

Economic, Social, and Business: Revolution 4.0, Industry VS Agriculture in a Future of Agro-industry Development

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Indeed, we are in a rapidly changing world. Who would have thought that we already had three industrial revolutions, which brought significant changes by revolutionizing the production of goods and services and the way people communicate with each other. These industrial revolutions have impacted the technological, socioeconomic, and cultural aspects of people's lives.

A lot of technological breakthroughs emerged during the industrial revolution. New materials (iron and steel) were discovered and new machines were invented (power loom and spinning jenny). Large-scale industries emerged from countries once dominated by agriculture and handicraft. Productivity has further increased due to the introduction of mechanized manufacturing using new machines powered by new sources of energy and the utilization of division of labor which made work in the factory much more efficient. Agriculture also flourished.

Transportation run by steam was introduced and radio and telegraph improved communication. In terms of socioeconomics, the distribution of wealth for a wider section of the population was realized, and workers began to organize to protect themselves. There were also sweeping changes in the culture of the people, particularly in the way they handle things. They were brought to a higher level of productivity by being armed with new skills and the shift from hand tools to machines. This led to the rapid economic expansion of countries in Europe, particularly Great Britain, Belgium, and France, as well as the United States and Japan.

A Glimpse on the First Three Industrial Revolutions

The first industrial revolution was initially seen in Britain in the 18th century (1760 to 1840), with the rapid expansion of industries with the help of skilled workers, who first worked using hand production techniques before transitioning to machines, thus the mechanized factory system was born. New sources of energy were explored and became instrumental in the manufacture of products that were exported around the world. Steam run the mechanized cotton-spinning machine to produce textiles. The carbon rich fuel called coke was preferred in making huge supply of iron.

The first industrial revolution later spread to Belgium and France. Germany, another country in Europe, followed suit. Soon, non-European countries joined the bandwagon like the United States, Japan, and Soviet Union.

The second industrial revolution, which started in 1870 and ended in 1914, was marked by the further economic rise of Britain, Germany, France, Belgium, Italy, Japan, and the United States.

The mass production of steel as a result of the utilization of Bessemer process paved the way for the practical building of railroads, which has tremendously

improved and democratized transportation in that era. The railroad transport system has spurred modern business management.

Among the inventions in the second industrial revolution were the paper making machine, chemical in the form of synthetic dye, rubber, bicycle, automobile, fertilizer, machine tool, and the steam turbine.

Electric power came into picture, as well as maritime technology. Telegraph became a major way in which people communicate.

In the late 1950s, we saw the advent of the Third Industrial Revolution. Featuring the widespread use of digital computers, which facilitated record keeping and computing at a rate that has never been imagined, this era of high technology has been aptly termed as Digital Revolution. The new breed of super machine also made communication much faster.

With digitalization, a much more efficient technique has been invented to transform analog into its digital format, paving the way for the mass production of the original. Another wonder that digitalization did in communications by using a repeating hardware is being able to spread the signal in a perfect state. With digital technology, the transfer of files between media can be performed seamlessly, and getting and dispensing it can be done anytime and anywhere (en. wikipedia.org).

Game changing inventions were rolled out, which are very popular up to these days. These were the home computer, the video game console, arcade video games in the 1970s; electronic music, automated teller machines, electronic billboards, industrial robots, the first mobile phone, digital camera, and the world wide web were thing of the 80s; first HDTV broadcast, accessible World Wide Web, web browser, online internet banking, text messaging, expansion of the internet in the 90s; widespread use of cell phones, text messaging, internet, HDTV characterized 2000s; increased internet use, cloud computing, use of tablet and smartphones in 2010s.

With all the gadgets developed in the Digital Revolution, the people have been “more connected” and the flow of information unprecedented. Social media became very accessible with the extensive use of smartphones and access to Internet.

The interconnectivity brought about by the World Wide Web has also brought the consumers and the businesses side by side, allowing for more communications and easier transactions. With World Wide Web, companies were also able to reach a wider audience for their products, allowing for more sales and a truly international scope and operations. With the easy access and free flow of information from the consumers from different places, entrepreneurs were the given the convenience of faster and more efficient decision-making.

The Fourth Industrial Revolution

And now, we are facing another era of industrial metamorphosis called the Industrie 4.0, otherwise known as Revolution 4.0, or the Fourth Industrial Revolution.

The Fourth Industrial Revolution, simply put, complements business with digitalization to create smart businesses or factories, capable of capitalizing the information from upstream and downstream partners in creating highly customized products.

To achieve this goal, businesses must focus heavily on interconnectivity, automation, machine learning, and real-time data. Industry 4.0, also sometimes

referred to as IoT or smart manufacturing, marries physical production and operations with smart digital technology, machine learning, and big data to create a more holistic and better connected ecosystem for companies that focus on manufacturing and supply chain management (<https://www.epicor.com/en-ae/resource-center/articles/what-is-indus>).

A great feature of the Fourth Industrial Revolution is the required connectivity among business stakeholders to gather information about processes and products for further improvement.

The so-called Internet of Things (IoT), another highlight of the Fourth Industrial Revolution, fulfills the required connectivity. Devices such as sensors and smartphones are connected to automated systems via the Internet, making it possible to gather data that can be further analyzed and later serve as inputs in making important business decisions that can optimize the products and services offered to the customers. This is where machine learning comes using real time data gathered through the Internet.

With all these workings of the IoT, there are conceived benefits. Matthew Evans (2018), the IoT Program Head at techUK, said that IoT offers us the opportunity to be more efficient in how we do things, saving us time, money and often emissions in the process. It allows companies, governments and public authorities to re-think how they deliver services and produce goods (<https://www.wired.co.uk/article/internet-of-things-what-is-explained-iot>)

With the interconnectivity requirement of Industrie 4.0 came several issues that need to be addressed for its effective performance. Difficulty in connecting was experienced and seemed to be a problem by several gadgets. If this is the case, then the real time data required for a machine to learn and make important decisions for creating customized products is deemed impossible.

Another problem is the tendency of hacking devices connected to the Internet. The interconnectivity created by the Internet proved to be vulnerable to digital invasion by hackers, especially when there is unsecured connection.

James Clapper (2016), the US Director of National Intelligence said that “In the future, intelligence services might use the [internet of things] for identification, surveillance, monitoring, location tracking, and targeting for recruitment, or to gain access to networks or user credentials” (<https://www.theguardian.com/technology/feb/internet-of-things-smart...>).

But in spite of these challenges, the idea of Fourth Industrial Revolution is here to stay and they must be leveraged by business enterprises and other entities for greater benefit.

The question now is, can the Fourth Industrial Revolution possibly democratize its full potential in many countries, developed or developing, more specifically in their private enterprises? Will the Fourth Industrial Revolution work in a developing and at the same time, agricultural country like the Philippines?

These are the serious questions that need to be answered.

Many people are skeptical, casting their doubts due to the possible quagmire it may create, especially in developing countries where technology is not yet developed or, worst, still in the introduction stage.

They worry that countries cannot perform equally in the Fourth Industrial Revolution, as they are not on a level playing field due to the different stages they are in when it comes to technological development and adoption.

Another thing to consider are the businesses. Industrie 4.0 is all about smart factory or digitalizing businesses using the Internet. The businesses must be ready to invest in technology to catch up with the technological requirements of the new Industrial Revolution.

Businesses must also be ready to invest in its people. The right skills must be developed among the workers to cope with the new technology. To survive and to realize the true effect of Industrie 4.0, workers must be equipped with the right technological knowledge to be able to help in operating the smart factory. It is possible that robots might replace people who cannot cope with technology in the workplace. They must secure the necessary skills so they wont be displaced, but instead promoted to higher types of jobs.

The prevailing industries in countries must also be considered. There are industries that require more use of technology, while some requires less, like agriculture. But this does not mean that agriculture cannot be digitalized. Big farms can invest in technologies that will certainly improve and increase their produce, now that we are in the era where population continues to increase at an exponential rate and that many need to eat but the problem is the supply of food. This is true in many developing nations, like those in Southeast Asia, our beloved region.

The governments also play a part. Their policies and beliefs about technology will either make or break the successful staging of the Fourth Industrial Revolution in their countries. A government must have an environment that fully supports the new industrial metamorphosis. Programs must be rolled out that will encourage enterprises to take advantage of technologies that will make them smarter and better. The government must spearhead efforts towards the practical acquisition of technologies needed, so private enterprises will have no reason not to purchase these technologies to improve their operations through digitalization and provide better products and services for the customers, thus ensuring their satisfaction.

With all these issues, let us look at the readiness of my beloved country, the Philippines for the Fourth Industrial Revolution.

The Philippine Economic Structure

The Philippines is a newly industrialized country, as we all know. It has successfully shifted from agriculture to service and manufacturing industries.

The Philippines is now considered as one of the Tiger Cub Economies in Asia, together with Indonesia, Malaysia, Thailand, and Vietnam. It has exhibited aggressiveness when it comes to exporting products and technologies in other countries, leading to enormous increase in its economy.

The major exports that generated the \$811.73 billion economy (2016 GDP-PPP) of the Philippines were semiconductor and electronic products, transport equipment, garments, copper products, petroleum products, coconut oil, and fruits, and trading with partners such as the United States, Japan, China, Singapore, South Korea, the Netherlands, Hong Kong, Germany, Taiwan, and Thailand (www.globaltrends.com).

The Philippines' continuous roar as an important player in the economic scene in Asia can be attributed to past and present administrations of President Benigno Aquino and President Rodrigo Duterte. Clean governance, strong leadership, growing infrastructure and policy endeavors have catapulted the Philippines onto a path of faster growth (www.investopedia.com).

The Philippine Statistics Authority reported in April 2019 that the "The Philippine economy grew by 6.2 percent in 2018, slower than the 6.7 percent growth recorded in 2017. Manufacturing, trade and repair of motor vehicles, motorcycles, personal and household goods, and construction were the main drivers of growth for the year.

Among the major industries, services recorded the fastest growth of 6.8 percent. This was followed by industry with 6.7 percent, and agriculture, hunting, forestry and fishing (AHFF) with 0.9 percent.

Among the sub-industries, five (5) posted faster growth in 2018: Public Administration and Defense; Compulsory Social Security grew by 15.2 percent; Construction, 14.9 percent; Other Services, 7.7 percent; Electricity, Gas and Water Supply, 5.5 percent; and Transport, Storage and Communication, 5.4 percent.

On the other hand, the following sub-industries posted slower growth: Financial Intermediation, 7.2 percent; Trade, 6.0 percent; Manufacturing, 4.9 percent; Real Estate, Renting and Business Activities, 4.7 percent; Mining and Quarrying, 1.3 percent; Agriculture and Forestry, 1.1 percent. Fishing declined by 0.2 percent.

The Philippine Statistics Authority further revealed that in terms of share to the country's total Gross Domestic Product, services accounted for 57.8 percent of the total GDP in 2018. Industry recorded a share of 34.1 percent while AHFF comprised 8.1 percent of the national economy.

Things have improved for the services and industry sectors based on the data gathered from the previous year.

In 2017, services accounted for 57.5 % of the GDP compared to the industry's share of 34.0% and agriculture, hunting, forestry, and fishing's 8.5% of the national economy according to a report from the Philippine Statistics Authority in 2018.

The services sector is also the country's top employer. Data from the same agency declared that 55.4% of the 40 million labor force of the Philippines are working for service businesses, slightly lower than 2016's 56.2%. Less than half that of the services industry or 26.1% are working in the agriculture sector while almost 19% are deployed in the industry.

With the present status of the different sectors of the Philippine economy, the concern now is or should I say the big question is, which among these sectors will be adversely affected by the Fourth Industrial Revolution?

As earlier mentioned, the services sector is a major driver in the Philippine economy, contributing to almost 60% of the GDP, while its manufacturing and industrial sectors remain underdeveloped, generating less than a quarter of the economic output.

With this, let us take a closer look at the two subsectors of the services sector making waves in the economic scene in the Philippines.

First is the OFW subsector.

The Philippines, like many Asian countries, is known for exporting low cost and low skilled labor in countries around the world. This started during the administration of President Ferdinand Marcos, to address the worsening case of unemployment in the country. Mendoza (2015) said that in 2013, 1.8 million temporary migrant workers fanned out to more than 190 countries, each one bearing an employment contract issued and certified by the Philippine government: from factory and domestic workers to engineers and nurses, and a wide range of jobs in foreign labor markets (<https://www.worldpoliticsreview.com>articles>human-capital-the-philipp...>).

According to World Bank, Filipino OFWs working in the United States, UAE, Saudi Arabia, Qatar, Kuwait, Canada, Malaysia, Japan, Australia and other countries were able to contribute US\$28.4 billion or 10% of the Philippine economy in 2015. In 2018, the remittances reached US\$31.3 billion, a testament that the OFWs are constant major contributors to the nation's coffers for the country's development.

Second is the IT-BPO Industry

Another cash cow for the country is the IT-BPO industry. The industry is composed of eight sub-sectors, namely, knowledge process outsourcing and back offices, animation, call centers, software development, game development, engineering design, and medical transcription. The IT-BPO industry plays a major role in the country's growth and development (en.wikipedia.org).

The IT-BPO industry has an economic output comparable to the OFW subsector. In 2017, it has generated US\$22.1 billion. International financial institution and other organizations are very positive on the nation's IT-BPO industry in the years ahead. By the year 2022, the World Bank and outsourcing advisory firm Tholons have predicted the industry's income to reach US\$38.9 billion up to US\$48 billion. The contribution of the industry to the GDP is 9%.

The Philippine government is very supportive of the industry's growth, a proof is its inclusion as a priority in the MTPDP (Medium Term Development Plan 2004-2010) to generate 1.5 million jobs a year from 2004-2010. This effort, together with English proficiency, outstanding customer service, and technology has consistently made the Philippines the Call Center Capital of the World.

The Services Sector's Response to the Fourth Industrial Revolution

The Fourth Industrial Revolution has made it imperative for the Philippines to further improve its human capital being sent to other countries. And part of the effort is the enactment of the K to 12 Law and the Philippine Qualifications Network.

The K to 12 Law (RA 10533 or Enhanced Basic Education Act) has increased the taking of the basic education among the students to 12 years (from the previous 10 years) comprising of six years primary education, four years of Junior High School, and two years of Senior High School. In Senior High School, the students are free to choose from the following tracks: 1) Academic; 2) Technical- Vocational and Livelihood; 3) Sports, and 4) Arts and Design. Specifically, the Academic Track includes three strands: Accountancy, Business and Management (ABM); Humanities, Education, Social Sciences (HESS); and Science, Technology, Engineering, Mathematics (STEM). The Technical-Vocational and Livelihood track has the

following specialization in Agri-fishery Arts; Information and Communication Technology; Industrial Arts; and Home Economics.

According to TESDA, K to 12 is poised at preparing students for mid-level technical and life skills expected to make them more ready for college life and possible employment, as well as entry to business.

Another effort to make the human capital competitive in the international labor market is the implementation of the Philippine Qualifications Framework. According to TESDA, it describes the levels of educational qualifications and sets the standards for qualifications outcomes. It is a quality-assured national system for the development, recognition, and award of qualifications based on standards of knowledge, skills and values acquired in different ways and methods by learners and workers of a certain country.

With the PQF, Filipinos will now be more qualified to work in other countries as their qualifications are in sync with the international qualifications framework.

The effect of the Fourth Industrial Revolution is more pronounced in the IT-BPO Sector as technology is inherent in its operations. Technology has made it easier and more efficient for the IT-BPO companies to do their daily tasks and there is this threat of possibly substituting human workers with machines, now that these companies have learned the benefits of machine learning, artificial intelligence, and automation. Though technology is expensive, many companies in this sector have seen their costs diving in the long run with the use of technologies. Companies from this sector are now utilizing chat bots and AI, with the former answering the basic questions and concerns of clients and customers. With the advent of FIR, BPO companies became more strict in their recruitment, procuring people who have skills in decision making and critical thinking.

Fortunately, IT-BPO companies have bright prospects for the industry and are taking steps in favor of their employees. Many players in the sector are not seeing an exodus of their workers to other jobs. Benedict Hernandez (2019), the Chairman of the Contact Center of the Philippines (CCAP) said that “technological advances will augment, not replace call center workers”. He further added that “workers will be freed from mundane jobs and can move up the value chain” (<https://kittelsoncarpo.com>philippine-it-bpo-industry-expected-to-grow-t..>).

This upward movement in the career ladder for contact agents, as envisioned by Mr. Hernandez is already materializing. A shift from the call center operations to knowledge-based process outsourcing has been introduced by American IT-BPO companies in the country, making way for call center agents in mid-skill to high-skill jobs in accounting, animation, engineering, fintech, and legal work.

Character also comes into play to spare Filipinos working in the IT-BPO sector from the effects of FIR. The unique characteristic inherent among Filipino call center agents will save them from the threat of technology of the Fourth Industrial Revolution. Filipino call center agents are known the world over for their excellent and unparraleld customer service and the right attitude needed by big companies like Google and Amazon to provide a new customer experience.

The government, thru the Department of Internet Technology, and the academe, are also making actions to support the ever growing demand for workers in the IT-BPO Sector. There are recent improvements in IT services and provision of digital

literacy. According to Kittelson and Carpo (2019), a consulting firm, 50 universities have created classes on analytics, internet technology, and service management. In partnership with DepEd, students as young as grades 11 and 12 are already learning the skills for the IT- BPOs of tomorrow. The Philippines already graduates roughly half a million tertiary students each year (<https://kittelsoncarpo.com>philippine-it-bpo-industry-expected-to-grow-t..>).

The Philippine Agricultural Sector's Response to the Fourth Industrial Revolution

As the Philippines' service industry is bracing for the coming of the Fourth Industrial Revolution, the agriculture sector is also flexing its muscles to cushion against the effects of the new industrial metamorphosis. Although most farmers in the Philippines are not on the use of high technology, the government and other stakeholders, such as private entities and the academe, are strongly advocating the utilization of technology to make our agricultural sector more productive, efficient, and competitive. After all, this is what the Philippines was known for before becoming a newly industrialized country. And it has over one hundred million Filipinos to feed. So technologizing more the agriculture sector is the right thing to do.

As the Fourth Industrial Revolution is geared towards the use of technology, the private sector is inching their way towards this direction to further help the agricultural sector. The Philippine Society of Agricultural and Bio-Systems Engineers (PSABE) is working closely with the ASEAN Cooperation on Agricultural and Bio-Systems Engineering (ACABE) and the ASEAN Universities Consortium on Food and Agro-based Engineering and Technology Education (AUCFA) and is providing avenues for the further dissemination of technologies in the Philippines through forums and trainings. The engineers could help farmers in successfully linking agriculture with bio-systems engineering through the Internet of Things (IoT) and artificial intelligence. With the efforts of PSABE, more Filipino farmers have realized the benefit of mechanizing their operations. It also hopes to encourage young people to work in agriculture sector, now that farming has been introduced with technologies like AI and robotics.

PSABE's partnership with AUCFA and ACABE seeks to create a regional bond for the agricultural sector to better combat and deal with the challenges of the Fourth Industrial Revolution.

To strengthen the agriculture curriculum of the colleges and universities in the ASEAN Region and to create a single standard, they are evaluated and revised. This effort is expected to produce the same quality graduates and professionals in agriculture and agricultural engineering among the ASEAN countries, making work mobilization and cooperation possible for the effective implementation of Industrie 4.0. PSABE expects that with its affiliation with AUCFA and ACABE, it can raise the bar of competence among the agriculture and bio-systems engineers in the country.

The partnership of PSABE with AUCFA and ACABE also aims to increase the competence of local agriculture and bio-systems engineers with a little help from the state colleges and universities, government and private sectors.

Mr. William DAR, the current acting Secretary of the Department of Agriculture in the Philippines, has conducted studies on farms worldwide before and he observed

that almost a quarter of them are on bad state with no or less irrigation and unfit for farming.

In an article written by him in the Manila Times dated April 30, 2019, he pushed for “technologizing agriculture” and proposed 4 approaches such as “producing differently using new techniques; using new technologies to bring food production to consumers; increasing efficiencies in the food chain; and incorporating cross-industry technologies and applications.”

Mr. Dar referred to hydroponics, feedstock from algae, desert utilization thru seawater irrigation/farming, and use of bio plastics, genetic modification as the new way of production.

Hydroponics is a water, fertilizer, and space efficient and soil-less technique of growing plants. It is also organic because no pesticides are being applied.

Algae can be explored as alternative for feedstock and feed mill. Agriculture and bio-systems engineers can work together to come up with ways on how to utilize seawater in irrigating arid lands like deserts.

Recyclable bio plastics must be produced extensively to lessen environmental problems.

New technologies include cultured meat and 3D printing. The problem on supply, diseases, and animal welfare can be solved by cultured meat. 3D printing is slowly catching up in food production in the way of additive manufacturing where layers of materials are added up in the printing process using hydrocolloids (gel like substances) and soon to be replaced with natural ingredients like grass, algae, and duckweed.

Food chain efficiency that eliminates post harvest losses can be achieved by technologies such as GPS, cold storage, and internet connectivity.

Meanwhile, drone technology, food sharing and crowd farming, block chain, and nanotechnology and precision agriculture are ways of incorporating cross industry technologies and applications.

Dar said that in the Philippines, drones are being explored as means to apply pesticides in farms and recent experiment by the Philippine Rice Research Institute (PhilRice) showed a reduction of 90% as compared to regular application using traditional means. Drones can also be used in soil and field analysis, planting monitoring, crop progression monitoring, irrigation and health assessment, which are critical steps in the crop cycle.

Zero food wastage has been the discovered benefit of food sharing and crowd farming. Block chain has made it easy to monitor and regulate contaminated food products and inefficiencies in the supply chain.

Nanotechnology can bring precise agrochemical dosage for plants through programmed nanoparticles and farmers can now make precise crop decision making by the use of biosensors.

Dar also advocated the creation of an institution in the country that will oversee the implementation of the Fourth Industrial Revolution in the agriculture sector just like in India through the Consortium of Researches for Disruptive Technologies in Agriculture (CDTA), which is banking on technologies. The aim of CDTA is to help farmers in slowly adopting the new farming technologies, so as not to be

overwhelmed. However, the body does not suggest a total sweep of the basic technologies. Rather, the basics should be partnered with the new for the farmers and agri-enterprises to have high productivity and financial returns.

These suggestions by Mr. Dar will definitely make the Philippines' agricultural sector ready for the coming Fourth Industrial Revolution. This will be the future of the country's agro industry.

To end my lecture, let me give you this quotation by Klaus Schwab, Founder and Executive Chairman, World Economic Forum. He said that "We must develop a comprehensive and globally shared view of how technology is affecting our lives and reshaping our economic, social, cultural, and human environments. There has never been a time of greater promise, or greater peril."

Nothing is permanent in this world except change. We must embrace change, for change is not a problem but an opportunity. This Fourth Industrial Revolution must not be a problem for us. It should be treated as an opportunity, which will give us another chance to move forward just like what the past three industrial Revolutions brought and taught us.

But in managing this new industrial transformation, let the lessons of the past not be put into wastes, but rather be included in our arsenal of strategies, ready to be unleashed and complement the new ways of doing things.

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