the 21st-century will require the close interaction of employers and training institutions with major technology firms that have both the know-how and the capacity to contribute to the training.

Summary

Artificial intelligence has been described as machines performing human-like cognitive processes such as learning, understanding, reasoning, and interacting, which can take various forms, artificial intelligence technologies have the potential to transform the training of the workforce and contribute to addressing major global challenges. The workforce has been defined as people engaged in or available for work, either in a country or in a particular industry. It is the number of people in a country who are available for work. TVET refers to a form of education that is planned to impart knowledge, skills, the right attitude, the autonomy of identity, perseverance, and character, and the work ethic into learners in readiness for work and general employment. This, in turn, leads to productivity, social inclusion, and economic development. Around the world, the development of the workforce increasingly depends on a person's ability to use artificial intelligence effectively and efficiently, so that best practices and lessons learned can easily be disseminated and facilitate the implementation of TVET.

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