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Website: https://etcor.org
iJOINED ETCOR P - ISSN 2984-7567 E - ISSN 2945-3577
The Exigency P - ISSN 2984-7842 E - ISSN 1908-3181

Chinese University Administrators' Preparedness in Technology for the Fourth Industrial Revolution

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Received: 05 March 2023 **Revised**: 23 March 2023 **Accepted**: 03 April 2023
Available Online: 07 April 2023

Volume II (2023), Issue 2, P-ISSN – 2984-7567; E-ISSN - 2945-3577

Abstract
Aim: The aim of this study is to determine the educational technology predictors of university administrators' preparedness at Guangdong Vocational and Technical University of Business and Technology for the Industrial Revolution 4.0.
Methodology: The study utilized a descriptive method of analysis using the survey technique. During the investigation, the population characteristics are identified and examined. It strived to establish correlations between independent and dependent variables pertaining to respondents. This study attempted to determine how variables interact with one another. The study made use of the descriptive-comparative-correlational research design.
Results: Comparing the assessment of the student respondents on the competency of the teachers in terms of subject matter knowledge, instructional representation and strategies, knowledge of students' understanding, and technology integration and application and their self-assessment of the student respondents on their level of academic motivation in terms of: attention, relevance, confidence, and satisfaction, a computed R-value of -0.06 and a significance value of 0.40 were identified. The R-value indicates a weak correlation between the assessment of the administrator respondents on their preparedness for industrial revolution 4.0 and their proficiency on the technology standards for university administrators in terms of leadership and vision, learning and teaching, productivity and professional practice, support, management, and operations, assessment and evaluation, and social, legal, and ethical issues. This means that the two variables do have a relationship, but the relationship is very weak and that an increase in one may have a weak effect on the other variable. The correlation co-efficient also indicates that the relationship between the assessment of the administrator respondents on their preparedness for industrial revolution 4.0 and their proficiency on the technology standards for university administrators in terms of leadership and vision, learning and teaching, productivity and professional practice, support, management, and operations, assessment and evaluation, and social, legal, and ethical issues is negative.
Conclusion: As the other variable increases, the inverse is observed in the other. This illustrates that the higher the assessment of the administrator respondents on their preparedness for industrial revolution 4.0 is, the opposite happens for their assessment of their proficiency on the technology standards for university administrators in terms of leadership and vision, learning and teaching, productivity and professional practice, support, management, and operations, assessment and evaluation, and social, legal, and ethical issues will be.

Keywords: Chinese University, Administrators' Preparedness, Technology, Fourth Industrial Revolution

INTRODUCTION

The Industrial Revolution in universities is now the demand of the times, particularly in this technological age. China, being one of the leading progressive countries in the world, has been wrapping up and preparing for the 5th industrial revolution while other countries are still starting their way to the 4th industrial revolution in education.

The term "Industrial Revolution 4.0" was used to describe the merging of physical, digital, and biological boundaries. It is also a convergence of developments in artificial intelligence (AI), robotics, the Internet of Things (IoT), 3D printing, genetic engineering, quantum computing, and other technologies.

Furthermore, all of the commodities and services that are fast becoming indispensable in daily life are based on this mutual power. (McGinnis, 2018). Industrial Revolution 4.0, as part of this ideal technological storm, sets the path for transformational changes in the way we work while radically disrupting virtually every industry field. On the

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other hand, corporate leaders aren't the only ones who need to know how to adapt the Industrial Revolution 4.0 to the current world.

Educators, universities, government officials, and parents must rethink their curricula in order to prepare the next generation to take advantage of the multitude of opportunities and tackle the problems presented by rapid technological development (Sanchez, Sanchez & Sanchez, 2023). Emerging inventions have a big impact on people's education as well. Only highly trained and experienced personnel would be able to keep track of these new developments (Salendab & Cogo, 2022). Universities and businesses should collaborate (Benešová & Tupa, 2017).

When the COVID-19 epidemic reached China (Dela Cruz & Natividad-Franco, 2021), the effects of Industrial Revolution 4.0 on educational institutions became even more apparent. All educational institutions made an attempt to adapt to the changing scene, especially when regular classrooms were no longer an option (Flores, 2022; Flores, 2020; Muńoz & Sanchez, 2023; Natividad-Franco, 2022; Regala, 2023). Guangdong Vocational and Technical University of Business and Technology is of no different from many universities in this aspect.

Different types of distance learning are being used by universities, and they are utilizing Industrial Revolution 4.0 technologies. In order to adjust their sails to the wind, most universities in China adopted Flexible Learning Programs (FLP). As its name suggests, FLP consists of traditional, synchronous, and asynchronous classes where students can learn at their own pace, place, and time. The program was made possible through the acquisition of different learning platforms that will best suit the needs of every university.

In addition, universities also utilize online meeting rooms integrated into the system mostly in WeChat and other platforms for their synchronous instructions. For asynchronous classes, universities manage different modalities for post readings, recorded lectures, videos, modules, and activities to conduct assessments. For skill-based laboratory classes, universities are using applications, simulations, and virtual reality software.

Clearly, the survival and expansion of higher education institutions in the face of the Industrial Revolution 4.0's repercussions are dependent on the university administrators' preparation (Salendab & Dapitan, 2021a). University administrators should be the first to prepare for the Industrial Revolution 4.0 adaption before instructors (Sanchez, 2022).

How can university administrators instruct their subordinates on how to prepare if they are not themselves prepared? Indeed, university administrators who are aware of the Industrial Revolution 4.0, have experience with adaptive initiatives, and have the competence to plan and execute Industrial Revolution 4.0 approach will make the decision to steer the organization toward adaptation. Furthermore, it is important to evaluate the variables that will contribute to and predict the preparedness of the university administrators (Sanchez, et al., 2022). If these factors have been determined, steps will be taken to intensify attempts to transition to Industrial Revolution 4.0. Mindful of this situation, hence, this study.

The world is currently undergoing a new phase of the industrial revolution, known as Industrial Revolution 4.0, which is being fueled by the growth and proliferation of digital technology. New technologies such as the Internet of Things, Artificial Intelligence, and autonomous vehicles are increasingly integrated into everyday life and used in the industrial sector as part of the Industrial Revolution 4.0. (Fu, 2017). The Industrial Revolution 4.0's developing technologies have drastically altered how people live and work. (Lestari & Santoso, 2019).

The age of industrialization began in the 1700s, and each subsequent industrial revolution has achieved significant advances in modern technology. During the First Industrial Revolution in the 1700s, the effect of water and steam on mechanical machinery was the driving force behind the creation of mechanical looms, which altered the economic structure even further. The Second Industrial Revolution began in the 1870s, providing electrical energy and establishing mass manufacturing as a key framework. To be more successful, these transitions rely on a number of human skills. The emergence of computers, sometimes known as the Digital Revolution, occurred during the Third Industrial Revolution in the 1970s. The Fourth Industrial Revolution, often known as IR 4.0, is now built on the Digital Revolution, in which technology and people are linked. By connecting physical, digital, and biological elements, technological innovation has discovered new methods to show its capability. (Alaloul, Liew, Zawawi & Kennedy, 2019)

Rapid and significant technological advancements have the potential to improve human existence (Dizon & Sanchez, 2020), but they also raise fears about the future. One of the most common concerns about emerging technology is that robots and artificial intelligence may eventually replace humans in the workplace, resulting in "technological unemployment." (Zervoudi, 2020). All graduates now live in a technologically changed environment, where the Internet, cloud computing, and social media present distinct opportunities and problems for formal education institutions. Universities are grappling with issues about their own fate, particularly employment, as students ponder life beyond graduation. Industrial Revolution 4.0 necessitates a set of skills that differ from those

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necessary during the third industrial revolution when information technology was the driving force. Critical thinking, people management, emotional intelligence, judgment, negotiation, cognitive flexibility, and knowledge generation and management are among these skills. (Bo & Tshilidzi, n.d.)

As a result, today's educational institutions, notably their university administrators, must be ready for Industrial Revolution 4.0 (IR 4.0). The IR 4.0 preparedness determines how capable university administrators are in planning and implementing adaptive measures in their institution. The cumulative importance of the IR 4.0 mindset, knowledge, and work skills serves as an indicator of IR 4.0 preparedness in this study.

Educational technology (also known as learning technology) may be simply defined as a set of technologies that can help students study more effectively. It encompasses, but is not limited to, software, hardware, and internet-based applications and activities. It is also connected to instructional media, which includes all of the resources and physical methods that an instructor might employ to execute teaching and assist students in meeting their learning objectives. (Benolirao, 2016).

The capacity to utilize technology to communicate effectively and professionally, organize information, generate high-quality goods, and improve thinking abilities is referred to as technical proficiency. In the classroom, it refers to a teacher's ability to use technology to educate and assist, as well as to increase learning, productivity, and performance. These skills are required to function in today's technology environment. Teachers with technology proficiency can discover and investigate a wide range of technical tools and gadgets in order to assess and pick those that best respond to teaching and learning material (Sanchez & Sarmiento, 2020). Basic information technology skills are commonly utilized by instructors in universities and higher education institutions to interact electronically, coordinate activities and information, and generate papers. (Saad & Sankaran, 2020)

Experience and instruction can lead to proficiency in the use of technical tools and gadgets. Experimentation must be included in instructional methods, and technology tools and gadgets must be readily available. Many parts of the teaching profession, such as lesson planning and the development of education, appear to be technology-related (Flores, 2019a; Sanchez, 2023a). Teachers' ideas about how the topic should be taught, as well as the skills associated with teacher competency in managing classroom activities utilizing technology tools and devices, all influence teacher decisions to use technology in teaching and learning activities. As a result, in order to meet the desired outputs, teachers must be able to use the technical knowledge and abilities necessary for professional work duties and responsibilities. (Saad & Sankaran, 2020)

In addition, university leaders/administrators play an essential role in whether these innovations are being used effectively in their university (Regala, 2020; Salendab, 2021). Many government education agencies have created technology plans to encourage efficient technology usage and to assist administrators in implementing technology initiatives that will improve their university's efficiency, effectiveness, and productivity. One of the government's technology strategies emphasizes the necessity for administrators to initiate, promote, and support the successful use of technology in their educational environments to stress the administrators' responsibility in introducing technology into the universities. Although it is encouraging to see the administrators' role acknowledged in plans like the one stated above, there is a lack of focus on identifying the technical proficiencies that administrators require to perform this job. (Yu & Durrington, 2019).

University administrators play an important role in facilitating technology use in universities (Ertmer et al., 2022; Salendab & Dapitan, 2021b), and they are one of the keys to successful technology planning and integration (Office of Technology Assessment, 2019). MacNeil and Delafield (2018) found that when administrators act as technology leaders, the teachers and students integrate and use technology more successfully. Yet many university administrators are novice technology users and have little experience or training in the knowledge and skills required to be effective technology leaders (Ertmer et al., 2022). To help teachers integrate technology, the university leaders need to keep up with the latest technology. Without this knowledge, administrators find it difficult to help teachers understand the use of technology in the classroom.

Paben (2022) indicated that university leaders' vision for their universities must include technology. So, what exactly do administrators need to know to be effective technology leaders? Schmeltzer (2021) indicated that administrators need a broad set of experiences; they need to develop an understanding of how technology can improve instructional practices and a repertoire of strategies for supporting teachers' efforts to use technology in the classroom.

Indeed, university administrators are crucial to successful technology planning and integration (Ertmer et al., 2022; Office of Technology Assessment, 2019). Teachers and students integrate and use technology more successfully when administrators act as technology leaders, according to MacNeil and Delafield (2018). Many

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university administrators, on the other hand, are inexperienced with technology and lack the knowledge and skills needed to be successful technology leaders (Ertmeret al., 2022; Flores, 2019b; Salendab, 2023).

University administrators must stay up with the latest technologies in order to assist instructors in integrating technology (Salendab & Dapitan, 2020; Sanchez, 2023b). Administrators find it difficult to assist instructors in understanding the use of technology in the classroom without this expertise. According to Paben (2022), university administrators' visions for their universities must incorporate technology. So, what does an administrator need to know in order to be an effective technology leader? Administrators, according to Schmeltzer (2021), require a diverse range of experiences, including a grasp of how technology may improve instructional practices and a repertory of techniques for assisting teachers in their efforts to employ technology in the classroom. (Yu & Durrington, 2019)

The ISTE Standards for Administrators/ Educational Leaders

The International Society for Technology in Education (ISTE) is an international advocacy group dedicated to transforming teaching and learning via technology and the promotion of ISTE Standards conformance. It is the leading organization in the field of classroom technology. As a result, the ISTE has developed a number of quality standards for how students, teachers, administrators, coaches, and computer educators should use technology in the classroom.

The ISTE Standards for Education Leaders provide a framework for leading digital-age learning and support the execution of the ISTE Standards for Students and ISTE Standards for Educators. These standards focus on the knowledge and attitudes that leaders must possess in order to empower teachers and facilitate student learning. Equity, digital citizenship, visioneering, team and system building, continuous improvement, and professional growth are some of the most relevant, but lasting, issues in education today.

1. Visionary Leadership

Administrators inspire and lead the development and implementation of a common vision for full technology integration to promote excellence and support organizational change.

a. Inspire and facilitate among all stakeholders a shared vision of purposeful change that maximizes the use of digital-age resources to meet and exceed learning goals, support effective instructional practice, and maximize the performance of university leaders.

b. Engage in an ongoing process to develop, implement and communicate technology-infused strategic plans aligned with a shared vision.

c. Advocate on local, state, and national levels for policies, programs and funding to support the implementation of a technology-infused vision and strategic plan.

2. Digital Age Learning Culture

Administrators foster a dynamic, digital-age learning culture that provides all students with a challenging, relevant, and engaging education.

a. Ensure instructional innovation focused on continuous improvement of digital age learning.

b. Model and promote the frequent and effective use of technology for learning.

c. Provide learner-centered environments equipped with technology and learning resources to meet the individual, diverse needs of all learners.

d. Ensure effective practice in the study of technology and its infusion across the curriculum.

e. Promote and participate in local, national, and global learning communities that stimulate innovation, creativity, and digital age collaboration.

3. Excellence in Professional Practice

Administrators foster a culture of professional growth and innovation that allows teachers to use cutting-edge technology and digital resources to improve student learning.

a. Allocate time, resources, and access to ensure ongoing professional growth in technology fluency and integration.

b. Facilitate and participate in learning communities that stimulate, nurture, and support administrators, faculty, and staff in the study and use of technology.

c. Promote and model effective communication and collaboration among stakeholders using digital age tools.

d. Stay abreast of educational research and emerging trends regarding the effective use of technology and encourage evaluation of new technologies for their potential to improve student learning.

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4. Systemic Improvement

Administrators provide leadership and management for the digital era, ensuring that the organization is always improving via the efficient use of information and technological resources.

a. Lead purposeful change to maximize the achievement of learning goals through the appropriate use of technology and media-rich resources.

b. Collaborate to establish metrics, collect and analyze data, interpret results and share findings to improve staff performance and student learning.

c. Recruit and retain highly competent personnel who use technology creatively and proficiently to advance the university and operational goals.

d. Establish and leverage strategic partnerships to support systemic improvement.

e. Establish and maintain a robust infrastructure for technology including integrated, interoperable technology systems to support management, operations, teaching and learning.

5. Digital Citizenship

Administrators serve as role models for social, ethical, and legal concerns and obligations that arise as a result of a growing digital culture.

a. Ensure equitable access to appropriate digital tools and resources to meet the needs of all learners.

b. Promote, model and establish policies for safe, legal and ethical use of digital information and technology.

c. Promote and model responsible social interactions related to the use of technology and information.

d. Model and facilitate the development of a shared cultural understanding and involvement in global issues through the use of contemporary communication and collaboration tools. (International Society for Technology in Education, n.d.)

Industrial Revolution

In the 1700s, farming and craft economies in Europe and America were converted into manufacturing and urbanized economies. The term used to describe this phenomenon is "Industrial Revolution". The Industrial Revolution was underpinned by the Revolution in Agriculture. From the mid-18th century to the mid-19th century, agricultural development grew considerably. The dramatic increase in food production enabled growth and maintained a huge population and boosted trade. Increased use of machinery for human or animal power in agriculture often meant that fewer farm workers were required and could abandon the field to industrial cities. Better metals and richer fuel have led to industrialization by developing a steam engine, an integral industrialization machine that propelled mills, locomotives, and ships. Modern steam engines used coal and iron, both in building and as power, to increase the need for these materials. Roads, canals, and roadways have radically altered Britain, connecting Britain and enabling goods to be sent over long distances. Visually, the revolution was visible in the emerging industrial areas, with burning factories dominating the skyline.

The Industrial Revolution saw the mechanization of the textile industry, which had historically been produced at home. Output improved on a wide scale due to new innovations, such as the spinning mule and the power loom. With Henry Bessemer, the iron industry created an inexpensive method for the mass production of steel. Iron and steel became essential materials for machine tools, steam engines, and ships required for technological development. (The Industrial Revolution, n.d.)

Industrial job opportunities have attracted people from the countryside to the suburbs. Britain was the cradle of the Industrial Revolution, and for a long time, it was the only mature industrial economy. Historians have argued that this is because, as an island, Britain has had relative prosperity and security compared to mainland Europe. Instead of investing in a huge defense force, money could be invested in other projects, and there was trust among investors. Native resources were also plentiful and readily accessible for early scientific advances and discoveries. Germany, France, Switzerland, Belgium, and the United States quickly emulated the industrial transition of Britain; and by 1900 Britain would no longer be at the forefront, with the United States as the world's largest industrial country in the 20th century. (The Industrial Revolution, n.d.)

The world has had three different technological revolutions that have taken place in the course of history. The First Industrial Revolution, which took place in the 1800s, was followed by other Industrial Revolutions. The Second Industrial Revolution started in the 19th century with the invention of electricity and assembly line manufacturing. It was characterized by industrial manufacturing and emerging industries such as steel, oil, and electricity. The Third Industrial Revolution, also known as the Digital Revolution, began in the seventies in the twentieth century with partial automation using memory-programmable controllers and computers. In only a few decades, we have seen the invention of a semiconductor, a personal computer, and the Internet. And now the

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Fourth Industrial Revolution, which is characterized by the introduction of information and communication technology to industry and is also known as the "Industrial Revolution 4.0" (The Industrial Revolution, n.d.)

Industrial Revolution 4.0

The term "Fourth Industrial Revolution" was introduced by the organizer of the World Economic Forum, retired professor Klaus Schwab. Schwab wrote a book with that title to characterize an age characterized by the following:

"Technological revolution… that is blurring the lines between the physical, digital, and biological spheres."

Technologies such as artificial intelligence, autonomous cars, or the Internet of Things are being reflected in our everyday lives, and also in our bodies. Usually, Industrial Revolution 4.0 (IR 4.0) is that technology is gradually integrating with humans' lives, and that technological transition is occurring quicker than ever before. (Santosh, 2019)

Organizations are adopting modern technology to make their industries more effective, comparable to the steam engine they adopted during the First Industrial Revolution. Yet several businesses and policymakers are unable to keep up with the accelerated speed of technological transition. Data shows that innovators, consumers, and customers profit most from creativity. The danger is that the Fourth Industrial Revolution would generate injustice, which is still a major problem, even greater. Experts caution that we are in the "winner-take-all" economy, where highly qualified employees are compensated with high wages, while the majority of the workers are left out. Studies confirm that innovations such as AI would remove some jobs and generate a market for new expertise that many employees do not have. Privacy concerns are another matter since the Fourth Industrial Revolution turns every company into a software company. The food, retail, and banking sectors are going global, and they are gathering a lot of data from their customers along the way. Users are beginning to fear that businesses know so much about their digital private lives. The World Economic Forum maintains that the majority of leaders do not expect their organizations to be equipped for the changes associated with the Fourth Industrial Revolution. (Schwab, 2016)

However, corporate leaders are not the only ones who need to know how to adapt the Industrial Revolution 4.0 to the modern era. Educators, colleges, government leaders, and parents must reinvent university and train the next generation to take advantage of the abundance of possibilities and resolve the complexities of ever-increasing technological change. (Impacts of the Fourth Industrial Revolution, n.d.)

Educational Implications of IR 4.0

Education in the Industrial Revolution 4.0 (IR 4.0) is a dynamic, dialectical and exciting opportunity that could ultimately change society for the better. IR 4.0 has various consequences for many other aspects of life. As such, it holds both benefits and obstacles to education. Via the use of various elements of IR 4.0, such as IoT, 3D printing, quantum computing, and AI, the education field could be fully transformed to deliver solutions to new challenges. (Kayembe & Nel, 2019)

Curricula

Most emerging or underdeveloped countries, particularly at the upper end, lack innovative talent. To fully embrace the potential of a new wave of industrialization, a country's educational system should focus not only on teaching knowledge-based skilled people, but also on nurturing inventive talent. These students must be trained in an interdisciplinary environment where they should understand humanities and social science and vice versa. (Bo & Marwala, n.d.)

Butler-Adam (2018) points out that students studying fundamental and applied sciences need to understand the political and social essence of the society in which they work and in exchange, students studying humanities and social sciences need to understand at least the foundations on which AI is centered and how it works. In light of the above, IR 4.0 advocates the concept of a multidisciplinary area in which humanities and social sciences integrate technology to solve problems. IR 4.0 and the advancement of biotechnology and AI profoundly question human beliefs and their interaction with the natural environment. IR 4.0 Liberal arts systems can be built to prepare for the social dislocation in IR 4.0. In general, the IR 4.0 curriculum should respond to political and social pressures arising from the rapid speed of technological development. (Penprase, 2018)

Teaching and Learning

Online instruction and expanded use of AI need new instructions to establish a theoretical foundation for digital pedagogy (Penprase, 2018). Digital literacy is a fundamental requirement for students to learn adaptive skills

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to engage in a global digital world, benefit from the digital economy, and build new possibilities for jobs, creativity, creative expression, and social inclusion. (Brown-Martin, 2017).

Education institutions must also move immediately to exploit wearables' enormous potential to transform how we educate and train students, as well as how they learn. Consider numerical simulation, which is a powerful tool for engineers to analyze and forecast the state of real-world physical systems. A user's sense and engagement with the actual environment can be increased with the advent of some wearable technology, such as augmented reality (AR), resulting in the creation of a virtual laboratory. AR may enhance reality by superimposing computer-generated information over the actual surroundings in real-time, making it easier to explore and interpret findings. (Marwala et al., 2017)

MOOCs, or massive open online courses, are also popular in this period. MOOCs are a type of online education that offers stand-alone teaching (Bo, 2019). This technology is easing the educational limitations that formerly required students to assemble in a lecture hall to hear the lecturer or sit around a table to discuss with their peers. However, this will result in a significant shift in education. MOOCs pose various threats to different colleges, despite the fact that there is still a lot of testing to be done. Physical proximity requirements and productivity limitations are two major variables that influence a university's expenditures. Enrolling additional students is costly due to the requirement for physical proximity, especially with the increased number of facilities and teachers. The greatest number of students that may be crammed into lecture halls and exam-marking rosters is restricted due to productivity constraints. MOOCs can overcome these challenges by operating on an entirely new paradigm: an off-campus and online one; and once an online course is established, educating additional students becomes a benefit. (Bo & Marwala, n.d.)

Furthermore, many courses isolate topics, preventing a thorough grasp of the connections between each piece of information and the overall picture. As a result of this learning process, students are only able to recognize portions of the system, but their understanding of how it works as a whole is paralyzed. In this sense, a lecturer's primary goal is to allow students to gain conceptual understanding (i.e., essential relationship between knowledge fragments and their functions in the whole knowledge system). In order to solve this problem, a generalized blended learning (i.e., a methodology that combines e-learning with face-to-face learning) is being used nowadays which may contribute to the problem. Virtual environments are well-known for their educational usefulness in the transmission of information and interactive engagement, whether in real time (e.g., video conferences) or with non-simultaneous participants (e.g., forums and chats). Face-to-face education and evaluation can be employed in this process to improve analytical expressions and problem-solving abilities. Lecturers may now obtain tangible feedback on how well their information is being transmitted to pupils. Then, using online graphic representations and multiple choice exam questions, students' comprehension of some key conceptual difficulties is further tested and reinforced, giving them the advantage of immediately evaluating their findings.

Human Resources

Effective implementation of IR 4.0 in the field of education would require suitable skills. Skills are needed to introduce, handle and collaborate with emerging innovations and with one another (Butler-Adam, 2018). The requisite collection of skills is very necessary in order to achieve the goal of achieving the best outcomes from emerging technologies.

The key skills listed by the World Economic Forum to be in demand in 2020 are dynamic problem-solving, analytical thinking, cognitive maturity, mathematical analysis, and active learning. In addition, Cooper (n.d.) adds, beyond abilities, the need to bring about a change of mind, to promote a 'development of mind' over a 'work of mind', and to improve the individual's agility to learn. Gray (2016) argues that in the immediate term, nearly 35% of the qualities that are considered essential in today's workforce will shift. New sets of skills would then be required for the new revolution and the use of new technologies. For example, those employed in distribution and manufacturing would require technical literacy skills (Gray, 2016). When emerging technologies produce new jobs (e.g. social media experts), work shifts (e.g. toll booth operators) may also occur. (Nordin and Norman, 2018).

The discussion about the effect of technology on jobs is one that stretches back hundreds of years. In 1776, Adam Smith published 'The Prosperity of Nations' explaining the division of labor-a separation of various duties for different individuals in order to increase productivity (1776). Jobs became 'automated' during the (first) Industrial Revolution (1760-1820). Productivity improved with the advent of a steam engine and the assigning of specialized roles to workers. In the Second Industrial Revolution (1870-1914), the railroad, telegraph and machine tools were invented. In 1930, John Maynard Keynes noted,

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"The increase of technical efficiency has been taking place faster than we can deal with the problem of labor absorption" (Keynes, 1933).

Keynes predicted "widespread technological unemployment due to our discovery of means of economizing the use of labor outrunning the pace at which we can find new uses for labor".

Hooker and Kim (2019) suggest that recent technological developments, such as the AI revolution, could lead to a more drastic outcome; they could displace jobs on a scale not seen before. This might contribute to the lack of job prospects for a significant fraction of the population. However, several journalists, scholars, universities, and policymakers disagree on the above-mentioned issue. Some people, on the one hand, claim that the modern movement would lead to increased job growth. Conversely, the point is that existing or future employment would be destroyed due to the widespread use of technology.

These consequences also extend to educational institutions where instructional leaders, faculty members, and university and co-university employees are affected.

Ethical and Moral Decisions

The IR 4.0 has a potential effect on legal and ethical choices that must be taken into account. Technology affects people's lives in a variety of ways. Through the widespread use of digital technologies in industry, government, and other areas of existence, a variety of dynamic changes are taking place. Ethics plays an important role in the field of education. As more and more educational products become available and accessible, ethical boundaries should be emphasized in order to ensure that ethical principles are cultivated in education. (Nordin & Norman, 2018).

Preparedness for Industrial Revolution 4.0

Preparedness for Industrial Revolution 4.0 (IR 4.0) is a test of how able instructional leaders can successfully plan and incorporate adaptive measures in their organizations. The cumulative importance of IR 4.0 mindset, knowledge and work skills serve as an indicator of preparedness. This index of preparedness has also been applied in so many other studies. To partly assess the level of preparedness for change, Hilfe (2019) determined the composite level of mindset, knowledge, and work skills for management change. Montano (2020) also referred to the index of preparedness composed of mindset, knowledge and work skills to partly measure the level of preparedness for globalization. Odronia (2020) incorporated mindset, knowledge. and skills to describe information and communication technology preparedness. The index of preparedness used in this study has the same facets of mindset, knowledge, and work skills.

Mindset for Industrial Revolution 4.0

The development of an adaptive strategy that will ensure the survival and growth of the institution amidst the risks of climate change starts in the administrators' minds. This is the mental creation that kicks off the process of achieving a goal (Covey, 2019). To enhance the mental creation of an adaptive strategy, instructional leaders must have the proper mindset for IR 4.0.

Mindset includes the attitude, view, perception, and belief of an individual (Newstrom & Davis, 2020). People's mindset in an organization is a consideration that has a direct effect on management style, management practices and the content of organizational policies (Soriano, 2020). The manner in which instructional leaders respond to the demands of IR 4.0 can also be mirrored in their mindset. Those with a low level of mindset for IR 4.0 see its risks and opportunities as less important and do not merit consideration. Many with the right level of mindset agree that IR 4.0 has significant consequences for higher education institutions and more needs to be done.

The notion that IR 4.0 will carry different risks to different societies can no longer be doubted. The fact that IR 4.0 would have an influence on higher education institutions is also well established. Events of the past have shown the same impacts on educational institutions as technical innovation and the energy crisis. Despite data pointing to the realities of the threats to IR 4.0 and its consequences for educational institutions, some instructional leaders might still be doubtful. Skepsis or just not getting the right level of mindset was part of the multinational IR 4.0 initiative. Instructional leaders who do not have the right level of mindset for IR 4.0 may risk their organization because they are not ready for it.

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The correlation between mindset and preparedness was developed by the Deloitte Report (2020). The study was participated by 2,029 global executives and public sector leaders, only 10% said their companies had robust IR 4.0 plans. Conversely, two-thirds of the participants said that their organizations either do not have structured IR 4.0 plans or take ad hoc deployment approaches. This strategy approach indicates that certain leaders do not yet understand the consequences or future gains of IR 4.0. Almost a third of executives said that incorporating IR 4.0 technology into their operations was "not that important;" only 4 percent said it was "very important." The results of their report reveal that global executives and leaders are skeptical and have a low degree of thought about IR 4.0. Furthermore, their research reveals that businesses with systematic plans to take advantage of IR 4.0 innovations are producing progress in several fields of industry, from product creation to employee preparation to social effect. This is parallel to the related research carried out in the previous year which showed that people who said they were pursuing a structured strategy-setting methodology were doing well in a variety of IR 4.0 fields. From the study of Deloitte (2020), it can be inferred that leaders who believe that IR 4.0 poses a risk and opportunity to their company have acted readily. Indeed, mindset is an indicator of preparedness.

Knowledge for Industrial Revolution 4.0

The threats to IR 4.0 are a challenge to the success of an organization. A plan to ensure that the organization continues to work or even expand in the midst of the risks of IR 4.0 would begin with limited inputs. This feedback is based on the expertise of instructional leaders on how to adapt the university to the various threats of IR 4.0. IR 4.0 clearly places certain facets of an organization at risk. However, some of these threats had already surfaced independently on different occasions and had been mitigated by different means. Instructional leaders who know these basic means are best suited for a climate change policy (Regala, 2019a; Regala, 2019b).

The instructional leaders' knowledge of these simple ways of adapting to IR 4.0 risks is a good indicator of their preparedness the way Fadri (2019) considers knowledge of administrators as an indicator of preparedness for climate change and Soriano (2020) considers knowledge of managers of an enterprise as an indicator of preparedness to lead it.

Work Skills for Industrial Revolution 4.0

Work skills illustrate the preparedness of instructional leaders to follow an IR 4.0 approach. The identification of particular threats to the university, the planning of the appropriate response for each challenge, and the execution and evaluation of the success of the approach would involve a certain range of work skills to be done. These basic skills are technical, human, and conceptual (Katz, 1991). Possessing these skills in light of IR 4.0 is an indicator that instructional leaders are ready for an adaptive strategy.

Conceptual skills include the capacity to view the institution as a whole. It requires awareness of how the various sectors of the enterprise are interrelated and how improvements in one sector impact all other sectors (Fadri, 2019). Instructional leaders with strong conceptual skills will predict the role their college or department would play in transitioning to IR 4.0. They are able to work out the plans to carry out their roles. Conceptually skilled instructional leaders are also excellent at forecasting effects from past records, such as projecting the amount of possible class conceptual skills, and can anticipate the position that their college or department would play in suspensions based on weather conditions and quantifying wins or losses against investment in IR 4.0. They can track and measure changes in university ecology, university enrolment, the employability of graduates, the relevance of the curriculum, the reputation of the university, and the financial capability of IR 4.0.

Technical skills include awareness and competence of a specific form of activity, especially one involving methods, systems, procedures, and techniques (Fadri, 2019). Human skills or the ability to collaborate with others are important for the production and application of IR 4.0 adaptation steps. Instructional leaders with strong human skills will inspire people to do their best to minimize IR 4.0 threats to their organizations. They can collaborate well with others and resolve disputes. These instructional leaders will work for the integration of a portion of energy efficiency and conservation resources to pay university personnel.

Work skills outline the capacity of instructional leaders to prepare, execute and track the IR 4.0 approach. Work skills, along with mindset and knowledge, reflect the preparedness of instructional leaders for IR 4.0.

Theoretical Framework

One of the educational consequences of the Industrial Revolution 4.0 is a mismatch between student skills and industry needs, which might lead to unemployment. In this light, Paul Romer's New Growth Theory (NGT) for Technological Change was used to drive this research. New Growth Theory, according to Cortright (2021), is a way of

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looking at the economy that combines two key elements. First, it considers technological advancement to be a byproduct of economic activity. Previously, technology was assumed to be a given or a result of non-market causes. Because it incorporates technology into a model of how markets work, New Growth Theory is frequently referred to as "endogenous" growth theory. Second, according to New Growth Theory, knowledge and technology, unlike physical items, are defined by rising returns, which drive the growth process.

Transitioning from one industrial revolution to the next has historically necessitated the development of new skills, notably for the economy. In NGT, a growing supply of skilled labor has prompted profit-maximizing capital goods manufacturers to look for new technologies that complement skilled labor more aggressively. The relative demand for skilled labor increased as the use of complementary capital products for skilled labor became more prevalent, resulting in a rise in the skill premium. As a result, skill-biased technical change may be one explanation for the paradox that skill supply and skill premiums rose in full agreement. Economic historians have lately begun to use quantitative data to estimate the technological change bias, in addition to presenting historical narratives of technical developments throughout the Industrial Revolution. Recent empirical studies have attempted to account for the quantitative impacts of industrialization on the demand for skilled and unskilled labor by using a variety of indicators for skewed technical change and a variety of data sources. (Brugger & Gehrke, 2018)

This, according to the study, may be remedied by reforming the educational system. University administrators, in particular, must be ready to cope with new developments and problems in the educational institution. Studies on preparedness provide insight into how people and organizations react to the emergence of new problems and developments. Some of the studies on preparedness include preparedness for information technology (Odronia, 2020), preparedness for lifelong learning (Tabaranza, 2019), preparedness for globalization (Montano, 2020), preparedness for change management (Hife, 2019), and preparedness for the effects of climate change (Hife, 2019). (Fadri, 2019). One of the notions that came out of these studies is that some variables can predict preparedness.

Conceptual Framework

The research framework is based on the studies and literature cited earlier. The subsequent paradigm has been conceptualized to help visualize the focus of the research.

The conceptual framework is seen in Figure 1.

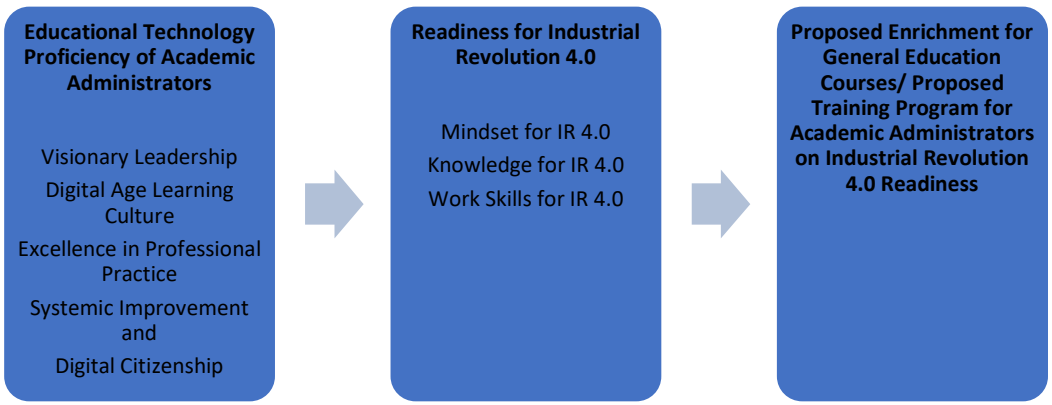

Figure 1
Conceptual Framework Showing University Administrators' Qualities for Educational Technology, Indicators of Preparedness IR 4.0, and the Output of the Study

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The ISTE Standards for Education Leaders will be used to assess university administrators' proficiency in educational technology. The knowledge and attitudes that leaders must have in order to empower teachers and support student learning are the emphases of these standards. The standards include the following criteria: Visionary Leadership, Digital Age Learning Culture, Excellence in Professional Practice, Systemic Improvement, and Digital Citizenship. In this study, these will be evaluated to be possible predictor variables for Industrial Revolution 4.0 preparedness.

The preparedness for Industrial Revolution 4.0 will be based on the respondents' combined perceived mindset, knowledge, and work skills for Industrial Revolution 4.0, as guided by the aforementioned studies and literature.

The results of the study will be used as a basis for a proposed upskilling for university administrators on industrial revolution 4.0 preparedness.

Objective:

The aim of this study is to determine the educational technology predictors of university administrators' preparedness at Guangdong Vocational and Technical University of Business and Technology for the Industrial Revolution 4.0.

Specifically, the study sought to answer the following questions:

1. What are the demographics of the university administrators in terms of the ff:
   1.1. Highest University Qualification
   1.2. Number of Years as University Administrators
2. To what extent are the university administrators proficient in terms of the following Technology Standards (ISTE) for University Administrators' qualities:
   2.1. Visionary Leadership
   2.2. Digital Age Learning Culture
   2.3. Excellence in Professional Practice
   2.4. Systemic Improvement and
   2.5. Digital Citizenship?
3. Is there a significant difference in the extent of proficiency of university administrators in educational technology for the Fourth Industrial Revolution when their profile is taken as a test factor?
4. To what extent are the university administrators prepared for Industrial Revolution 4.0 in Education in terms of the following:
   4.1. mind-set for Industrial Revolution 4.0
   4.2. knowledge of Industrial Revolution 4.0 and
   4.3. work skills for Industrial Revolution 4.0?
5. Is there a significant difference in the extent of the university administrators' preparedness for Industrial Revolution 4.0 in Education when their profile is taken as a test factor?
6. Is there a significant relationship between the university administrators' proficiency in terms of the Technology Standards and their extent of preparedness for Industrial Revolution 4.0 in Education?
7. Based on the results of the study what management development upskilling will be proposed?

Hypothesis

The following hypotheses were tested in this study:

1. Ho1: There is no significant difference in the extent of proficiency of the university administrators in educational technology for the Fourth Industrial Revolution when their profile is taken as a test factor.
2. Ho2: There is no significant difference in the extent of the university administrators' preparedness for Industrial Revolution 4.0 in Education when their profile is taken as a test factor.
3. Ho3: There is no significant relationship between the university administrators' proficiency in terms of the Technology Standards and their extent of preparedness for Industrial Revolution 4.0 in Education.

Significance of the Study

The key focus of this study is to define the educational technology predictors of the preparedness of university administrators at Guangdong Vocational and Technical University of Business and Technology for Industrial Revolution 4.0.

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In particular, this study is expected to be of the highest interest to university administrators, teachers, students, and prospective researchers.

For university administrators at Guangdong Vocational and Technical University of Business and Technology, this study can become a meaningful focal point for the implementation of realistic institutional adaptation strategies, as the study illustrates the potential issues and threats that may result from IR 4.0.

For the teachers, this study will lead to improvements in teaching methods to enhance student success and abilities to help adapt to IR 4.0. A boost in their effectiveness, leading to self-improvement as part of their professional engagement, can also be accomplished. In addition, the rewards derived by the students will also establish a supportive mindset for teachers whose primary priority is to provide students with knowledge effectively.

For the students, improved curricula and teaching approaches are a possible opportunity for developing their competence and achievement in order to fulfill the demands of IR 4.0.

And for the prospective researchers, the results of the study will be a springboard for discovering alternative opportunities to contribute to the field of learning and education.

Scope and Delimitations of the Study

The study's main goal determined the educational technology predictors of university administrators' preparedness for the Industrial Revolution 4.0. The respondents of the study will be delimited only to the dean and chairpersons of Guangdong Vocational and Technical University of Business and Technology during the 1st Semester of the School Year 2022-2023.

Definition of Terms

In order to better understand the content of this study, the following terms are defined operationally:

University Administrators. It consists of the deans and chairpersons of Guangdong Vocational and Technical University of Business and Technology.

Educational Technology Proficiency of University Administrators. This pertains to the ability of university administrators at Guangdong Vocational and Technical University of Business and Technology to use technology to educate and assist, as well as to increase learning, productivity, and performance. It is measured through the ISTE standards for administrators/educational leaders in this study.

Visionary Leadership. This refers to the ability of university administrators at Guangdong Vocational and Technical University of Business and Technology to inspire and lead the development and implementation of a shared vision for comprehensive integration of technology to promote excellence and support transformation throughout the organization.

Digital Age Learning Culture. This refers to the ability of administrators at Guangdong Vocational and Technical University of Business and Technology to create, promote and sustain a dynamic, digital-age learning culture that provides a rigorous, relevant and engaging education for all students.

Excellence in Professional Practice. This refers to the ability of university administrators to promote an environment of professional learning and innovation that empowers educators to enhance student learning through the infusion of contemporary technologies and digital resources.

Systemic Improvement. This refers to the ability of university administrators at Guangdong Vocational and Technical University of Business and Technology to provide digital-age leadership and management to continuously improve the organization through the effective use of information and technology resources.

Digital Citizenship. This refers to the ability of university administrators at Guangdong Vocational and Technical University of Business and Technology to model and facilitate an understanding of social, ethical, and legal issues and responsibilities related to an evolving digital culture.

Preparedness for Industrial Revolution 4.0. This is the perceived level of preparedness of university administrators at Guangdong Vocational and Technical University of Business and Technology for Industrial Revolution 4.0. It is measured through the Industrial Revolution 4.0 preparedness index based on the responses on mindset, knowledge, and work skills for Industrial Revolution 4.0. It is the composite score of mindset, knowledge, and work skill for Industrial Revolution 4.0.

Mindset for Industrial Revolution 4.0. This pertains to how well university administrators at Guangdong Vocational and Technical University of Business and Technology understand Industrial Revolution 4.0 risks and opportunities for their institutions. It will be reflected in the research instrument.

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Knowledge of Industrial Revolution 4.0. This refers to how well university administrators at Guangdong Vocational and Technical University of Business and Technology know Industrial Revolution 4.0 and the technologies related to it. It will be reflected in the research instrument.

Work Skills for Industrial Revolution 4.0. This refers to the capability of university administrators at Guangdong Vocational and Technical University of Business and Technology to conceptualize and implement the Industrial Revolution 4.0 adaptation strategy. It will be reflected in the research instrument.

METHODS

Research Design

The study utilized a descriptive method of analysis using the survey technique. During the investigation, the population characteristics are identified and examined. It strived to establish correlations between independent and dependent variables pertaining to respondents. This study attempted to determine how variables interact with one another. The study made use of the descriptive-comparative-correlational research design.

Research Locale

This study was conducted at Guangdong Vocational and Technical University of Business and Technology in China. There are about 19,300 students enrolled in the university and about 1,072 teachers.

Guangdong Vocational and Technical University of Business and Technology is located in Zhaoqing City, Guangdong Province. It is a full-time private undergraduate college approved by the Ministry of Education and a demonstration school of innovation and entrepreneurship education for college students in Guangdong Province.

The school's predecessor is Zhaoqing Oriental Talent School founded in 1996, Zhaoqing Industrial and Commercial Vocational School founded in 1997, Zhaoqing Industrial and Commercial Vocational College founded in 1999 and upgraded to Zhaoqing Industrial and Commercial Vocational and Technical College in 2019. In 2014, it was renamed Guangdong Vocational College of Industry and Commerce. In 2019, it was upgraded to Guangdong Polytechnic University of Industry and Commerce with the approval of the Ministry of Education.

By June 2022, the university has two campuses, Xinghu and Dawang, covering an area of 1,742 mu with a building area of 580,000 square meters. The total value of teaching and research equipment is 186 million yuan. There are 19300 full-time students and 1072 full-time teachers. It has 14 teaching units, offering 22 undergraduate majors and 53 junior majors.

Respondents of the Study

The study involved all university administrators of Guangdong Vocational and Technical University of Business and Technology during the 1st Semester of the school Year 2022-2023. The respondents of the study were composed of deans and department heads who will be chosen using the total enumeration.

Sampling Technique

The study employed complete enumeration sampling method. Complete enumeration sampling, also known as total population sampling, is a kind of purposive sampling in which the entire population of interest is examined. Complete enumeration sampling was used in practice when the target group is small and distinguished by an uncommon and well-defined feature. It frequently provides more in-depth insights into a target group than partial sampling could. It has the ability to provide a researcher with a far more complete picture while also substantially reducing uncertainty. It also removes the possibility of biased sample selection, which is common in would-be random research samples. (Glen, n.d.)

Research Instrument Used

The researcher made use of the instrument from the International Society for Technology in Education (ISTE) Standards for Administrator/ Educational Leaders.

The International Society for Technology in Education (ISTE) standards, released in 2019, served as a blueprint for administrators, teachers and students, indicating and outlining the performance indicators necessary to promote teaching and learning conducive to technology competencies. The ISTE standards were divided into three sub-categories: Administrators, Teachers and Students.

ISTE Standards for Administrators/ Educational Leaders are the standards for evaluating the skills and knowledge university administrators and leaders need to support digital age learning, implement technology and

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transform the education landscape. These standards target the knowledge and behaviors required for leaders to empower teachers and make student learning possible. They're focused on some of the timeliest, yet enduring, topics in education today – equity, digital citizenship, visioneering, team and systems building, continuous improvement and professional growth.

A. Visionary Leadership
   Administrators inspire and lead development and implementation of a shared vision for comprehensive integration of technology to promote excellence and support transformation throughout the organization.
B. Digital Age Learning Culture
   Administrators create, promote and sustain a dynamic, digital age learning culture that provides a rigorous, relevant and engaging education for all students.
C. Excellence in Professional Practice
   Administrators promote an environment of professional learning and innovation that empowers educators to enhance student learning through the infusion of contemporary technologies and digital resources.
D. Systemic Improvement
   Administrators provide digital age leadership and management to continuously improve the organization through the effective use of information and technology resources.
E. Digital Citizenship
   Administrators model and facilitate understanding of social, ethical and legal issues and responsibilities related to an evolving digital culture. (International Society for Technology in Education, n.d.)

In this study, the ISTE standards for administrators/educational leaders were adopted and converted into a Likert-type survey, with 1 (strongly disagree) being the lowest score and 4 (strongly agree) being the highest score. This determined the educational technology proficiency of the university administrators.

Industrial Revolution 4.0 Preparedness Index

Industrial Revolution 4.0 Preparedness Index (IR 4.0 Preparedness Index) is a researcher-made questionnaire checklist. It will be designed and constructed on the research problem in order to evaluate the preparedness of the respondents to IR 4.0 in terms of mindset, knowledge, and work skills. The content of the questionnaire was based from related literatures and was improved and refined through the help of the experts.

Validity of IR 4.0 Preparedness Index

The IR 4.0 Preparedness Index, to be developed by the researcher, was validated to guarantee that it produces accurate findings. According to Lynn (2020), the extent to which an instrument measures what it was meant to quantify is defined as validity. In this study, the Validation Rubric for Expert Panel (VREP), developed by Simon and White (2013), was adopted to assess the face, construct, and content validity of the researcher-made questionnaire. The instrument on a scale of 1 to 4, with 1 indicating that it is not acceptable and 4 indicating that it exceeds expectations.

Data Gathering Procedure

A formal written requests was submitted to the President of Guangdong Vocational and Technical University of Business and Technology seeking permission to conduct the study in the university. Upon approval of the requests, the testing instruments with attached letters of inquiry would be circulated online to the respondents using social media WeChat. The respondents' consent will be sought, and they will be informed of the purpose of the survey. During the conduct of the survey, the respondents was given adequate time for them to read and answer the questionnaires. Data on an appropriate number of samples was gathered, coded, compiled, tabulated, statistically treated and analyzed.

Statistical Analysis of the Data

The respondents' qualities for educational technology would be evaluated using descriptive statistics such as weighted average and standard deviations. The respondents' preparedness for the IR 4.0 would be assessed using the same statistical tool. Frequency Count, Percentage, Weighted Mean, Standard Deviation, t-test, F-test and

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Pearson's Correlation was used to analyze the data to be collected. Results will be evaluated at 0.05 level of significance. All data were analyzed using IBM SPSS Statistics Version 25 software.

The following values of the computed mean were interpreted as follows:

Point	Range of Values	Qualitative Description	Interpretation
1	1.00 – 1.50	Not True of Me	Not Proficient/ Prepared
2	1.51 – 2.50	Somewhat True of Me	Somehow Proficient/ Prepared
3	2.51 – 3.50	True of Me	Proficient/ Prepared
4	3.51 – 4.00	Very True of Me	Very Proficient/ Prepared

Ethical Consideration

To guarantee that basic ethical norms of scientific conduct during university research are followed, the study will be supported by the following ethical considerations:

Conflict of Interest. The study had no conflicts of interest because it was solely look at educational technology predictors of university administrators' preparedness at Guangdong Vocational and Technical University of Business and Technology for Industrial Revolution 4.0. Privacy and Confidentiality. Each respondent's identity was protected by the researcher, who collected data in a secure manner. For the respondents and other persons engaged in the study, the Data Privacy Act was strictly followed.

Informed Consent Process. The respondents were given a consent form as part of the questionnaire in order to obtain their permission to participate in the study. The consent document included research details as well as terms and conditions for completing the survey questionnaire. The researcher ensured that the participants are at ease and willing to participate in the study. This ensures that the participants were not coerced into participating in the study and that their privacy and confidentiality were protected.

Vulnerability. To prevent prejudice and conflicts of interest, the research excluded vulnerable persons.

Benefits. Students, teachers, university administrators, researchers, and other stakeholders benefited from the research.

Community Consideration. The study aimed to avoid communal conflict. The researcher ensured that the study does not hurt or affect the community's interests.

Duration. The researcher were politely requested that respondents take some time to complete the survey. The respondents were also be given enough time to complete the survey satisfactorily.

Possible Risks, Discomforts, and Inconvenience. The researcher guaranteed that the study would not cause any injury, discomfort, or inconvenience to the respondents.

Rights of the Respondents. Respondents were given the following rights as part of the study: (1) right to withdraw from the study, (2) right to just benefit or compensation, (3) right to reject ongoing use of personal information, samples, or personal contribution, and (4) right to view the study's results.

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RESULTS and DISCUSSION

Profile of the Administrator Respondents

Table 3.1 shows the demographic profile of the administrator respondents in terms of their age, sex, and section.

Table 3.1
Frequency Distribution of the Student Respondents' Profile

Profile	Frequency	Percentage
Qualifications		
With Master's Unit	119	29.8%
Master's Degree Holder	85	21.3%
With Doctorate Unit	98	24.5%
Doctorate Degree Holder	98	24.5%
Total	**400**	**100%**
Number of Years as Administrators		
Below 1 year	133	33.3%
1 year to 5 years	134	33.5%
6 to 10 years	133	33.3%
Total	**400**	**100%**

In terms of qualifications, one-hundred and nineteen (119) or about 29.8% of the administrator respondents have units in their master's degree, eighty-five (85) or about 21.3% of the administrator respondents are master's degree holders, ninety-eight (98) or about 24.5% of the administrator respondents have units in their doctorate degrees, and ninety-eight (98) or about 24.5% of the administrator respondents are doctorate degree holders. This means that majority of the administrator respondents have units in their master's degree. This may be taken to mean that the administrators have undertaken means to grow professionally and to be a better fit to the position that they are holding.

In terms of number of years as administrator, one-hundred and thirty-three (133) or about 33.3% of the administrator respondents have been an administrator for less than 1 year, one-hundred and thirty-four (134) or about 33.5% of the administrator respondents have been an administrator for 1 to 5 years, and one-hundred and thirty-three (133) or about 33.3% of the administrator respondents have been an administrator for 6 to 10 years. This means that majority of the administrator respondents have been an administrator for 1 to 5 years. This may be taken to mean that the administrators are seasoned and have accumulated a considerable amount of experience being an administrator.

Assessment of Administrator Respondents on the Preparedness for Industrial Revolution 4.0

Table 3.2 shows the assessment of the administrator respondents on their preparedness for industrial revolution 4.0.

Table 3.2
Assessment of Administrator Respondents on the Preparedness for Industrial Revolution 4.0

	Mean	Qualitative Description	Interpretation
1. I know what the Fourth Industrial Revolution is	2.30	Somewhat True of Me	Somehow Prepared
2. I know why I need to pay attention to	2.20	Somewhat True of	Somehow Prepared

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Industry 4.0		Me	
3. I know which industries are most affected	2.29	Somewhat True of Me	Somehow Prepared
4. I know what the workforce trends are	2.24	Somewhat True of Me	Somehow Prepared
5. I know what is meant by the gig economy	2.30	Somewhat True of Me	Somehow Prepared
6. I know what demographic shifts are in the workforce	2.33	Somewhat True of Me	Somehow Prepared
7. I know the emerging in-demand roles in work	2.32	Somewhat True of Me	Somehow Prepared
8. I know which advanced cognitive skills are required	2.26	Somewhat True of Me	Somehow Prepared
9. I know which social behavioral skills are required	2.23	Somewhat True of Me	Somehow Prepared
10. I know which skills for adaptability are required	2.28	Somewhat True of Me	Somehow Prepared
11. I know the main transformative technologies	2.32	Somewhat True of Me	Somehow Prepared
12. I know about the changing nature of work	2.27	Somewhat True of Me	Somehow Prepared
13. I know what is meant with lifelong learning	2.28	Somewhat True of Me	Somehow Prepared
14. I know what the strategic drivers are for new business models	2.33	Somewhat True of Me	Somehow Prepared
15. I know what is meant with human capital foundations	2.33	Somewhat True of Me	Somehow Prepared
16. I know how to become future ready for Industry 4.0	2.33	Somewhat True of Me	Somehow Prepared
17. I know how 4IR will impact my career	2.32	Somewhat True of Me	Somehow Prepared
18. I know how 4IR will impact my life	2.29	Somewhat True of Me	Somehow Prepared
19. I know how 4IR will impact my health	2.33	Somewhat True of Me	Somehow Prepared
20. I know how 4IR will impact my wellness	2.34	Somewhat True of Me	Somehow Prepared
Composite Mean	**2.29**	**Somewhat True of Me**	**Somehow Prepared**

Legend: 3.51-4.00 Very True of Me/ Very Prepared; 2.51-3.50 True of Me/ Prepared; 1.51-2.50 Somewhat True of Me / Somehow Prepared; 1.00-1.50 Not True of Me / Not Prepared

Taking into consideration the assessment of the administrator respondents on their preparedness for industrial revolution 4.0, the highest mean of 2.34, with the qualitative description of the administrators evaluating that this is somewhat true among them and is interpreted as the administrators showing that they are somehow prepared for industrial revolution 4.0, was found for item 20 which states that administrators know how 4IR will impact their wellness. The fourth industrial revolution (4IR) is characterized by the fusion of the digital, biological, and physical worlds, as well as the growing utilization of new technologies such as artificial intelligence, cloud computing, robotics, 3D printing, and the Internet of Things. A recent survey has suggested that the most valuable skills in the future will be those that machines cannot yet easily replicate, like creativity, critical thinking, emotional intelligence, adaptability, and collaboration. On the other hand, almost every field has benefited from advances in artificial intelligence.

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The Exigency
P - ISSN 2984-7842
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On the other hand, the lowest mean of 2.20, with the qualitative description of the administrators evaluating that this is somewhat true among them and is interpreted as the administrators showing that they are somehow prepared for industrial revolution 4.0, was found for item 2 which states that the administrators know why they need to pay attention to Industry 4.0. The 4IR assumes that high-level skills and knowledge will be required in the 4IR economy, and that schools and teacher education need to reconfigure themselves to ensure that such high knowledge and skills will be developed through education. The fourth industrial revolution has enabled workers to become more remote and has given birth to the Gig Economy. This new breed of the economy is where self-employed people are paid to do short term freelance tasks. These workers form part of the new human cloud which is a sector within the gig economy.

The overall mean of 2.29 shows that the administrators evaluated that they somewhat know industrial revolution 4.0 and shows that the administrators are somehow prepared for industrial revolution 4.0. Because of the Fourth Industrial Revolution, novel and advanced educational institutions are emerging that offer education, research, and service differently, including massive open online courses (MOOC), virtual classrooms, virtual libraries, virtual laboratories, and virtual educators. The Fourth Industrial Revolution (Industry 4.0 or 4IR) has given teachers what might be the greatest responsibility of our time: to evolve teaching strategies so they can unlock individual student potential and prepare students with the skills needed to shape the future through innovation supported by technology.

HEI's are considered one of the most critical elements of global competition due to their ability to influence and change social development, science, technology, and economics (Köse & Korkmaz, 2019). Organizational culture is an effective way to understand how universities perform and are managed and is one of the critical factors to distinguish one university from another (Mwangi & Waithaka, 2018; Köse & Korkmaz, 2019). According to the Department of Higher Education and Training in SA, SA's HEIs are responsible for developing and empowering students with the necessary skills for social and economic development (Wiseman et al., 2016). The success of these institutions is dependent on the performance of both students and academic staff, influenced by the institution's culture (Wiseman et al., 2016).

Assessment of Administrator Respondents on their Proficiency on the Technology Standards for University Administrators

Table 3.3 to 3.8 show the assessment of the administrator respondents on their proficiency on the technology standards for university administrators in terms of leadership and vision, learning and teaching, productivity and professional practice, support, management, and operations, assessment and evaluation, and social, legal, and ethical issues.

Table 3.3
Assessment of Administrator Respondents on their Proficiency on the Technology Standards for University Administrators in terms of Leadership and Vision

Educational leaders:	Mean	Qualitative Description	Interpretation
1. facilitate the shared development by all stakeholders of a vision for technology use and widely communicate that vision.	2.37	Somewhat True of Me	Somehow Proficient
2. maintain an inclusive and cohesive process to develop, implement, and monitor a dynamic, long-range, and systemic technology plan to achieve the vision.	2.31	Somewhat True of Me	Somehow Proficient
3. foster and nurture a culture of responsible risk-taking and advocate policies promoting continuous innovation with technology.	2.29	Somewhat True of Me	Somehow Proficient
4. use data in making leadership decisions.	2.27	Somewhat True of Me	Somehow Proficient
5. advocate for research-based effective practices in use of technology.	2.27	Somewhat True of Me	Somehow Proficient

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6. Advocate on the state and national levels for policies, programs, and funding opportunities that support implementation of the district technology plan.	2.35	Somewhat True of Me	Somehow Proficient
Composite Mean	**2.31**	**Somewhat True of Me**	**Somehow Proficient**

Legend: 3.51-4.00 Very True of Me/ Very Proficient; 2.51-3.50 True of Me/ Proficient; 1.51-2.50 Somewhat True of Me / Somehow Proficient; 1.00-1.50 Not True of Me / Not Proficient

Taking into consideration the assessment of the administrator respondents on their proficiency on the technology standards for university administrators in terms of leadership and vision, the highest mean of 2.37, with the qualitative description of the administrators evaluating that this is somewhat true among them and is interpreted as the administrators showing that they are somehow proficient on the technology standards for university administrators in terms of leadership and vision, was found for item 1 which states that educational leaders facilitate the shared development by all stakeholders of a vision for technology use and widely communicate that vision. A technology vision is a statement that clearly describes what the future state of a company's technology will be and why. It is a guiding light to current and future engineers that brings with it an assurance that the technology leaders of an organizations are governed by something greater than themselves.

On the other hand, the lowest mean of 2.27, with the qualitative description of the administrators evaluating that this is somewhat true among them and is interpreted as the administrators showing that they are somehow proficient on the technology standards for university administrators in terms of leadership and vision, was found for items 4 and 5 which state that educational leaders use data in making leadership decisions and advocate for research-based effective practices in use of technology. Evidence-Informed (or Research-Based) Practices are practices that were developed based on the best research available in the field. This means that users can feel confident that the strategies and activities included in the program or practice have a strong scientific basis for their use.

The overall mean of 2.31 shows that the administrators observed among themselves that being proficient in the technology standards and is interpreted as the administrators showing that they are somehow proficient on the technology standards for university administrators in terms of leadership and vision. Technology integration is highest in buildings in which the administrators are involved and excited about technology and its possibilities and is lowest in buildings in which the administrators don't demonstrate technology use while encouraging others to use it too. Modeling technology usage is key if administrators want teachers to play an active role in technology integration.

Keeping up with the age of technology that we are living in is related to be up to date with the latest developments. Hannafin and Savange (1993) examined reasons for school teachers who resist computers and discussed the changing role of teachers who do use computers. Educational technology focusing on microcomputers; social norms and societal resistance to new instructional methods with effective educational software usage were the issues that dominated that last two decades. Hartley (2007) asserted 5 key effects of new technology on teaching and learning. These were direct instruction, adjunct instruction, facilitating the skills of learning, facilitating social skills and widening learners' horizons. Ertmer et.al (2012) hereby underlined the role of school administrators on teachers having stated that most teachers indicated that internal factors (e.g., passion for technology) and support from administrators played key roles in shaping their practices.

According to Gürsel (2006) a school administrator is a person, who organizes and instructs school staff; and plans, coordinates and inspects works in order to achieve goals at school. Increasing sanctions imposed upon education causes the competition between schools and require them to improve their active learning environments. In addition to these, school administrators are expected to undertake new roles and responsibilities (Hacıfazlıoğlu, Karadeniz & Dalgıç, 2011). The administrators should pave the way for technology to be integrated at every stage of education throughout their institutions by adapting it as part of their working strategy and advocating the use of it by turning into technology champions (Banoğlu, 2011). Studies by Yu and Darrington (2006) support technology integration into schools and believe this process to be starting with the school administrators mind for the first instance.

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Table 3.4
Assessment of Administrator Respondents on their Proficiency on the Technology Standards for University Administrators in terms of Learning and Teaching

Educational leaders:	Mean	Qualitative Description	Interpretation
1. identify, use, evaluate, and promote appropriate technologies to enhance and support instruction and standards-based curriculum leading to high levels of student achievement	2.30	Somewhat True of Me	Somehow Proficient
2. facilitate and support collaborative technology-enriched learning environments conducive to innovation for improved learning	2.37	Somewhat True of Me	Somehow Proficient
3. provide for learner-centered environments that use technology to meet the individual and diverse needs of learners	2.36	Somewhat True of Me	Somehow Proficient
4. facilitate the use of technologies to support and enhance instructional methods that develop higher-level thinking, decision-making, and problem-solving skills	2.33	Somewhat True of Me	Somehow Proficient
5. provide for and ensure that faculty and staff take advantage of high-quality professional learning opportunities for improved learning and teaching with technology	2.36	Somewhat True of Me	Somehow Proficient
Composite Mean	**2.34**	**Somewhat True of Me**	**Somehow Proficient**

Legend: 3.51-4.00 Very True of Me/ Very Proficient; 2.51-3.50 True of Me/ Proficient; 1.51-2.50 Somewhat True of Me / Somehow Proficient; 1.00-1.50 Not True of Me / Not Proficient

Taking into consideration the assessment of the administrator respondents on their proficiency on the technology standards for university administrators in terms of learning and teaching, the highest mean of 2.37, with the qualitative description of the administrators evaluating that this is somewhat true among them and is interpreted as the administrators showing that they are somehow proficient on the technology standards for university administrators in terms of learning and teaching, was found for item 2 which states that educational leaders facilitate and support collaborative technology-enriched learning environments conducive to innovation for improved learning. Technology in education enables children to adjust to their own pace of learning. Students who need extra time can spend more time going over exercises until they understand, whilst students who need less support can continue ahead. It also frees up the teacher to help kids who need more support on an individual level.

On the other hand, the lowest mean of 2.30, with the qualitative description of the administrators evaluating that this is somewhat true among them and is interpreted as the administrators showing that they are somehow proficient on the technology standards for university administrators in terms of learning and teaching, was found for item 1 which states that educational leaders identify, use, evaluate, and promote appropriate technologies to enhance and support instruction and standards-based curriculum leading to high levels of student achievement. A very important technological impact on education is increased interactivity and class engagement. In addition, better overall comprehension, practical learning, time management, and combined learning methodologies are just some of the impacts that technology has had on student learning.

The overall mean of 2.34 shows that the administrators observed among themselves that being proficient in the technology standards and is interpreted as the administrators showing that they are somehow proficient on the technology standards for university administrators in terms of learning and teaching. By integrating technology into existing curricula, as opposed to using it solely as a crisis-management tool, teachers can harness online learning as

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a powerful educational tool. The effective use of digital learning tools in classrooms can increase student engagement, help teachers improve their lesson plans, and facilitate personalized learning. It also helps students build essential 21st-century skills.

Integration of Information, Communication, and Technology (ICT) in education refers to the use of computer- based communication that incorporates into daily classroom instructional process. In conjunction with preparing students for the current digital era, teachers are seen as the key players in using ICT in their daily classrooms. This is due to the capability of ICT in providing dynamic and proactive teaching-learning environment (Arnseth & Hatlevik, 2012). While the aim of ICT integration is to improve and increase the quality, accessibility and cost-efficiency of the delivery of instruction to students, it also refers to benefits from networking the learning communities to face the challenges of current globalization (Albirini, 2006, p.6). The process of adoption of ICT is not a single step, but it is ongoing and continuous steps that fully support teaching and learning and information resources (Young, 2003).

ICT integration in education generally means technology-based teaching and learning process that closely relates to the utilization of learning technologies in schools. Due to the fact that students are familiar with technology and they will learn better within technology-based environment, the issue of ICT integration in schools, specifically in the classroom is vital. This is because the use of technology in education contributes a lot in the pedagogical aspects in which the application of ICT will lead to effective learning with the help and supports from ICT elements and components (Jamieson-Procter et al., 2013). It is right to say that almost all ranges of subjects starts from mathematics, science, languages, arts and humanistic and other major fields can be learned more effectively through technology-based tools and equipment. In addition, ICT provides the help and complementary supports for both teachers and students where it involves effective learning with the help of the computers to serve the purpose of learning aids (Jorge et al., 2003).

Table 3.5
Assessment of Administrator Respondents on their Proficiency on the Technology Standards for University Administrators in terms of Productivity and Professional Practice

Educational leaders:	Mean	Qualitative Description	Interpretation
1. model the routine, intentional, and effective use of technology	2.45	Somewhat True of Me	Somehow Proficient
2. employ technology for communication and collaboration among colleagues, staff, parents, students, and the larger community	2.34	Somewhat True of Me	Somehow Proficient
3. create and participate in learning communities that stimulate, nurture, and support faculty and staff in using technology for improved productivity	2.34	Somewhat True of Me	Somehow Proficient
4. engage in sustained, job-related professional learning using technology resources	2.50	Somewhat True of Me	Somehow Proficient
5. maintain awareness of emerging technologies and their potential uses in education	2.28	Somewhat True of Me	Somehow Proficient
6. use technology to advance organizational improvement	2.28	Somewhat True of Me	Somehow Proficient
Composite Mean	**2.36**	**Somewhat True of Me**	**Somehow Proficient**

Legend: 3.51-4.00 Very True of Me/ Very Proficient; 2.51-3.50 True of Me/ Proficient; 1.51-2.50 Somewhat True of Me / Somehow Proficient; 1.00-1.50 Not True of Me / Not Proficient

Taking into consideration the assessment of the administrator respondents on their proficiency on the technology standards for university administrators in terms of productivity and professional practice, the highest mean of 2.50, with the qualitative description of the administrators evaluating that this is somewhat true among

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them and is interpreted as the administrators showing that they are somehow proficient on the technology standards for university administrators in terms of productivity and professional practice, was found for item 4 which states that educational leaders engage in sustained, job-related professional learning using technology resources. The Fourth Industrial Revolution is rapidly changing labor markets. Workers need continuous learning, upskilling and reskilling to keep up. The Fourth Industrial Revolution (Industry 4.0 or 4IR) has given teachers what might be the greatest responsibility of our time: to evolve teaching strategies so they can unlock individual student potential and prepare students with the skills needed to shape the future through innovation supported by technology.

On the other hand, the lowest mean of 2.28, with the qualitative description of the administrators evaluating that this is somewhat true among them and is interpreted as the administrators showing that they are somehow proficient on the technology standards for university administrators in terms of productivity and professional practice, was found for items 5 and 6 which state that educational leaders maintain awareness of emerging technologies and their potential uses in education and use technology to advance organizational improvement. Apart from promoting academic success, educational technology improves learners mentally and physically. Using technologically advanced tools enhances cognitive and learning skills. As a result, students realize better academic performance and physical health.

The overall mean of 2.36 shows that the administrators observed among themselves that being proficient in the technology standards and is interpreted as the administrators showing that they are somehow proficient on the technology standards for university administrators in terms of productivity and professional practice. There are many problems that educators all around the world face when trying to bring new technology-related teaching methods into classrooms. Despite much knowledge, and despite the research that has been conducted over the decades, the reality is that the majority of teachers are still reluctant or suspicious towards technology-enhanced learning methods. There are several reasons for that, for example, the lack of paid time, infrastructure or lesson designs. But an additional problem—something that is easy to miss—is that valuable resources are wasted during unsuccessful implementation trials: not only the physical or financial resources, but also the time of teachers and children who have been involved in these processes.

No doubt, teachers have increased their personal and professional uses of computers (Project Tomorrow, 2008; van Braak, Tondeur, & Valcke, 2004). In response to the Teachers Talk Tech survey (CDW-G, 2006), 88% of the teachers reported using technology for administrative tasks, whereas 86% reported using technology for communication tasks. Similarly, 93% of the teachers who responded to the Speak Up 2007 survey (n = 23,756/25,544) reported using technology to communicate with colleagues or parents (Project Tomorrow, 2008).

Alongside these increases in teachers' professional uses are increases in the reported instructional uses of computers in the classroom (National Education Association, 2008; Project Tomorrow, 2008). Unfortunately, when we look closer at these data, reported uses still tend to be "low-level" (Mad- dux & Johnson, 2006; Russell, Bebell, O'Dwyer, & O'Connor, 2003)—that is, those that support traditional, teacher-directed instruction (e.g., using PowerPoint to present a lesson, searching the Web for information resources) or that focus on the development of students' technical skills (Tondeur, van Braak, & Valcke, 2007b). Based on the results of the Speak Up 2007 national survey (Project Tomorrow, 2008), 51% of the responding teachers (n = 13,027 / 25,544) reported that their primary uses of technology to "facilitate student learning" comprised (a) asking students to complete homework assignments using the computer (e.g., writing reports, finding information on the Internet) and (b) assigning practice work at the computer (e.g., using drill-and-practice software). These results are verified, to some extent, by the large percentage of students (grades 6–12) taking the same survey who re- ported using technology to (a) write assignments (74%), (b) conduct online research (72%), and (c) check assignments or grades online (58%).

Table 3.6
Assessment of Administrator Respondents on their Proficiency on the Technology Standards for University Administrators in terms of Support, Management, and Operations

Educational leaders:	Mean	Qualitative Description	Interpretation
1. develop, implement, and monitor policies and guidelines to ensure compatibility of ISTE | NETS for Administrators 2002	2.30	Somewhat True of Me	Somehow Proficient
2. implement and use integrated technology-	2.31	Somewhat True of	Somehow Proficient

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based management and operations systems		Me	
3. allocate financial and human resources to ensure complete and sustained implementation of the technology plan	2.27	Somewhat True of Me	Somehow Proficient
4. integrate strategic plans, technology plans, and other improvement plans and policies to align efforts and leverage resources	2.42	Somewhat True of Me	Somehow Proficient
5. implement procedures to drive continuous improvement of technology systems and to support technology replacement cycles	2.30	Somewhat True of Me	Somehow Proficient
Composite Mean	**2.32**	**Somewhat True of Me**	**Somehow Proficient**

Legend: 3.51-4.00 Very True of Me/ Very Proficient; 2.51-3.50 True of Me/ Proficient; 1.51-2.50 Somewhat True of Me / Somehow Proficient; 1.00-1.50 Not True of Me / Not Proficient

Taking into consideration the assessment of the administrator respondents on their proficiency on the technology standards for university administrators in terms of support, management, and operations, the highest mean of 2.42, with the qualitative description of the administrators evaluating that this is somewhat true among them and is interpreted as the administrators showing that they are somehow proficient on the technology standards for university administrators in terms of support, management, and operations, was found for item 4 which states that educational leaders integrate strategic plans, technology plans, and other improvement plans and policies to align efforts and leverage resources. By integrating technology into existing curricula, as opposed to using it solely as a crisis-management tool, teachers can harness online learning as a powerful educational tool. The effective use of digital learning tools in classrooms can increase student engagement, help teachers improve their lesson plans, and facilitate personalized learning. It also helps students build essential 21st-century skills.

On the other hand, the lowest mean of 2.27, with the qualitative description of the administrators evaluating that this is somewhat true among them and is interpreted as the administrators showing that they are somehow proficient on the technology standards for university administrators in terms of support, management, and operations, was found for item 3 which states that educational leaders allocate financial and human resources to ensure complete and sustained implementation of the technology plan. A Strategic Technology Plan is a guide as to how an organization will use technology to help achieve its business strategy. It's a snapshot to let an organization know where they are now and where they want to be in the future in regard to technology and infrastructure. It is a mechanism to help prioritize and budget for the technology tools that are most important for achieving organizational goals.

The overall mean of 2.32 shows that the administrators observed among themselves that being proficient in the technology standards and is interpreted as the administrators showing that they are somehow proficient on the technology standards for university administrators in terms of support, management, and operations. Technology in schools is shifting from simple tools used in days of the data projector, to solutions that integrate with everything, and it is transforming teachers into active participants rather than just facilitators. Leaders and administrators should take stock of where their faculty members are in terms of their understanding of online spaces. From lessons learned during this disruptive time, they can implement solutions now for the future. For example, administrators could give teachers a week or two to think carefully about how to teach courses not previously online. In addition to an exploration of solutions, flexibility during these trying times is of paramount importance.

In the governance and administrative functions, particular attention is paid to efficiency of financial management, formulation of goals and objectives, monitoring outcomes, setting services standards and policies and procedures (Kowalczyk, & Jakubczak, 2014). The role of ICT in facilitating governance and administrative functions is recognized in three important areas. These are, administration is assisted in the performance of public functions by simplifying the work processes and internal function, through internal computerization and automation, thus promoting transparency and accountability. Another area is, ICT facilitates the formulation of measures and policies through multi-stakeholders, participation enabling administration to incorporate the ideas and suggestions obtained from professionals, researchers, academicians, educationists, private sector, civil society organizations, media and community members. Another area is ICT renders public goods and services to the individuals, by making delivery of services much more convenient, customer-oriented and cost-effective (Unit 4, n.d.).

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Through the use of ICT, the structure of the working environmental conditions gets formed in such a manner that individuals are able to feel pleasurable and contented with the performance of their job duties. Through the use of technology and internet, the individuals are able to acquire information and augment their understanding in terms of various concepts and fields. It facilitates organizational learning and adaptation to the changing global environment by way of partnership, participation, information sharing and delegation. These traits require a complete transformation from the functional traits of classic administration. Through ICT, there has been transformations coming about in the administrative processes from traditional administration to modern administration. In other words, there has been implementation of modern and innovative methods in the governance and administrative functions at all levels of education.

Table 3.7
Assessment of Administrator Respondents on their Proficiency on the Technology Standards for University Administrators in terms of Assessment and Evaluation

Educational leaders:	Mean	Qualitative Description	Interpretation
1. use multiple methods to assess and evaluate appropriate uses of technology resources for learning, communication, and productivity	2.35	Somewhat True of Me	Somehow Proficient
2. use technology to collect and analyze data, interpret results, and communicate findings to improve instructional practice and student learning	2.33	Somewhat True of Me	Somehow Proficient
3. assess staff knowledge, skills, and performance in using technology and use results to facilitate high-quality professional development and to inform personnel decisions	2.30	Somewhat True of Me	Somehow Proficient
4. use technology to assess, evaluate, and manage administrative and operational systems	2.25	Somewhat True of Me	Somehow Proficient
Composite Mean	**2.30**	**Somewhat True of Me**	**Somehow Proficient**

Legend: 3.51-4.00 Very True of Me/ Very Proficient; 2.51-3.50 True of Me/ Proficient; 1.51-2.50 Somewhat True of Me / Somehow Proficient; 1.00-1.50 Not True of Me / Not Proficient

Taking into consideration the assessment of the administrator respondents on their proficiency on the technology standards for university administrators in terms of assessment and evaluation, the highest mean of 2.35, with the qualitative description of the administrators evaluating that this is somewhat true among them and is interpreted as the administrators showing that they are somehow proficient on the technology standards for university administrators in terms of assessment and evaluation, was found for item 1 which states that educational leaders use multiple methods to assess and evaluate appropriate uses of technology resources for learning, communication, and productivity. Technology can be used for instant assessment; helping to boost engagement, identify knowledge gaps, and support deeper learning. Technology is a powerful ally for teachers, especially in measuring student learning. With the use of digital formative assessments, teachers can expedite their ability to provide student feedback in real-time. Technological systems are an important tool in managing day to day school operations. There are even software tools that help students collaborate on assignments and keep parents up to date on their students' progress.

On the other hand, the lowest mean of 2.25, with the qualitative description of the administrators evaluating that this is somewhat true among them and is interpreted as the administrators showing that they are somehow proficient on the technology standards for university administrators in terms of assessment and evaluation, was found for item 4 which states that educational leaders use technology to assess, evaluate, and manage administrative and operational systems. Although the physical components of technology are required for change, just as important is the manner in which technology is implemented, and implementation is directly affected by the

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quality of a school's technology leadership. In other words, the ability of school administrators to plan, inspire, and lead technology usage in a school strongly influences the success of any technology plan. Administrators influence technology usage through a variety of methods, including providing and selling the vision to the community and faculty, obtaining resources such as time, personnel, knowledge, materials, and facilities, and providing encouragement and recognition for teachers successfully making the transition.

The overall mean of 2.32 shows that the administrators observed among themselves that being proficient in the technology standards and is interpreted as the administrators showing that they are somehow proficient on the technology standards for university administrators in terms of assessment and evaluation. Technology assessment (TA) refers to the early identification and assessment of eventual impacts of technological change and applications, as a service to policy making and decision making more generally. It encompasses several potential applications, which may be teacher or student-oriented, including educational assessment throughout the continuum of learning, such as computerized classification testing, computerized adaptive testing, student testing, and grading an exam.
According to Gürsel (2006) a school administrator is a person, who organizes and instructs school staff; and plans, coordinates and inspects works in order to achieve goals at school. Increasing sanctions imposed upon education causes the competition between schools and require them to improve their active learning environments. In addition to these, school administrators are expected to undertake new roles and responsibilities (Hacıfazlıoğlu, Karadeniz & Dalgıç, 2011). The administrators should pave the way for technology to be integrated at every stage of education throughout their institutions by adapting it as part of their working strategy and advocating the use of it by turning into technology champions (Banoğlu, 2011). Studies by Yu and Darrington (2006) support technology integration into schools and believe this process to be starting with the school administrators mind for the first instance.

Integrating technology with schools, school administrators, deputy administrators and teachers; planning future strategies regarding the use of technology at schools and reviewing the technological infrastructure and technical set-ups of schools in accordance with these plans; and keeping in mind that education and technology are two important elements that complement each other and that can minimize many problems at schools.

Table 3.8
Assessment of Administrator Respondents on their Proficiency on the Technology Standards for University Administrators in terms of Social, Legal, and Ethical Issues

Educational leaders:	Mean	Qualitative Description	Interpretation
1. ensure equity of access to technology resources that enable and empower all learners and educators	2.27	Somewhat True of Me	Somehow Proficient
2. identify, communicate, model, and enforce social, legal, and ethical practices to promote responsible use of technology	2.29	Somewhat True of Me	Somehow Proficient
3. promote and enforce privacy, security, and online safety related to the use of technology	2.32	Somewhat True of Me	Somehow Proficient
4. promote and enforce environmentally safe and healthy practices in the use of technology	2.28	Somewhat True of Me	Somehow Proficient
5. participate in the development of policies that clearly enforce copyright law and assign ownership of intellectual property developed with district resources	2.27	Somewhat True of Me	Somehow Proficient
Composite Mean	**2.29**	**Somewhat True of Me**	**Somehow Proficient**

Legend: 3.51-4.00 Very True of Me/ Very Proficient; 2.51-3.50 True of Me/ Proficient; 1.51-2.50 Somewhat True of Me / Somehow Proficient; 1.00-1.50 Not True of Me / Not Proficient

Taking into consideration the assessment of the administrator respondents on their proficiency on the technology standards for university administrators in terms of social, legal, and ethical issues, the highest mean of 2.32, with the qualitative description of the administrators evaluating that this is somewhat true among them and is

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interpreted as the administrators showing that they are somehow proficient on the technology standards for university administrators in terms of social, legal, and ethical issues, was found for item 3 which states that educational leaders promote and enforce privacy, security, and online safety related to the use of technology. Safe and responsible use of ICTs means that children are able to fully engage with the multitude of positive opportunities they present, while employing sensible safeguards to protect themselves and others, in the context of informed parental guidance and appropriate legal and regulatory frameworks.

On the other hand, the lowest mean of 2.27, with the qualitative description of the administrators evaluating that this is somewhat true among them and is interpreted as the administrators showing that they are somehow proficient on the technology standards for university administrators in terms of social, legal, and ethical issues, was found for items 1 and 5 which state that educational leaders ensure equity of access to technology resources that enable and empower all learners and educators and participate in the development of policies that clearly enforce copyright law and assign ownership of intellectual property developed with district resources. Equity in education means that personal or social circumstances such as gender, ethnic origin or family background, are not obstacles to achieving educational potential (definition of fairness) and that all individuals reach at least a basic minimum level of skills (definition of inclusion). On the other hand, intellectual property protection plays an important role in technological development and dissemination, supporting incentives for innovation and helping to determine conditions under which technology will be transferred.

There are even subscription sites that allow unlimited downloading of movies, music, or games, which further blurs the line between what is free and what is copyrighted. In fact, some students are confused that copying and pasting is plagiarism because their source material didn't have an author, and therefore it was "common knowledge." Plagiarism is a big ethical concern, especially with search engines that make it easy to find any query. The widespread availability of knowledge also makes it easier for students to fabricate research and fake a source. Reinforcing how to cite authors, and why it's important to respect the intellectual property of others, will help to minimize these occurrences. Requiring well-cited sources will also help prevent any fabricated research.

Increasing student use of ICT, especially the Internet, has brought with it a number of social issues for teachers and their schools. At the top of the list of most visible issues are violations of intellectual property, especially student plagiarism, and exposure of students to pornography and other inappropriate materials (cf. Johnson, 2003). In addition, there are other issues such as the unauthorized access of computer systems or databases. In the United States, these issues tend to be defined as ethical problems, legal problems, or both. Description and analysis of these problems is challenging because some countries do not have laws addressing these issues and some cultures do not define some of these issues as ethical ones. If relatively few teachers and students in a school are using ICT, these ICT-related problems are likely to be rare, giving little incentive for schools to establish explicit policies to deal with them. But as ICT use grows extensively and intensively within a school, there may be pressure from parents, teachers, and other stakeholders to establish policies and penalties to discourage students from acting in ways that raise these issues. For those relevant matters of conduct that are not defined as clearly illegal or unethical, teachers and staff may ask for clarification as to what is appropriate or inappropriate ICT-related behavior. For example, is it appropriate for a teacher or student to make a personal copy of a shareware software program? An answer to this question is not straightforward, and it may be hard to get official clarification, which may result in pressure on school officials to establish a policy on the matter. There are signs of institutional involvement in these ethical issues with ICT use in education at national and cross-national levels. The National Educational Computer Conference, the largest technology-in-education conference, meets annually, and for the past two decades has had at least one or two sessions on ethics each year. The U.S. Department of Justice has a web site with lesson plans for teachers to teach about "cyber ethics." For several years, the Centre for Computing and Social Responsibility at De Montfort University in Leicester has sponsored an international conference called "ETHICOMP" with a special emphasis on principles of teaching technology-related ethics within higher education. As teachers attempt to use ICT in their teaching, questions continue to emerge of what is appropriate ICT-related ethical behavior and how it can be promoted among students. Schools, under pressure from parents, teachers, and other community groups, may respond by establishing policies that require staff and students to accept ethical codes of conduct or they may install software, such as filtering software, that makes it impossible to access certain information sources deemed inappropriate.

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Significant Differences in the Assessment of Administrator Respondents on the Preparedness for Industrial Revolution 4.0

Table 3.9 to 3.10 show the significant differences in the assessment of administrator respondents on their preparedness for industrial revolution 4.0 when the respondent's demographic profiles are taken as test factors.

Table 3.9
Differences in the Assessment of Administrator Respondents on the Preparedness for Industrial Revolution 4.0 According to Qualifications

	Group	Mean	SD	F-value	Sig	Decision on Ho	Interpretation
Qualifications	With Master's Unit	2.31	.21	.90	.44	Accepted	Not Significant
	Master's Degree Holder	2.26	.21				
	With Doctorate Unit	2.29	.23				
	Doctorate Degree Holder	2.28	.22				
	Total	2.29	.22				

In terms of age, a computed F-value of 0.90 and a significance value of 0.44 were identified. Since the significance value is greater than 0.05 level of significance, the null hypothesis is accepted which means that there is no significant difference in the assessment of administrator respondents on their preparedness for industrial revolution 4.0 when their qualifications are taken as a test factor. This means that there is no difference in the assessment of administrator respondents on their preparedness for industrial revolution 4.0 despite the difference in the qualification of the administrators. This may be taken to mean that the administrators with higher qualifications and those with lower qualifications have similar assessment of their preparedness for industrial revolution 4.0. Thus, the factor qualification does not affect the assessment of administrator respondents on their preparedness for industrial revolution 4.0.

Table 3.10
Differences in the Assessment of Administrator Respondents on the Preparedness for Industrial Revolution 4.0 According to Years as Administrator

	Group	Mean	SD	F-value	Sig	Decision on Ho	Interpretation
Number of Years as Administrator	Below 1 year	2.31	.22	.72	.48	Accepted	Not Significant
	1 year to 5 years	2.28	.22				
	6 to 10 years	2.28	.21				
	Total	2.29	.22				

In terms of year level, a computed F-value of 0.72 and a significance value of 0.48 were identified. Since the significance value is greater than 0.05 level of significance, the null hypothesis is accepted which means that there is no significant difference in the assessment of administrator respondents on their preparedness for industrial

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revolution 4.0 when their number of years as administrator is taken as a test factor. This means that there is no difference in the assessment of administrator respondents on their preparedness for industrial revolution 4.0 considering the difference in the number of years in the position of the administrators. This may be taken to mean that the administrators with longer experience and those with shorter experience have similar assessment of their preparedness for industrial revolution 4.0. Thus, the factor number of years as administrator does not affect the assessment of administrator respondents on their preparedness for industrial revolution 4.0.

Significant Differences in the Assessment of Administrator Respondents on their Proficiency on the Technology Standards for University Administrators

Table 3.11 to 3.12 show the significant differences in the assessment of administrators-respondents on their proficiency on the technology standards for university administrators in terms of leadership and vision, learning and teaching, productivity and professional practice, support, management, and operations, assessment and evaluation, and social, legal, and ethical issues when the respondent's demographic profiles are taken as test factors.

Table 3.11
Differences in the Assessment of Administrator Respondents on their Proficiency on the Technology Standards for University Administrators According to Qualifications

	Group	Mean	SD	F-value	Sig	Decision on Ho	Interpretation
Qualifications	With Master's Unit	2.29	.23	3.41	.01	Rejected	Significant
	Master's Degree Holder	2.36	.23				
	With Doctorate Unit	2.29	.18				
	Doctorate Degree Holder	2.36	.21				
	Total	2.32	.22				

In terms of qualifications, a computed F-value of 3.41 and a significance value of 0.01 were identified. Since the significance value is lesser than 0.05 level of significance, the null hypothesis is rejected which means that there is a significant difference in the assessment of administrators respondents on their proficiency on the technology standards for university administrators in terms of leadership and vision, learning and teaching, productivity and professional practice, support, management, and operations, assessment and evaluation, and social, legal, and ethical issues when their qualifications are taken as a test factor. This means that there is a significant difference in the assessment of administrators respondents on their proficiency on the technology standards for university administrators in terms of leadership and vision, learning and teaching, productivity and professional practice, support, management, and operations, assessment and evaluation, and social, legal, and ethical issues in terms of their qualifications, with those who are Master degree holders and Doctorate degree holders having the highest assessment as indicated by the mean of 2.36 and those with units in their master's and doctorate's having the lowest assessment as shown in the mean of 2.29. This may be taken to mean that the post-graduate degree holders have a higher assessment of their proficiency on the technology standards for university administrators in terms of leadership and vision, learning and teaching, productivity and professional practice, support, management, and operations, assessment and evaluation, and social, legal, and ethical issues when compared to those who are still in the process of obtaining a higher post-graduate degree. Thus, the factor qualification does affect the assessment of administrators-respondents on their proficiency on the technology standards for university administrators in terms of

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leadership and vision, learning and teaching, productivity and professional practice, support, management, and operations, assessment and evaluation, and social, legal, and ethical issues.

Table 3.12
Differences in the Assessment of Administrator Respondents on their Proficiency on the Technology Standards for University Administrators According to Years as Administrator

	Group	Mean	SD	F-value	Sig	Decision on Ho	Interpretation
Number of Years as Administrator	Below 1 year	2.33	.22	.18	.83	Accepted	Not Significant
	1 year to 5 years	2.31	.21				
	6 to 10 years	2.33	.22				
	Total	2.32	.22				

In terms of number of years in the position of the administrators, a computed F-value of 0.18 and a significance value of 0.83 were identified. Since the significance value is greater than 0.05 level of significance, the null hypothesis is accepted which means that there is no significant difference in the assessment of administrators respondents on their proficiency on the technology standards for university administrators in terms of leadership and vision, learning and teaching, productivity and professional practice, support, management, and operations, assessment and evaluation, and social, legal, and ethical issues when the number of years as administrator is taken as a test factor. This means that there is no difference in the assessment of administrators respondents on their proficiency on the technology standards for university administrators in terms of leadership and vision, learning and teaching, productivity and professional practice, support, management, and operations, assessment and evaluation, and social, legal, and ethical issues considering that there is a difference in the length of time the administrators have been in the position. This may be taken to mean that the administrators with a longer period being in the position and those in the position for a shorter amount of time have similar assessment of their proficiency on the technology standards for university administrators in terms of leadership and vision, learning and teaching, productivity and professional practice, support, management, and operations, assessment and evaluation, and social, legal, and ethical issues. Thus, the factor number of years as administrator does not affect the assessment of administrators respondents on their proficiency on the technology standards for university administrators in terms of leadership and vision, learning and teaching, productivity and professional practice, support, management, and operations, assessment and evaluation, and social, legal, and ethical issues.

Significant Differences in the Assessment of Administrator Respondents on their Preparedness for Industrial Revolution 4.0 and Proficiency on the Technology Standards for University Administrators

Table 3.13 show the difference in the administrator respondents on their preparedness for industrial revolution 4.0 and their proficiency on the technology standards for university administrators in terms of leadership and vision, learning and teaching, productivity and professional practice, support, management, and operations, assessment and evaluation, and social, legal, and ethical issues.

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Table 3.13
Difference on Administrator Respondents on their Preparedness for Industrial Revolution 4.0 and Proficiency on the Technology Standards for University Administrators

Variable	Profile	Mean	SD	R-value	Sig	Decision on Ho	Interpretation
	Preparedness for Industrial Revolution 4.0	2.29	.22	-.06	0.4	Rejected	Significant
	Proficiency on the Technology Standards for University Administrators	2.32	.22				

Comparing the assessment of the student respondents on the competency of the teachers in terms of subject matter knowledge, instructional representation and strategies, knowledge of students' understanding, and technology integration and application and their self-assessment of the student respondents on their level of academic motivation in terms of: attention, relevance, confidence, and satisfaction, a computed R-value of -0.06 and a significance value of 0.40 were identified. The R-value indicates a weak correlation between the assessment of the administrator respondents on their preparedness for industrial revolution 4.0 and their proficiency on the technology standards for university administrators in terms of leadership and vision, learning and teaching, productivity and professional practice, support, management, and operations, assessment and evaluation, and social, legal, and ethical issues. This means that the two variables do have a relationship, but the relationship is very weak and that an increase in one may have a weak effect on the other variable. The correlation co-efficient also indicates that the relationship between the assessment of the administrator respondents on their preparedness for industrial revolution 4.0 and their proficiency on the technology standards for university administrators in terms of leadership and vision, learning and teaching, productivity and professional practice, support, management, and operations, assessment and evaluation, and social, legal, and ethical issues is negative. This may mean that as the other variable increases, the inverse is observed in the other. This illustrates that the higher the assessment of the administrator respondents on their preparedness for industrial revolution 4.0 is, the opposite happens for their assessment of their proficiency on the technology standards for university administrators in terms of leadership and vision, learning and teaching, productivity and professional practice, support, management, and operations, assessment and evaluation, and social, legal, and ethical issues will be. Hence, the assessment of the administrator respondents on their preparedness for industrial revolution 4.0 and their proficiency on the technology standards for university administrators in terms of leadership and vision, learning and teaching, productivity and professional practice, support, management, and operations, assessment and evaluation, and social, legal, and ethical issues were found to have a weak negative correlation.

Conclusion

1. The demographic profile of the administrator respondents revealed that majority of the administrator respondents have units in their master's degree and have been an administrator for 1 to 5 years.
2. The administrators evaluated that they somewhat know industrial revolution 4.0 and shows that the administrators are somehow prepared for industrial revolution 4.0. Because of the Fourth Industrial Revolution, novel and advanced educational institutions are emerging that offer education, research, and service differently, including massive open online courses (MOOC), virtual classrooms, virtual libraries, virtual laboratories, and virtual educators. The Fourth Industrial Revolution (Industry 4.0 or 4IR) has given teachers what might be the greatest responsibility of our time: to evolve teaching strategies so they can

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unlock individual student potential and prepare students with the skills needed to shape the future through innovation supported by technology.

3. The administrators observed among themselves that being proficient in the technology standards and is interpreted as the administrators showing that they are somehow proficient on the technology standards for university administrators in terms of leadership and vision. Technology integration is highest in buildings in which the administrators are involved and excited about technology and its possibilities and is lowest in buildings in which the administrators don't demonstrate technology use while encouraging others to use it too. Modeling technology usage is key if administrators want teachers to play an active role in technology integration.
4. The administrators observed among themselves that being proficient in the technology standards and is interpreted as the administrators showing that they are somehow proficient on the technology standards for university administrators in terms of learning and teaching. By integrating technology into existing curricula, as opposed to using it solely as a crisis-management tool, teachers can harness online learning as a powerful educational tool. The effective use of digital learning tools in classrooms can increase student engagement, help teachers improve their lesson plans, and facilitate personalized learning. It also helps students build essential 21st-century skills.
5. The administrators observed among themselves that being proficient in the technology standards and is interpreted as the administrators showing that they are somehow proficient on the technology standards for university administrators in terms of productivity and professional practice. There are many problems that educators all around the world face when trying to bring new technology-related teaching methods into classrooms. Despite much knowledge, and despite the research that has been conducted over the decades, the reality is that the majority of teachers are still reluctant or suspicious towards technology-enhanced learning methods. There are several reasons for that, for example, the lack of paid time, infrastructure or lesson designs. But an additional problem—something that is easy to miss—is that valuable resources are wasted during unsuccessful implementation trials: not only the physical or financial resources, but also the time of teachers and children who have been involved in these processes.
6. The administrators observed among themselves that being proficient in the technology standards and is interpreted as the administrators showing that they are somehow proficient on the technology standards for university administrators in terms of support, management, and operations. Technology in schools is shifting from simple tools used in days of the data projector, to solutions that integrate with everything, and it is transforming teachers into active participants rather than just facilitators. Leaders and administrators should take stock of where their faculty members are in terms of their understanding of online spaces. From lessons learned during this disruptive time, they can implement solutions now for the future. For example, administrators could give teachers a week or two to think carefully about how to teach courses not previously online. In addition to an exploration of solutions, flexibility during these trying times is of paramount importance.
7. The overall mean of 2.32 shows that the administrators observed among themselves that being proficient in the technology standards and is interpreted as the administrators showing that they are somehow proficient on the technology standards for university administrators in terms of assessment and evaluation. Technology assessment (TA) refers to the early identification and assessment of eventual impacts of technological change and applications, as a service to policy making and decision making more generally. It encompasses several potential applications, which may be teacher or student-oriented, including educational assessment throughout the continuum of learning, such as computerized classification testing, computerized adaptive testing, student testing, and grading an exam.
8. The administrators observed among themselves that being proficient in the technology standards and is interpreted as the administrators showing that they are somehow proficient on the technology standards for university administrators in terms of social, legal, and ethical issues. In the Connected Age, it's easy to go online and download multimedia (illegally or legally). There are even subscription sites that allow unlimited downloading of movies, music, or games, which further blurs the line between what is free and what is copyrighted. In fact, some students are confused that copying and pasting is plagiarism because their source material didn't have an author, and therefore it was "common knowledge." Plagiarism is a big ethical concern, especially with search engines that make it easy to find any query. The widespread availability of knowledge also makes it easier for students to fabricate research and fake a source. Reinforcing how to cite

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authors, and why it's important to respect the intellectual property of others, will help to minimize these occurrences. Requiring well-cited sources will also help prevent any fabricated research.

9. The factors qualifications and number of years as administrator do not affect the assessment of administrator respondents on their preparedness for industrial revolution 4.0.
10. The factors qualifications and number of years as administrator do not affect the assessment of administrators-respondents on their proficiency on the technology standards for university administrators in terms of leadership and vision, learning and teaching, productivity and professional practice, support, management, and operations, assessment and evaluation, and social, legal, and ethical issues.
11. The assessment of the administrator respondents on their preparedness for industrial revolution 4.0 and their proficiency on the technology standards for university administrators in terms of leadership and vision, learning and teaching, productivity and professional practice, support, management, and operations, assessment and evaluation, and social, legal, and ethical issues were found to have a weak negative correlation.

Recommendations

1. Throughout time the purpose of education has evolved based on the needs of society during that period. It's no different during this transition. Currently, education serves to prepare people to take on the tasks of a job or discipline to "do" something. As we move farther into the future, education will need to support children to develop the skillset and mindset to do anything in their future rather than a particular "something."
2. Teaching needs to change so students move beyond remembering and understanding a given curriculum topic to learning how to apply, analyze, and create, using what they learn in the classroom.
3. Personalized learning is not a goal but a means to achieving those outcomes. The goal is to build students' talents and problem-solving skills using available technology tools that allow them to resolve issues in ways never imagined before.
4. Teachers can use Bloom's taxonomy, and other approaches supported by technology, to experience optimal ingenuity, innovation, and convergent thinking while ensuring more time for individual instruction. It's no longer about enabling students to perform functions as future workers, but instead it's about empowering them to think independently and design their own future in tomorrow's workplace.
5. Teachers must transition into being facilitators of learning beyond their own personal expertise. They should allow technology to support students' flexibility in gaining skills and pursuing passions. Lecturing to a group of students and expecting them to gain value from a broad presentation is now a limited teaching model.

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ETCOR Educational Research Center PHILIPPINES
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Website: https://etcor.org
ISSN
iJOINED ETCOR
P - ISSN 2984-7567
E - ISSN 2945-3577
The Exigency
P - ISSN 2984-7842
E - ISSN 1908-3181

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