

# Education 4.0: Disrupting Education towards Creativity, Innovation, and Commercialization

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**Abstract**—The rapidly evolving technological innovations in some fields such as robotics, artificial intelligence, the Internet of Things, 5G, and among others, disrupt teaching and learning. New and innovative methods and strategies were introduced in understanding education, classroom organization, classroom management, assessment, pedagogy, ethics, professional development, among others. This keynote paper is aimed at reviewing 4th Industrial Revolution technologies and processes and how this unprecedented technology disrupts education. It also examines the state of creativity and innovativeness in higher education. Further, it presents experiences of the digital transformation initiatives in the whole-person education of Silliman University.

**Keywords**— Commercialization, disruption, Education 4.0, innovation in education, technology business incubation

## I. INTRODUCTION

Quality education fosters creativity and knowledge [1]. Quality education is one of 17 Global Goals that make up the 2030 Agenda for Sustainable Development. The SDG noted that quality education “is one of the most powerful and proven vehicles for sustainable development” [2]. This goal aims of achieving universal access to a quality higher education. On the same manner, infrastructure and innovation is another one of 17 Global Goals that make up the 2030 Agenda for Sustainable Development. The increase of new industries and information and communication technologies are among this technological progress. World Bank reported of the learning crisis in global education [3]. Among the many reported issues of achieving quality education is the ability of the schools to adopt to technological changes [4].

The theory of disruptive innovation has proved to be a powerful way of thinking about innovation-driven growth [5], see Fig. 1. “The theory explains the phenomenon by which an innovation transforms an existing market or sector by introducing simplicity, convenience, accessibility, and affordability where complication and high cost are the status quo” [1]. Disruption is defined by Webster as “a break or interruption in the normal course or continuation of some activity, process, etc.”. It is uprooting and changing how we think, behave, do business, learn and go about our day-to-day” [6]. Common features in disruption includes business creation, products and services that are less expensive and more creative, useful and impactful, and scalable. Innovation, on the other hand, as defined by Merriam-webster, refers to a new idea, method, or device. [7] Explains three implications of disruptive innovation in education. First, disruptive innovation “is the catalyst for bringing about more equitable access to high-quality education”. Second, it is a tool to achieve personalized education system. Lastly, “disruptive innovation circumvents the political battles that have historically been at the centre stage of education reform”.

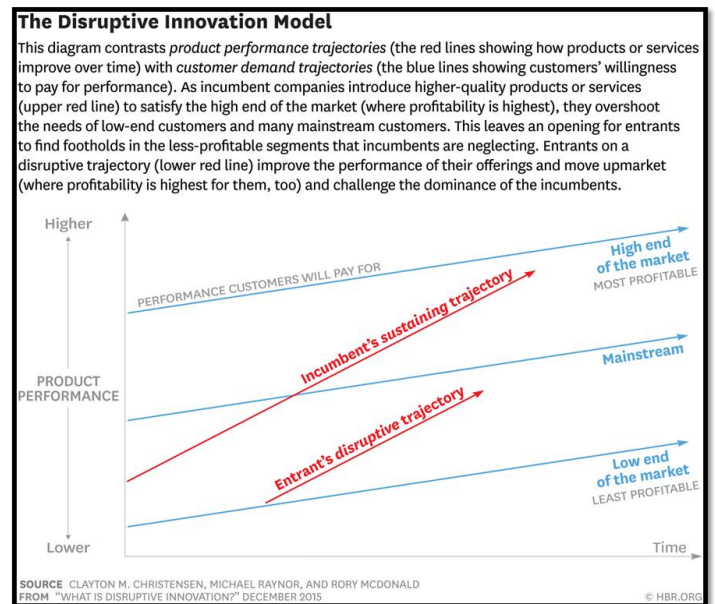


Fig. 1. The disruptive Innovation Model [5]

The Fourth Industrial Revolution (4IR), a disruptive innovation technology such as robotics, artificial intelligence, the Internet of Things, 5G, and among others, disrupts education. It changes that way stakeholders understand education, classroom organization, classroom management, assessment, pedagogy, ethics, professional development, and among others.

This paper is aimed at reviewing 4IR technologies and processes and how this unprecedented technology disrupts education. It also examines the state of creativity and innovativeness in higher education. Further, it presents experiences of the digital transformation initiatives in the whole-person education of Silliman University. Online reviews from related journal articles, periodicals, books and magazine were utilized in the discussions. On the other hand, reflections and lessons from the proponent of the digital transformation initiatives were utilized as case study.

## II. THE FOURTH INDUSTRIAL REVOLUTION: AN INNOVATIVE DISRUPTION IN EDUCATION

As summarized and published on the website of the World Economic Forum, the Fourth Industrial Revolution is “a new chapter in human development, enabled by technology advances that are commensurate with those of the first, second and third industrial revolutions, and which are merging the physical, digital, and biological worlds in ways that create both promise and peril” [8].

The Fourth Industrial Revolution opens global strategic alliances such as fusing technologies, ethics and identity, agile technology and governance, inequality, business disruption, disruption to jobs and skills, security and conflict, and innovation and productivity. See Table 1 and Fig. 2 for the graphical representation of the issues and alliances. As cited in the website, the many highlights of the Fourth Industrial Revolution are "to improve the quality of life for the world's population and raise income levels." The fusing technologies of information technology, advanced materials, virtual and augmented reality, neuroscience, advanced manufacturing and production, digital economy and society, 3D printing, blockchain, artificial intelligence and robotics, and biotechnology open new cutting edges. These disruptive technologies "might even help us better prepare for natural disasters and potentially also undo some of the damage wrought by previous industrial revolutions," explained in the website.

Table 1. Key Issues and Strategic Alliances of the Fourth Industrial Revolution (World Economic Forum)

Key issues	Strategic Alliances
Fusing Technologies	Collaboration between disciplines is opening new frontiers
Ethics and Identity	Innovations are redefining what it means to be human
Agile Technology Governance	New technologies are outpacing regulatory frameworks
Inequality	Wealth inequality is worsening, and new technologies threaten to aggravate that trend
Business Disruption	The foundations of business as we know it are being challenged
Disruption to Jobs and Skills	The Fourth Industrial Revolution is shifting job roles and skillsets
Security and Conflict	The Fourth Industrial Revolution is changing the nature of conflict
Innovation and Productivity	Traditional tools are not capturing the impact of new technologies on productivity

According to Klaus Schwab, founder of the World Economic Forum, the fourth industrial revolution "affects our lives and reshapes our economic, social, cultural, and human environments" cited in [9]. The adoption of cyber-physical systems, the Internet of Things, and the Internet of Systems makes exponential alterations to the way people live, work, and connect with others [10]. Marr also added that smart technologies and workplaces and connected machines could provide expert decisions. Gwata (2019) posits that interdisciplinary and T-shaped persons are in demand in this digital transformation age. He also encouraged everyone to possess "in-depth knowledge of a specific field, with sufficient knowledge in other fields outside their specialization." Likewise, Ladder (2016) emphasized that "individual must

have learning agility, the ability to learn, adapt, and apply in quick cycles" in this time. They must have broad skillsets and learn about these new technologies. Skill development in this fast-paced automation is "a more seamless and accessible process" [11].

Jack Ma stated, "If we do not change the way we teach, thirty years from now, we will be in trouble" [12]. Dell company estimated that 85% of jobs that will exist in 2030 have not yet been invented, cited in [13]. Undoubtedly, the education sector is challenged to keep abreast to make teaching and learning more relevant. The Internet of Things and AI can provide "intelligent decisions regarding the delivery of customized education and personalized learning experience for students" [14]. The cyberworld makes learning accessible. The library is everywhere with search engines, massive open online courses (MOOCs), podcasts, YouTube videos, and others. Smart technologies and robotics make classroom management and organization easy. Mobile technologies and AR/VR advance assessment and evaluation. The wearable technologies alter pedagogy and teaching strategy. "Risk, privacy, and security are other challenges facing higher education" [14]. Data analytics and machine learning refocus research, development, and creativity. Chatbots and voice-activated personal assistants augment community engagement and service-learning tremendously.

Digital transformation in the education system is imperative in preparing for the industrial economy. "From a system based on facts and procedures to one that actively applies that knowledge to collaborative problem solving" [15]. Asmaa Abu Meziad (2016) suggested to have a global "digital identity that is trusted, portable and secure, which stores an individual information and can be used across countries especially in cases of conflict eruption or natural disaster, would address this challenge." Gwata (2019) concluded that "technology does not make people obsolete, but it does change the prerequisite for employment, as a retrospective looks at the third industrial revolution demonstrates."

## III. TOWARDS CREATIVITY, INNOVATIVENESS, AND ENTERPRENURIAL MINDSET IN EDUCATION

A 2010 study of about 300,000 creativity tests found that creativity has decreased among American children in recent years [16]. In another international study reveals that "Education System is Stifling Creativity" [17], shown in Fig. 3. Interestingly, the study shows that "there is a growing concern that the education system itself is a barrier to developing the creativity that drives innovation" [17]. Trowbridge explained that the respondents cited the urgency to "provide tools and training to teach creativity, make creativity integral to the curriculum, and reduce mandates that hinder creativity." Likewise, the global creativity index 2015 shows that Australians are on the top with 970 out of 1000 index values and followed by the United States, shown in Fig. 4. Singapore earned the 9th spot with an 896 index. Hongkong on the 21st with 715, Japan on the 24th with 708 index value [18]. Further, the Global Schools Leadership Alliance Report, cited in [9], states that "the young people need to develop right-brain skills (creativity) just as much as left-brain

(mathematics and technical) to adapt to the emerging economy."

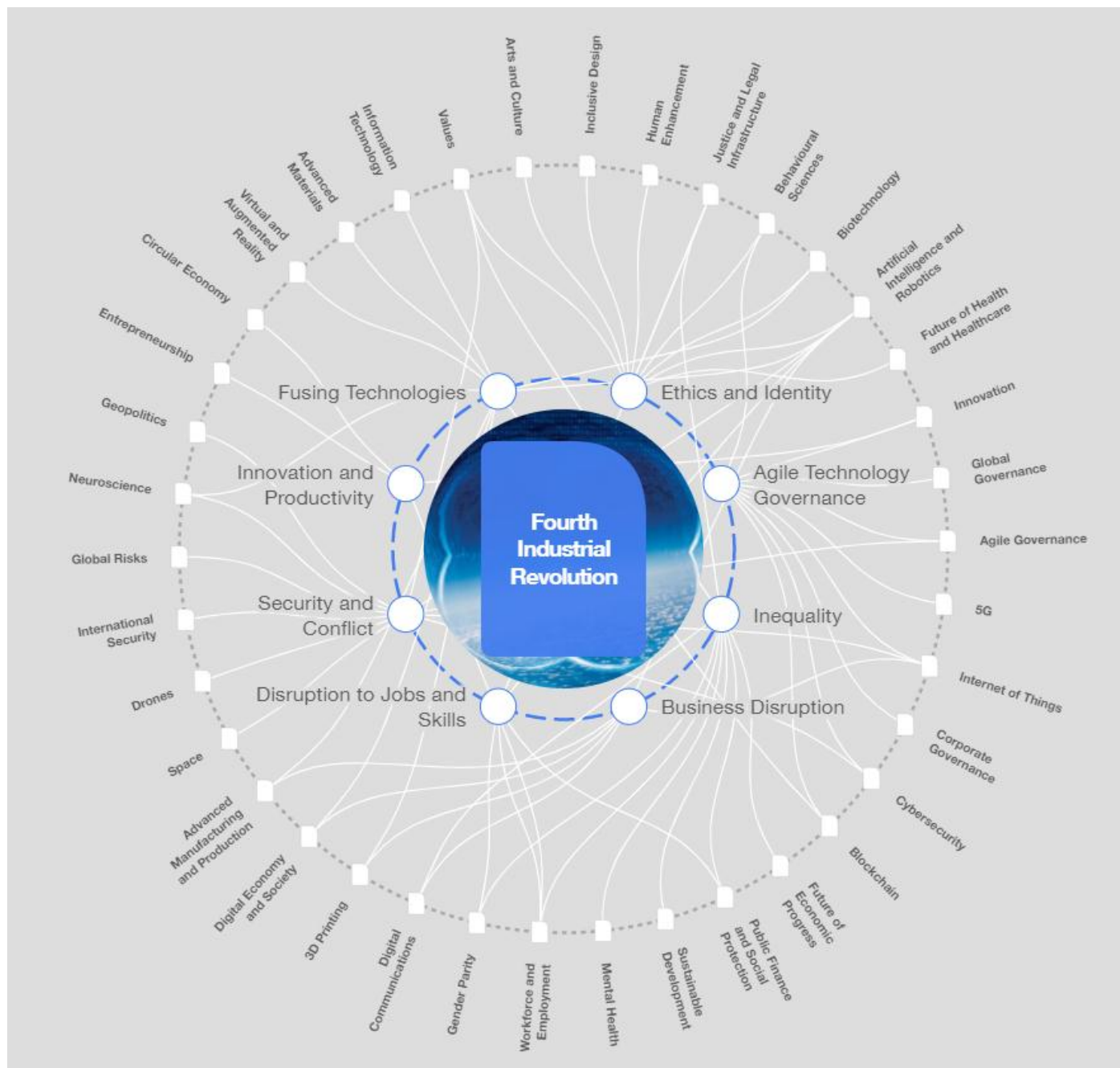


Fig. 2. The Global Issues of the Fourth Industrial Revolution  
<https://intelligence.weforum.org/topics/a1Gb000001RlhBEAW?tab=publications>

Rogers (2003) defined innovativeness as the degree to which an individual or other adoption unit is relatively earlier in adopting new ideas than the other members of a system. It is the skill and imagination to create new things (Webster). The 2019 Global Innovation index, shown in Fig. 5, has found that "innovation is still blossoming despite the global economic slowdown, especially in Asia" [19]. The index reported that India in the world's 52<sup>nd</sup> most innovative nation while China is the 14<sup>th</sup> placer.

Disruptive innovation and transformation in the curriculum, faculty, students, campus life, technology, or facilities are now considered prerequisites for survival in many educational institutions. Arizona State University's Tempe campus is considered as the number 1 innovative school according to the 2019 Most Innovative Schools survey by the U.S. News. A case study on the personal innovativeness among students found that students have high personal innovativeness. The result implies that students are highly creative with high inventiveness mind [20].

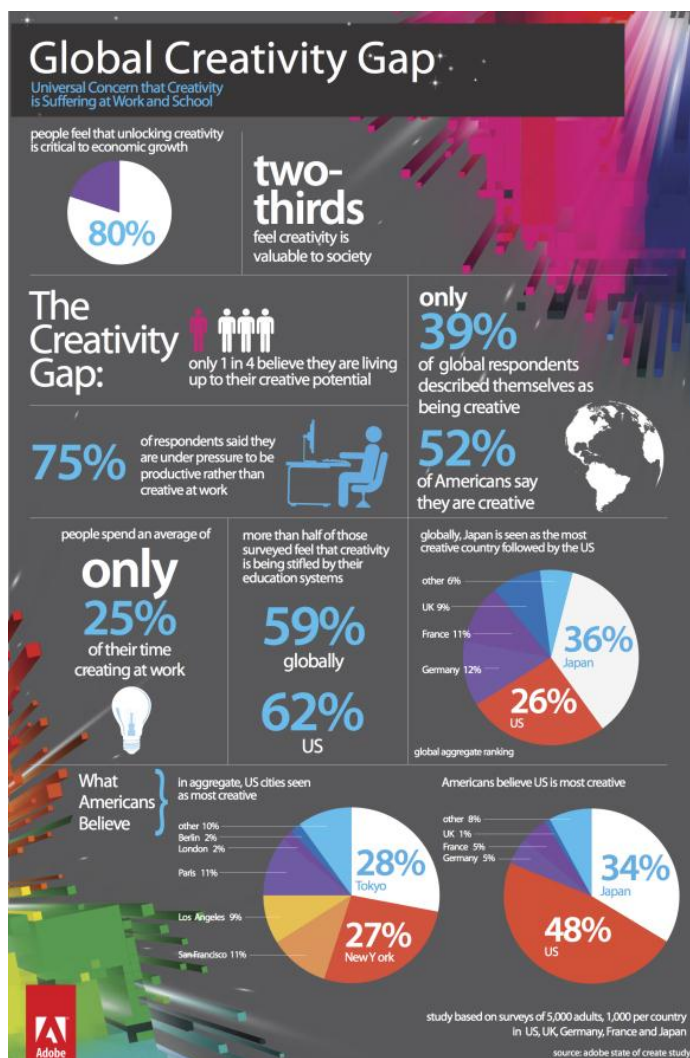


Fig. 3. Global Creativity Gap

(<https://blog.adobe.com/en/publish/2012/04/25/the-creativity-gap-what-research-is-telling-us-about-creating-now.html#gs.mns16f>)

There is a pressing demand to integrate the entrepreneurial component in research and creativity. "Commercialization is an attempt to profit from innovation by incorporating new technologies into products, processes, and services and selling them in the marketplace" [21]. Schools are challenged in the translation of research to commercialization. A study shows that the entrepreneurial and commercialization mindset in academic research is constrained. This is due to "lack of commercialization skills and low numbers of qualified staff, brain drain, aging of faculty, absence of intellectual property (IP) policy measures, and focus on lecturing rather than research-focused mandates" [22]. The Ministry of Higher Education of Malaysia has a low return on investment of their research initiative with only a 4.2% commercialization success rate [23]. Undeniably, different sectors have made an effort, including the government, colleges, and universities, concerning creativity, "innovation, commercialization, entrepreneurship, and the creation of economic value for their communities" [24]. Gachie and Govender proposed strategies to improve research commercialization. These "development

and implementation of fair IP policies and guidelines, bolstering human and organizational capabilities at HEIs and research institutes, and strengthening periodic reviewing by the National Intellectual Property Management Office."

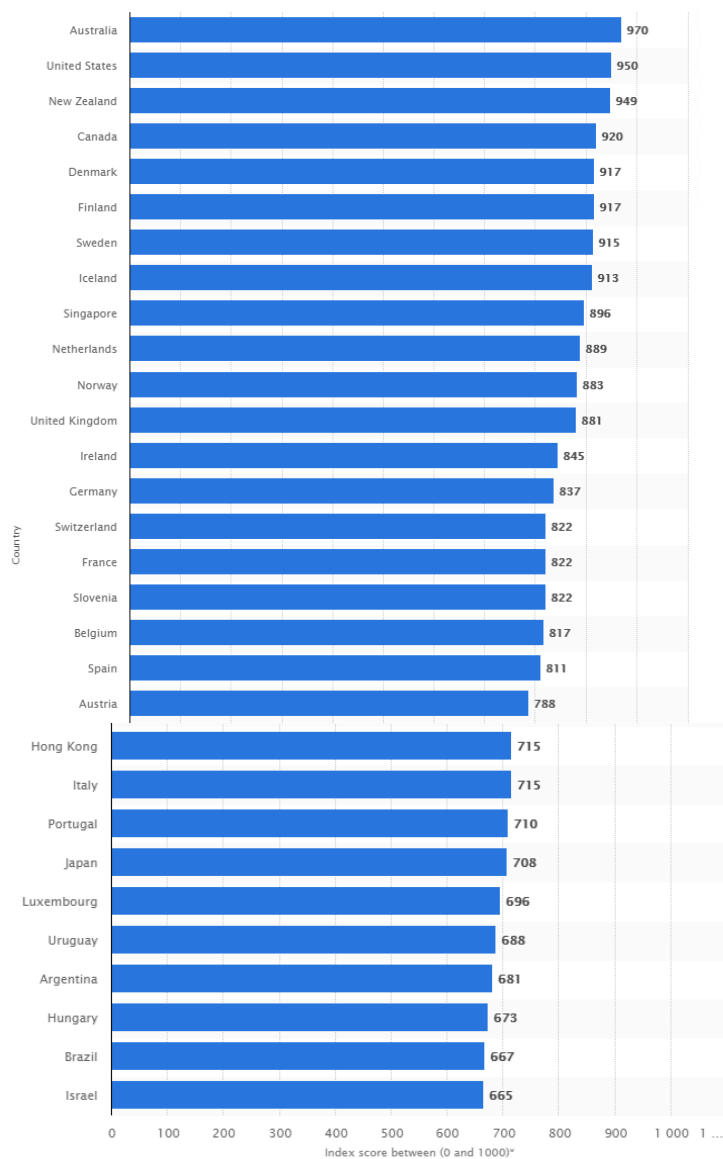


Fig. 4. Top 30 Countries according to the global creativity index in 2015, by index value (<https://www.statista.com/statistics/652922/the-global-creativity-index/>)

In the Philippines, the Commission on Higher Education introduced an elective general education course called "The Entrepreneurial Mind" [25]. The course is about the meaning and attributes of entrepreneurship like innovation, risk-taking, and self-reliance. It also discusses the social role and impact of entrepreneurship. Similarly, a technopreneurship course was also introduced by the commission to be integrated into the engineering and computing education curriculum. It is aimed to produced engineers "who will not just do well as laboratory nerds but also succeed in business" [26].

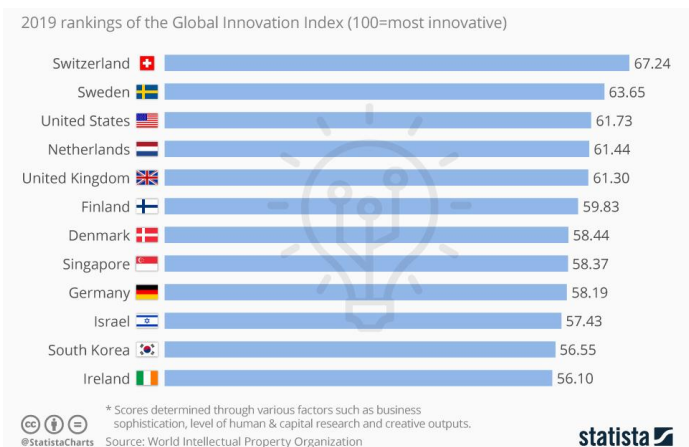


Fig. 5. The World's Most Innovative Countries 2019  
(<https://www.statista.com/chart/18804/rankings-of-the-global-innovation-index/#:~:text=Switzerland%20topped%20the%20rankings%20this,rounds%20off%20the%20top%20three.>)

The Department of Science and Technology of the Philippines launched its program on Technology Business Incubation (TBI) "to promote innovation and technopreneurship for the country's socio-economic development in a knowledge-based world economy" [27]. On its official website, the department featured that "the goal of TBI is to produce firms that will leave the incubation program financially viable and able to sustain operation and compete in the market" [27].

The department launched the Higher Education Institution Readiness for Innovation and Technopreneurship (HeIRIT) Program. The Program is a 12-month preparatory program for starting technology business incubators (TBIs) intending to "establish 1000 start-ups in the next five years through replication of start-up communities in the regions" [28]. Twenty private and public universities were identified as the recipient of the grant, see Fig. 6 for the list. Silliman University is one of the grantees with the mission to promote innovation and technopreneurship towards commercialization by promoting the culture within the university and the outside community by providing a range of resources, services, and facilities needed during the development stage.



Fig. 6. Philippine Schools under the Higher Education Institution Readiness for Innovation and Technopreneurship (HeIRIT) Program

#### IV. SILLIMAN'S DIGITAL TRANSFORMATION IN THE WHOLE-PERSON EDUCATION

##### A. Whole Person Education at Silliman University

Silliman University, a 62-hectares campus, was founded in 1901 with the vision to be "a leading Christian institution committed to total human development for the well-being of society and environment" has been innovative in its programs and services. From a school for the boys to an autonomous university offering diverse courses that emphasize whole-person education. Silliman's education is guided by three components that make us humans: "the mind, the heart, and the soul." As explained on its website ([www.su.edu.ph](http://www.su.edu.ph)), whole-person education is "the holistic development of one's competence, character, and faith. It is the approach to learning that is encapsulated in its tri-logical ministry of teaching, healing and preaching".

Whole-person education at Silliman University is a concerted effort and a shared responsibility by every stakeholder. As published on the leadership reflection by Tan on its website <http://su.edu.ph/679-silliman-education>, whole-person is a convergence of three factors: pedagogy, venues for interaction, and service-learning.

1. Silliman University's pedagogy of education	there is where we integrate faith-strengthening in instruction, research and extension. That is why, while others build their programs on the traditional "tri-focal" functions, we expand ours to come up with F-I-R-E: "faith, instruction, research and extension".
2. venues for a rich interaction of experiences -	the five Cs of Silliman education: "classroom", "church", "(athletic) court", "cultural center", and "community".
3. service-learning	where you yourselves validate and apply concepts and theories in your respective disciplines through an understanding of socio-civic issues on the ground while working with communities in finding solutions to their problems.

The high demands on disruptive innovation of research in a whole-person education require a holistic approach. It requires a total transformation from the traditional way of teaching, research, and productivity. Among the many efforts of Silliman University to technological innovation in 1997 being the first few movers to deploy an estimated cost of US \$2.5 million fiber-optic backbone. Its innovation effort was strengthened when recognized as a Center of Development in 2006, now Center of Excellence, by the Philippine Commission on Higher Education. Further, the re-landscaping of the country's educational system provided an opportunity for Silliman to disrupt teaching and learning.

##### B. The Technology Business Incubation Office

In June 2019, a new unit in the organizational structure of Silliman University was created to institutionalize its effort to innovation and commercialization, see Fig. 7. This department is called SU-TBI and structurally operated under the supervision of the Research and Development Center. It will centralize all innovation facilities such as the Apps lab, ICI lab, and technopreneur center. As of the moment, SU TBI is operated by a funding grant from the Philippine's Department of Science and Technology through its HeIRIT Program. Dubbed as SINERGY TBI, the office is aimed at establishing innovations on energy technology business incubation. The

office is aimed to produce firms that will leave the incubation program financially viable and able to continue operations and compete in the market by hosting start-ups and providing business development services.

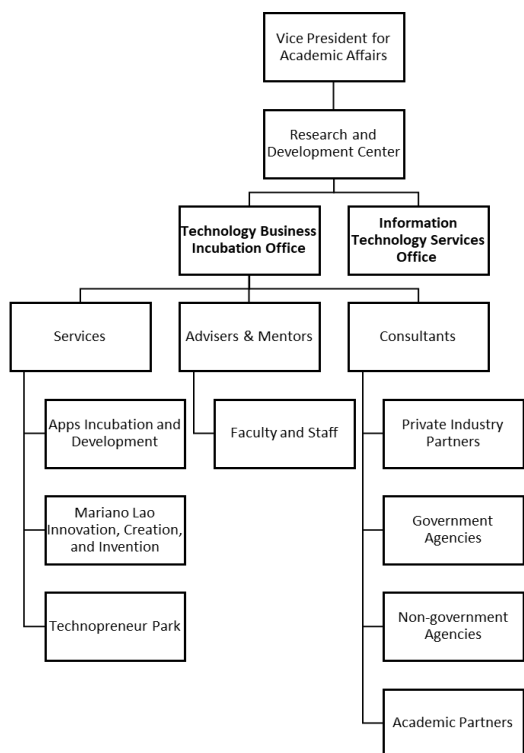


Fig. 7. Organizational Chart of the Newly Established TBI Office

### C. The SU Apps Incubation and Development Laboratory

On October 27, 2015, the university was established in partnership with Uytensu Foundation, the Application Incubation and Development Laboratory, see Fig. 8 for the inauguration photos. The laboratory is envisioned not only to cater to the academic needs of Silliman University but also to offer commercialization opportunities for the community. The laboratory will house 31 units of Apple equipment equipped with the needed software and accessories for development and training. As a development and incubation facility, the laboratory will serve as a resource center for all incubation facilities for Apple iOS startup developers, an outsourcing center for Apple iOS development, a learning venue for IT students, and a training facility for IT Education teachers. The laboratory serves as a classroom facility for the College of Computer Studies. It sometimes utilizes as a training facility for the public.

### D. The Innovation, Creation, and Invention Laboratory

On August 19, 2017, Silliman University, in partnership with its alumnus Mr. Mariano Lao, inaugurated the Mariano Lao Innovation, Creation, and Invention Laboratory, see Fig. 9 for the photo of the lab. This laboratory is intended to create a new learning space for high school and college students in Silliman to innovate, create, and invent technology-oriented products. It is a venue to promote new ideas with

entrepreneurial value. It is an open laboratory not only for the Silliman community but as well as the general public.



Fig. 8. Taken during the inauguration of the SU Apps Incubation and Development Laboratory (Photo from <http://su.edu.ph/1894-ios-apps-lab-inaugurated-tinker-with-the-world-president/>)

The laboratory is mandated to be a classroom, a teaching extension facility for teachers, a service-learning facility, a learning facility for Robotics Club, a recreation room, and a mini-incubation facility. It offers the following ongoing programs:

**Creativity Camp.** It is a competitive scholarship among top students in the province. It is specialized training on creativity to ignite new and innovative ideas with an entrepreneurial value among high school and college students in the province. At the end of the camp, all scholars are expected to submit a capstone project proposal.

**Research and Capstone Grant.** The Research and Capstone Grant is a competitive scholarship amounting to a maximum of P100,000.00 for a maximum of 2 years. It aims to stimulate new and innovative ideas with an entrepreneurial value among high school and college students. The laboratory envisions that grant to be supported towards serious incubation cycle. The grant will provide students an opportunity to learn and work together, develop and test new ideas, and engage in innovative and active learning.

**Innovation, Creation, and Invention (ICI) Talks.** ICI TALKS is a monthly forum to provide an avenue for high school and college students in Silliman University and neighbouring schools to exchange ideas about innovation and technopreneurship. It is one of the many initiatives at ICI Laboratory to inspire innovation, ignite creativity, and push for invention with entrepreneurial value.

**Competitions and Contests.** It refers to academic competitions such as computer programming, poster designing, website development, advocacy making, among others. It aims to promote critical thinking among students in a friendly competitive environment.

**Free Computer Education for Senior Citizens, Employees, and Students.** This program aims to provide need-based computer skills training for senior citizens, employees, and students, whether a Sillimanian or not.



Fig. 9. The Dr. Mariano Lao Innovation, Creation, and Invention Laboratory

### E. The Technopreneur Park

On May 22, 2019, a groundbreaking ceremony was held for the Silliman University Business Incubation Facility to be constructed at the Fel & Bert Bravo Technopreneur Park in San Antonio, Sibulan, shown in Fig. 10. The facility has two-fold objectives. First, to serve as an incubation facility that will host and assist innovators, scientists, and aspiring entrepreneurs in developing an idea, testing and vetting an idea, and developing a prototype. Second, to serve as an accelerator facility that will facilitate conversations with venture capital corporations.

The park has four-fold mandates:

*A research and ideation facility.* The Center will be used for science-and-technology-based research and ideation. Scientists, visiting professors, researchers, and industry practitioners, and anyone with innovative ideas shall be welcome in the Center. Ideas must be diverse and interdisciplinary anchored on the recent trends in science and technology. Basic research, knowledge discovery, and knowledge accumulation are among the significant activities in this part.

*A production and development laboratory.* The Center will be used for product prototyping, development, and testing. Access to equipment and prototyping instrument and technologies will be readily available in the Center. The Center will provide incubation programs that will include several forms of mentorship from businesspersons and practitioners.

*A Business Matching and Pitching Facility.* The Center will be used as a meeting hub for investors, venture capitalists, and corporate accelerators to finance the incubated idea. Entrepreneurial creativity, venture management, and financing are among the critical services the Center will provide during its first phase of the acceleration. The Center will facilitate business matching and round-table discussions to find early-stage investors as well as in the market discovery, messaging, and outreach

*A Business Expansion Training Facility.* The Center will provide capacity-building and other forms of training for start-ups and technopreneurs. Access to training, such as organizational, operational, and strategic planning. The Center

will introduce start-ups/technopreneurs to various funding and investment sources, including angel and venture capital investors.



Fig. 10. Ground-breaking Photo of the SU's Technopreneur Park  
(Photo from <http://su.edu.ph/silliman-university-breaks-ground-for-business-incubation-facility/>)

### F. Retooling Teaching and Learning at Silliman University through Digital Technology

With the university's new direction on the need to retooling skill sets among faculty and staff to be equipped with 21st-century skills using digital technology in the classroom, Silliman University launched its retooling program in 2018. The program was made not just to respond to the achievement of the said direction but also to explore new opportunities for Silliman University. The program primarily aimed at retooling teaching and learning at Silliman University using digital technology. Specifically, it aims to: a) redefine the organizational structure of Silliman Online University Learning as an academic support unit in the university, 2) develop a training development plan among faculty and staff, 3) explore new academic programs, both degree, and non-degree programs.

As shown in the organizational structure (Fig. 11), a new department in the College of Computer Studies was established in November 2018 to assist the Dean in promoting digital technology in the entire Silliman community. The department has three primary responsibilities. First, the department supervises the Silliman Online University Learning, like the technical administration of any learning management platform and faculty and staff training. Second, the department will assist the Dean in implementing other technology-assisted projects in the university like the Mariano Lao Free Computer Education, iPad in Junior High, AUDRN, and service-learning, among others. Lastly, the department supervises implementing the SHS computer subjects and serviced-courses in Education, MedTech, PT, Medical School, Nursing, etc.

A 3-year capacity-building plan was designed not only for teachers but as well as for office personnel. It primarily aims to retool and upgrade faculty and staff responsive to the changing needs in education, emphasizing a learner-centered environment. It has four interrelated specific objectives:

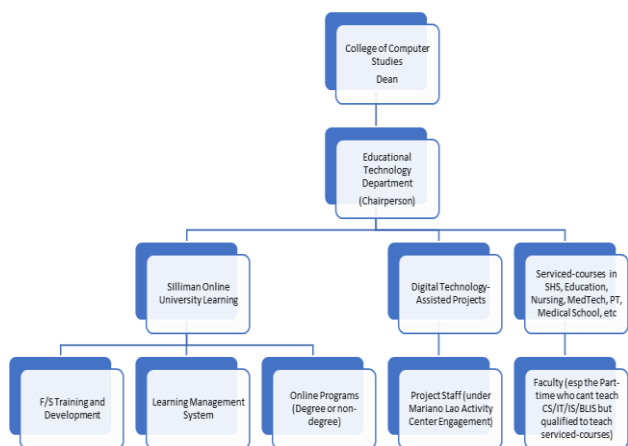


Fig. 11. Organizational Structure of a New Department overseeing Educational Technology Integration in the University

To utilize a learning management system as a teaching tool in SHS, College, and Graduate levels;

1. To retool SBE teachers using educational technology as a tool in performance-based learning;
2. To retool higher education teachers using educational technology to support outcomes-based education
3. To upgrade digital technology skills among office secretaries, staff, and personnel using the latest trends in ICT;
4. To disseminate e-learning culture and its trends and opportunities in the university.

Part of the retooling program is an exploration to offer new degree programs responsive to the needs in the educational system of the country. Likewise, it was also suggested to explore degree programs to allow two or more academic units to strengthen its partnership and collaboration to offer interdisciplinary and multidisciplinary-based degree programs.

#### G. The Transformative Learning Space: A Transdisciplinary State-of-the-Art Laboratory at Silliman University Library

Silliman University is in the process of modernization of the library. Specifically, modernization is aimed at transforming library services in keeping the demands of today's 21st-century learners. Although challenged by its limited resources, Silliman University is hoping to build a state-of-the-art laboratory in the library that is transformative and transdisciplinary. This effort is in partnership with the Uytensu Foundation, a believer of Silliman University's quality of education and a transformative teaching and learning promoter. The proposed laboratory will be competitive in Asia and the world, serving Silliman faculty and students and the broader community. It is envisioned as transformative, transdisciplinary, and wholistic, composed of state-of-the-art mini-labs, and a transformation of SU's library services emphasizing technology, collaboration, and flexibility.

This initiative is a subset of the bigger transformation effort, the reinvention of the Silliman University Library System for the 21st century. It is a modern transformation of library services to cater to the new generations of users'

information needs using the recent and relevant technological advancements. Specifically, the library transformation aims to:

1. Ensure balanced, current, relevant, and convenient access to the vast resources and services of the library;
2. Establish, strengthen and sustain the teaching-learning relationship among the 21st-century stakeholders and community;
3. Provide current and functional technology with reliable connectivity for library customers to become a knowledge-creator and innovator; and
4. Provide physical and virtual spaces for exploration, creation, and collaboration among library customers.

#### H. Silliman University as Secretariat in Advocating Local Knowledge in Whole-Person Education

In 2016, Silliman University became the secretariat of the Asian Universities Digital Resource Network for Local Knowledge, Inc (AUDRN). As a secretariat, the university leads the network in promoting "the (re)discovery and use of local knowledge in higher education and expand 21st century digital and critical literacy through capacity-building initiatives" ([www.audrn.weebly.com](http://www.audrn.weebly.com)). The network, as described on its website, is "a collaborative project of Miriam College and the United Board for Christian Higher Education and funded under the latter's Local Knowledge Initiative program since 2009". AUDRN is now having 21 partner schools in the country, which are all believers of whole-person education.

### Local Knowledge Case Statement

#### What is Local Knowledge?

Local Knowledge is a complex set of knowledge systems rooted in the context of a community within a defined territory, collectively owned and shared by the people, and identifies with their way of life. It provides an understanding of the experiences of the people rooted from a common history that generates similar worldviews and appreciation of their immediate, extended and external environments. These include native theories, beliefs and spirituality, customs and traditions, including practices and local technology, and insights of the elders in the community as well as the significant teaching of folklores which reflects lessons emanating from indigenous myths and legends. It is dynamic, evolving, non-discriminatory, and inclusive of the adaptive capacities of people to embrace change including its recognition of the psycho-social function of popular culture of the masses in society.

#### Local Knowledge in Whole Person Education

Stemming from a contextual and cultural framework of knowledge, AUDRN views education in a holistic approach that covers the intellectual, spiritual, humane, social and physical development of students. Local knowledge provides students with relevant perspectives in knowing, understanding, and actualizing education. In the midst of a globalized world and people's interconnectedness through virtual reality, local knowledge enables students to analyze and distinguish problems, create and perform solutions, and evaluate and decide what steps to take based on their own situated circumstances.

Image is captured from

<http://audrn.weebly.com/local-knowledge-case-statement.html>

#### V. SUMMARY AND CONCLUSION

Education 4.0 is a shared responsibility. The Fourth Industrial Revolution's pressing demand of disruptive innovation should be coupled with the institutional graduate outcomes. "Innovation and accepting change are now prerequisite for survival" [14]. All education stakeholders must fully understand disruptive innovation. "Disruptive innovation awareness must be the guiding principle behind education to ensure adaptability to change" [9]. "Disruptive innovation awareness must be emphasized by any educational sector [14]. Further, stable strategic partnerships and collaboration shall be established.



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