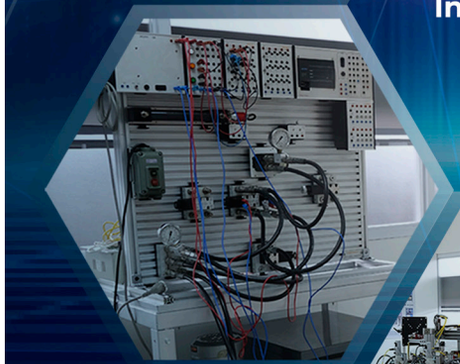
DIGITAL TRANSFORMATION:
THE WAY FORWARD
INDUSTRY 4.0 READINESS OF PHILIPPINE MSMEs



White Paper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Contents

Introduction

The way companies all over the world conduct their business is largely affected by the rapidly changing economic climate and the emergence of disruptive technologies such as digitalization and smart use of information and communications technology (ICT), known as Industry 4.0 (I4.0). The advent of I4.0 allowed the transformation of businesses worldwide into more competitive and flexible enterprises with adaptable business structures.

Are Philippine businesses ready for this transformation?

The Philippine economy largely depends on the performance of micro, small, and medium enterprises (MSMEs) which represent 99.51% [1] of all registered businesses. Carrying on their shoulders the very important role of keeping the economy robust, MSMEs need to be provided with enabling environments that will allow them to offer better product or service quality and improve overall efficiency. This can best be achieved through the upgrading of production technologies.

The Department of Science and Technology, through the DOST-Metals Industry Research and Development Center (DOST-MIRDC), implemented the Advanced Mechatronics, Robotics, and Industrial Automation Laboratory (AMERIAL) project from January 2019 to June 2022.

AMERIAL offers consultancy services to MSMEs, recommends technologies that will improve the firm's efficiency and operation, and gives insights on how to provide better customer service quality. Part of the project's objective is to determine the level of technology used in MSMEs' production floor and assess their readiness for digital transformation.

The AMERIAL project team was able to conduct consultancy services and assessments for 262 MSMEs. AMERIAL's engagement with MSMEs across the country led to the discovery that local businesses are largely still using Industry 2.0 (I2.0) and Industry 3.0 (I3.0) technologies. A few are even at the Industry 1.0 (I1.0) level. Although there are several I4.0 technologies available for the MSMEs' implementation, very few have transitioned to I4.0 (very few have the capability to implement such technologies).

Contained in this white paper are the AMERIAL team's findings on the technological capability of MSMEs and the various proposed technology upgrades that match the present MSMEs' technological capabilities. Within the pages of this white paper are descriptions of some of the challenges that hinder the majority of MSMEs from adopting new technologies and keep them from realizing improvement in overall efficiency.

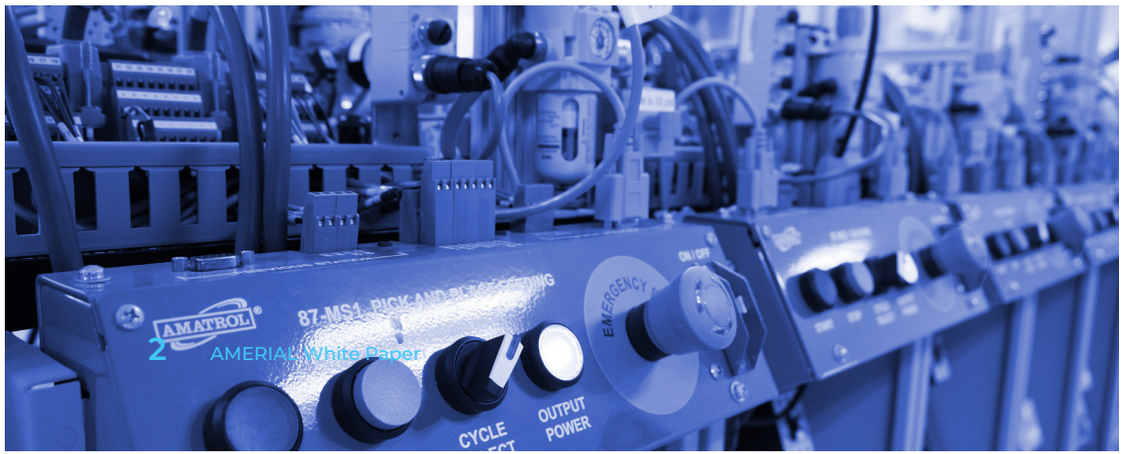
Innovation and Industrial Transformation

Innovation does not necessarily imply the invention of new or enhanced products but encompasses any novel approach to business organization, marketing strategy, or product distribution that allows the enterprise to differentiate itself relative to its market competitors [2]. History presents the way innovation transformed industries:

In the 18th century, it was I1.0. The use of steam power for industrial purposes and mechanization of production represented the most significant breakthrough which increased human productivity [3].

Then came the Second Industrial Revolution, or I2.0, in 1870 when the division of labor and electrical energy enabled mass production [4]. The introduction of computer power and automation in production ushered the Third Industrial Revolution or I3.0. This era is also characterized by machines and robots that replaced workers in assembly lines [5].

I4.0 changed the landscape even further. The IoT technologies were integrated into industrial value creation. These new technologies allow the manufacturers to harness entirely digitized, connected, intelligent, and decentralized value chains to deliver greater flexibility and robustness to firm competitiveness and build flexible and adaptable business structures [6].



Available I4.0 Technologies for Implementation of Philippine MSMEs

Below are several I4.0 technologies that MSMEs in the Philippines can readily implement:

Smart Sensors

The low-cost smart sensors that collect the data and status of the production line are available for MSMEs. These sensors are used to gather data on temperature, pressure, relative humidity, liquid level, flow, timers, and location (RFID). They can be installed in the existing equipment without disrupting its functions. These sensors will collect the necessary data to be used by the operator or other machines to perform their tasks.

Internet of Things (IoT)

IoT devices are cloud-connected sensors and physical objects that collect data from different production areas and transmit the data to servers or process them directly through microcontrollers. Low-cost computing devices, such as the Arduino or the programmable logic controllers (PLC), are combined with wireless communication modules to produce appropriate IoT devices. By using low-cost small computers, IoT devices can be manufactured with sufficient data collection and communication. These technologies can be readily applied to aquaculture systems, greenhouses, and manufacturing and food processing companies to control, monitor, manage resources, and optimize production processes. MSMEs can also use mobile applications for remote control and monitoring of their businesses.

Additive Manufacturing

Additive manufacturing or 3D printing can be readily used by MSMEs, particularly in the manufacturing sector, in their prototype development before mass production is performed. MSMEs can also benefit from 3D printers to create innovative products without incurring high development costs. Also, the cost of acquiring 3D printers has gone down significantly, and there are many types of printers available depending on the user's requirements.

Digital Marketing

The use of the internet in the food, manufacturing, and agriculture sector can significantly accelerate the respective businesses of MSMEs. The accessibility of online-marketing platforms, digital payment services, and logistics to MSMEs are considered game-changers in their respective industries. Companies can now access larger markets and accept payments through different payment methods, resulting in higher productivity and profit.

Pillars for I4.0 Transformation

Digital transformation is the process of using digital technologies to create new — or modify existing — business processes, culture, and customer experiences to meet changing business and market requirements [7]. Several established readiness assessment tools provide simple and intuitive ways for companies to assess their readiness and plans to harness the potential of I4.0 technologies.

The Smart Industry Readiness Index (SIRI) is an I4.0 readiness assessment tool developed by the Singapore Economic Development Board (EDB) in partnership with TÜV SÜD. SIRI is a suite of frameworks and tools to help companies – regardless of size and industry – start, scale, and sustain their manufacturing transformation journeys [8].

In this paper, the SIRI Technology Building Block was used as a guide to determine the I4.0 readiness level of MSMEs visited. According to SIRI, the following pillars must be present for any factory or plant to transform into I4.0 smart factory:

Automation

An automated system consists of a plant, a controller in the form of an automation computer, and peripheral devices. This environment is equipped with sensors that collect control data and actuators that perform controller commands. Further, interconnected fieldbus systems link the individual automation components together with the controller.

Connectivity

Connectivity measures the state of interconnectedness between equipment, machines, and computer-based systems to enable communication and data exchange across assets. Interoperability, the ability to access data across assets and systems with ease, is key to achieving this. Companies need to standardize or make use of complementary communication technologies and protocols to establish more open, inclusive, and transparent communications networks.

Intelligence

Intelligence is about the processing and analysis of data. This is important as modern manufacturing is no longer just about finding ways to operate faster while reducing expenses; it is also about doing so in a data-driven and intelligent way. With technologies such as cloud and data analytics, the vast quantities of data generated can be processed and translated into actionable insights to diagnose problems and identify opportunities for improvement. With machine learning, highly intelligent systems can assist the workforce in predicting equipment failures and changes in demand patterns [8].

An Examination of Shop Floor Automation: I4.0 Readiness of PH Enterprises

Technological capability is defined as the information and skills – technical, managerial, and institutional – that allow productive enterprises to utilize equipment and technology efficiently. It does not preclude the capability to undertake significant innovations or inventions, but it usually results from accumulating incremental technological efforts [9].

The AMERIAL assessed a total of 262 companies engaged in metal fabrication, aquaculture, agri-tourism farms, food and beverages, furniture, and pharmaceuticals, among others, from different regions. The assessment used SIRI as a reference and focused only on the shop floor automation dimension. Equipment and machinery on their shop floor were identified if they have applied automation technologies to control, monitor, and execute their production processes.

Most of these visited companies are beneficiaries of the Small Enterprise Technology Upgrading Program (SETUP) endorsed by the DOST Regional Offices. SETUP encourages and assists MSMEs in adopting relevant technology innovations to improve operational efficiency, increase productivity, and boost competitiveness [10]. The companies assessed were grouped under these categories: food processing, fabrication, agriculture, and others, see ***Figure 1***. The 'others' category is composed of companies from the pharmaceutical, textiles, printing, and those that do not fall into the three main categories.

MSMEs can be classified as micro, small, or medium based on the number of employees and their asset size. An enterprise is classified as micro if it has less than 10 employees, small if it has 10-99 employees, medium with 100-199 employees, and large with 200 or more employees. The number of employees was the basis used by the AMERIAL team in classifying the companies visited. Most of the companies visited are micro and small enterprises. There are only eight companies that are classified as medium enterprises as shown in ***Table 1***.

A shop floor automation assessment matrix based on SIRI was used to determine the automation level in the MSMEs' production area. The team formulated recommendations to improve overall productivity through technology upgrading and packaged these in proposals given to the MSMEs for possible implementation.

The companies visited were classified according to the automation level in their production processes:

- **None:** Production processes are executed by humans. Repetitive production and support processes are not automated.
- **Basic:** Production processes are executed by humans with the assistance of equipment, machinery, and computer-based system. Repetitive production processes are partially automated, with significant human intervention. Repetitive support processes are not automated.
- **Advanced:** Production processes are predominantly executed by equipment, machinery, and computer-based systems. Human intervention is required in unplanned events. Repetitive production processes are automated, with minimal human intervention [2].

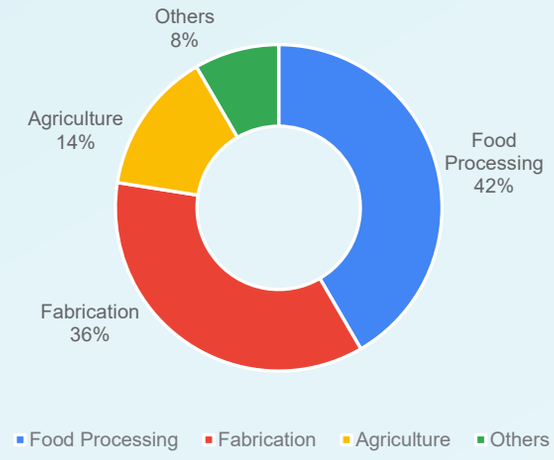


Fig. 1: MSMEs classification per sector

Table 1. Classification of MSMEs visited

Classification	No. of visited companies
Micro	152
Small	102
Medium	8

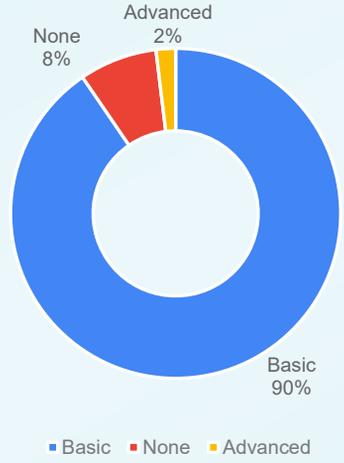


Fig. 2: MSMEs shop floor automation level

Figure 2 shows that 90% of the MSMEs have a basic level of shop floor automation in their production area. Most of the companies with a basic level of shop floor automation have locally fabricated, electric-powered, and stand-alone equipment, where human intervention is highly needed to complete the production process. The production of these companies is relatively low. They accept made-to-order jobs, such as custom-made furniture and iron works as well as specialized products like the province's delicacy. Generally, these companies' nature of business is predominantly in food processing and fabrication whose target market is only limited in their area.

Among the companies visited, 8% do not employ automation technologies on the shop floor. These are micro-enterprises which are backyard and family-owned businesses engaged in food processing and agriculture. Their typical production process mainly involves human labor to make *pasalubong* items and operate backyard farming. Their products are sometimes made-to-order and intended for resellers like those in public markets.

Five companies have an advanced level of shop floor automation. These companies require minimal human intervention in their production due to the nature of their businesses, such as pharmaceuticals, medical use masks, mass production of plastic products, and baby food products. These products have a wide range of market that requires consistent quality and mass production. The equipment present on their shop floor are a combination of locally fabricated and imported automated equipment. *Table 2* shows the machinery used and present on the shop floor per level.

Table 2. Equipment and technologies used based on the level of shop floor automation

None	Basic	Advanced
- LPG/ Biomass for cooking - Basic tools - Cutters - Manual packaging	- Electric mixers - Ovens - Electric-powered machines such as slicers, sealers - Electric-powered saw (band saw, table saw) - Grinders - Lathe machines - Air blowers - Water pumps - Air compressors	- Variable-frequency drive (VFD)-controlled machinery - PLC and human-machine interface (HMI) - CNC machines - Automated form-fill-seal machine - Automated filling-bottling-labeling machines - Timer and temperature-controlled ovens - Tank water level sensors - Automated textile printing machinery

Fig 3. Sample equipment available on the shop floor of MSMEs (a) none, (b) mixer, (c) automated folding

Technology Adoption through the Lens of the MSMEs

There are 222 proposals generated according to the needs of the companies visited. These proposals are classified according to the levels of technology (I2.0, I3.0, or I4.0).

- **I2.0 technologies:** Electric motors, machines running on electricity, motor control, and circuit protection, solar-powered systems
- **I3.0 technologies:** Electronics, PLC, HMI, VFD, computers, industrial robots, temperature, pressure and humidity controllers, level/proximity sensors, timers, automatic equipment, conveyor systems
- **I4.0 technologies:** IoT, smart sensors, enterprise resource planning (ERP)

• Assessment Activities of MSMEs Led to Proposals for Technology Upgrades

Proposals under I2.0 technologies (51%) were given to the companies to solve the maintenance problems of electric motors used in the production area. There are also proposed solutions to electricity supply problems, such as solar energy. The AMERIAL team also recommended to some companies the use of electric motor-driven machines and equipment to eliminate repetitive tasks and increase production output.

I3.0 technology solutions were contained in 47% of the proposals generated. These technologies include PLC, HMI, industrial robots, temperature, pressure, and humidity controllers, level/proximity sensors, timers, automatic equipment, and conveyor systems were provided to the companies to increase their productivity, reduce high labor costs, and maintain product quality. Out of the 222 proposals generated, only four companies (2%) were

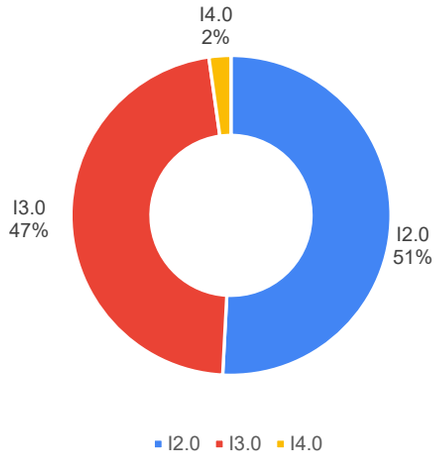


Fig. 4: Level of technology upgrade proposals

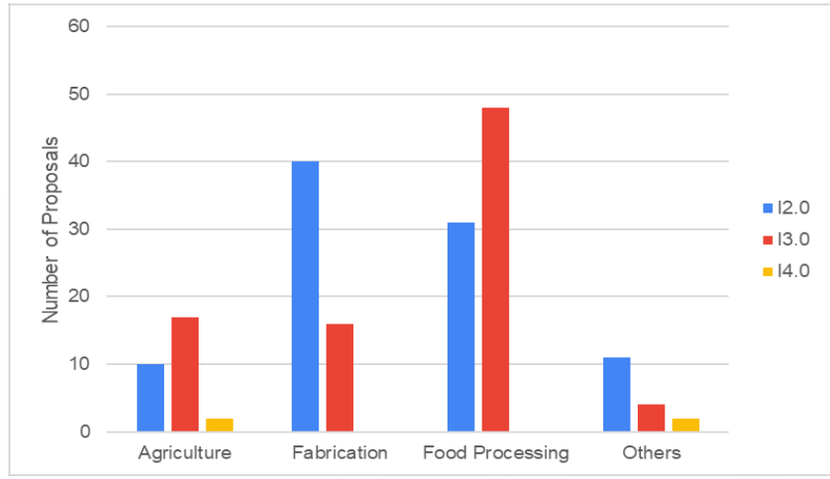


Fig. 5: Level of technology upgrade proposed for the visited MSMEs category or nature of business

recommended with I4.0 technologies. These companies are involved in printing services and aquaculture. See ***Figure 4***.

The described companies with I2.0 proposals are mainly from the fabrication and food processing sectors. These proposals are intended to improve companies' overall efficiency and productivity through mechanization and electric-powered machinery.

Most companies that were given I3.0 technology proposals are food processing companies transitioning from I2.0 to I3.0 level of production technology. These companies have motorized equipment that may be incorporated with automation technologies such as timers, sensors, and controllers to enhance their production process. For example, a timer or sensors can be integrated into a piece of existing electric-powered equipment with an on and off feature to dictate the start and stop of the process. By doing so, the operator can do other tasks while the process is still ongoing. This simple technology upgrade can help increase productivity.

The I4.0 proposals given to the companies offering printing services recommended the acquisition of ERP software to monitor their business operations regarding payroll, raw materials, business commitments, purchase orders, and other daily processes. The software is accessible online and through a mobile application that shows real-time monitoring and the status of the company's operation. This proposal is helpful for the company because their production and demand for their services are relatively high.

There are also I4.0 proposals given to two aquafarms. These proposals involve IoT, wireless sensor networks, and smart sensors for automatic control and real-time monitoring of the water quality parameters. The system will automatically regulate the water quality by controlling the aerators, feeders, and pumps for the production cycle. A mobile application and onsite monitoring are also readily accessible to view farm data, such as consumption, water quality, and other relevant data needed in the production cycle. ***Figure 5*** summarizes the major lines of businesses of the visited MSMEs with the corresponding levels of technologies contained in the respective proposals prepared by the AMERIAL team.

• Adoption Rate of Technology Upgrade Proposals

The adoption rate of the proposals is very low. Only 10 out of 222 proposals were implemented. These proposals are primarily in the I2.0 and I3.0 technologies for micro and small companies. Among the recommendations indicated is the installation of a motor protection system and troubleshooting automated equipment, which are relatively simple and low-cost. The company implemented the proposed solutions immediately to continue its business operation and avoid equipment downtime.

Two I4.0 proposals are ongoing implementation. The two firms have submitted project proposals for R&D collaboration with the Collaborative R&D to Leverage the Philippine Economy (CRADLE) program, under the DOST's Science for Change (S4CP) Program to solve their existing problems in aquaculture using new technologies. They are willing to shoulder monetary counterpart to provide testing materials for the study. Once the system is developed, the company will implement and use the solution in their aquaculture farms.

Figure 6. AMERIAL team staff installs a motor protection system for a visited enterprise

Barriers to Technology Adoption

During the visits and assessment, the company representatives were asked for their plans and insights about using technology in their business operations. They have identified several concerns about the firm's technology adoption challenges and barriers. The AMERIAL team conducted a semi-structured interview to determine if the suggested technology upgrades were implemented. For those that were not implemented, the company was asked for the reasons for the non-adoption of the proposal. This was done to determine the reasons for the low implementation rate of the proposed technologies.

Below are the challenges identified by MSMEs for technology adoption and upgrading of their production process:

• Technical

- **Lack of available machinery** - MSMEs have limited access to suppliers and fabricators mainly because the fabricators are located in Metro Manila. Advanced equipment are not locally developed and have to be sourced internationally. Meanwhile, available machines do not match their production capacity and specifications. In some cases, the equipment required by companies selling specialized products (custom-made) does not even exist.
- **Slow deployment of R&D outputs** - Equipment developed by R&D institutions were not used by MSMEs due to the complex documentation processes required to effectively transfer the technology.
- **No access to working prototype** - Alternatively, some MSMEs prefer to test and observe a working "proof of concept" before they

can be convinced to invest in a particular technology.

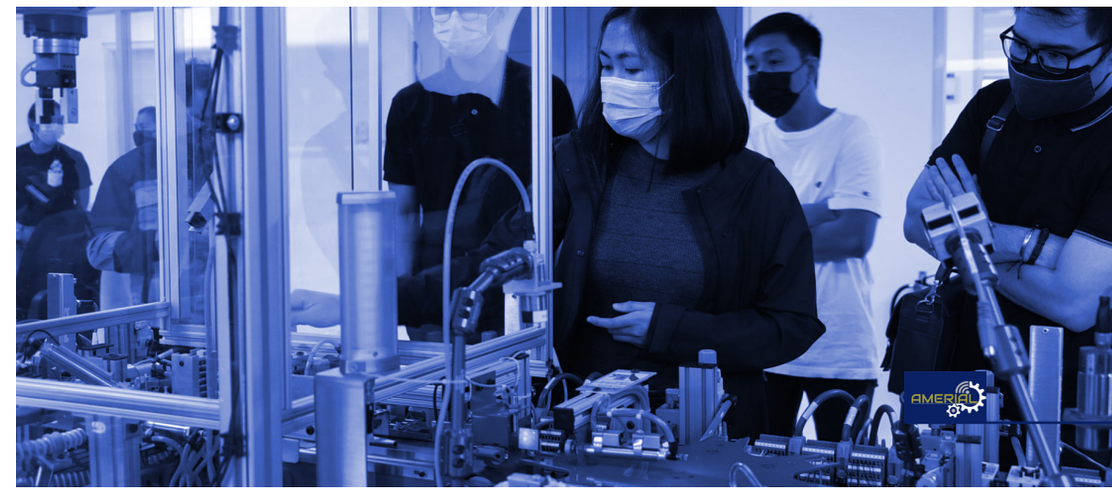
- **No R&D and innovation initiatives** - Most MSMEs do not have plans to engage in collaborative R&D with the academe and government institutions to upgrade their technologies and solve problems in their production. On top of that, the MSMEs' mindset is that engaging in R&D initiatives may take a significant amount of time and money to start and mature.

• Financial

- **High investment cost and risk of losses** - The use of more advanced technology requires a significant investment in machinery, equipment, and other business facilities. MSMEs are hesitant to replace the machines or production equipment used with more advanced technology because these have been matched already with their production capacity. Most of the available automated equipment has a high production capacity and is not yet appropriate to the requirements of MSMEs.
- **Manual/semi-automatic machines are suitable for small-scale production** – For local MSMEs, manual or semi-automatic machines are still profitable due to the small volume of production, fluctuating orders from clients, availability of cheap labor, and low technical level of the workforce.
- **No capital for equipment upgrade** – Most micro and small enterprises do not have expansion plans, particularly in the area of investing in new facilities and equipment. Their earnings are allocated to buy raw materials and for wages of employees, not for technology upgrades.
- **Limited market reach** – By upgrading technology, MSMEs face the risk that their increased production is not absorbed into the market due to limited marketing reach. Meanwhile, because not all MSMEs are located in cities and high-population areas, increasing the volume of production will entail additional logistics and transportation costs.
- **Abundance of cheap labor** – manual production process is more practical for MSMEs due to the availability of cheap labor. Having high-skilled personnel to operate and maintain more complex machinery and equipment results in higher operating costs for MSMEs.
- **Limited government assistance for MSMEs** – the companies acquired their machinery through the help of government loans and grants to improve their productivity, however, there are limits on the number of loans given to a company.

Competency

- **Lack of skilled workers** – MSMEs lack skilled workers to operate and maintain new equipment or automated systems. Most likely, these workers lack sufficient technical training and financial support to do so.
- **Insufficient training and support** – Others attended training offered by the government but did not deliver optimal results due to various difficulties including, but not limited to, mismatched training objectives, insufficient training courses, and a lack of post-training follow-up.



Socio-cultural

- **Lack of technology upgrading plans** – New machines, equipment, and other technological devices for business development are not an option for many MSMEs because they are satisfied with their current output. Most of them are solely concerned with earning money to support their families' fundamental requirements. Expansion and automation are not immediate business development goals. MSMEs also prefer quick returns to sustain their business operations; therefore, they are reluctant to invest in high-cost machinery with a long return on investment.
- **Fear of worker displacement due to automation** – There are also company owners who hesitate to acquire and utilize automated equipment because they think these machines will replace their workers and lose their livelihood.

Conclusion

The MSMEs are the backbone and drivers of the Philippine economy, contributing billions of pesos to the country's gross domestic product (GDP) and generating millions of jobs. Strengthening the MSMEs' technological capability through new technologies is the key to developing their businesses, improving their productivity, and becoming more competitive. Still, it was observed that most of the MSMEs visited have a very low level of technology used in their production area. They use manual or semi-automatic equipment and rely heavily on human labor to produce their products. Only a few companies have employed a combination of local and imported automated machinery – these are small and medium firms with a high production volume and broader market reach. Based on the shop floor automation level and the recommended technology upgrades, most MSMEs are still transforming their business from I2.0 to I3.0. They are not yet ready for I4.0. The low technology adoption of MSMEs visited is influenced by a lack of technical know-how about the new technologies, economic and financial concerns, a low level of technical competency of employees, and other socio-cultural and organizational issues.

To ensure that the firms will upgrade their production using appropriate technologies, they should have access to R&D, proper training, financial instruments, and a network of stakeholders in developing their businesses. Capacity building of local solutions providers through R&D collaboration and technology transfer will also enable faster technology upgrading and offer opportunities for innovation to the MSMEs.

Upgrading MSMEs and implementing digital transformation will result in a more efficient production process, better product and service quality, and increased profit, thus positioning them to become more competitive and sustainable. To improve technology adoption and promote innovation for MSMEs, the government's policies and programs related to introducing I4.0 must be strategic, long-term, sustainable, and inclusive. More importantly, policy and decision-makers must have a total understanding of the situation of the MSMEs on the ground.

The AMERIAL team directs your attention to the following action plans strongly recommended to lead to higher technology adoption rates that will ultimately result in the improvement of the business processes of local MSMEs:

1. Implement continued assessment of firms

A systematic and thorough assessment of MSMEs' technology needs should be implemented. I4.0 readiness assessment tools such as SIRI are necessary to analyze the technology level of companies and develop strategies and plans for their digital transformation. Based on the companies visited, not all MSMEs have the capacity to implement technology upgrades outright in terms of technical and financial resources. It is essential to determine which companies have the potential to use automation and intelligent technologies and can immediately implement digital transformation. Below are the criteria of firms with a high probability of implementing automation and I4.0 technologies needed to improve their business:

- **Business Goals** –The type and level of technology suitable for the company are dependent on its goals and targets. Companies should have technology upgrading plans to accommodate business expansion and innovations.
- **Company Size and Volume of Production** – Most micro and small companies do not have the required production volume to benefit from automation applications. Using manual or semi-automatic equipment and human resource is more suitable for these companies than high-volume and fully automated production machinery. Based on the data gathered, the small and medium-sized companies with higher production and broader market reach can take advantage of automation and digital technologies.
- **Financial Resources** – The acquisition of new equipment, the facility building, and hiring a skilled workforce for technology upgrades require funding to sustain the company's operation. Firms with robust profit sources and access to financial tools are ready to adopt new technologies.
- **Competency of Workforce** – To implement new technologies on the production shop floor, companies should have a competent workforce to operate and maintain the new equipment and automated machinery.

The output of the assessment is the recommendation of the technology appropriate for the company's needs, technology upgrading plan, and implementation strategy.

Figure 7. AMERIAL team conducts assessment activities for local MSMEs

2. Ensure availability of support for MSMEs' technology upgrading initiatives

Local providers to offer technology upgrades. The implementation of technology upgrades will be given to the solutions provider within the region, if available, to serve the needs of the companies. They can use their available technologies, equipment, and machinery to solve productivity problems and improve the MSMEs' overall efficiency. The solutions provider will also guide the company by training the personnel in the operation and maintenance of the new equipment or system.

Government and academe to provide R&D assistance if required technology upgrades are not offered by local suppliers. If there is a requirement that cannot be offered by the suppliers, fabricators, or system integrators, the company can avail of the R&D services of the government and the academe. Through R&D, the partner company will tap the expertise of research and development institutes (RDIs) and the academe to upgrade their business technologies. These R&D activities include equipment localization, scaling up/down machinery, developing custom-made equipment or process, and prototyping new products and processes. The technology output of R&D can be offered to adaptors through licensing and other modes of technology transfer to develop the equipment for other MSMEs. The R&D institute will also have to continue monitoring and assessing the output technology's design to improve the functionality further and optimize the fabrication processes.

Financial assistance to be made available to MSMEs that embark on technology upgrading. The MSMEs that cannot fund their required technology upgrade can access government programs (DOST, DTI, SUC extension program) related to financing and developing new technologies and equipment. They can also tap the services of fintech companies to fund their technology upgrading.

3. Enable MSME linkages through strengthened information exchange

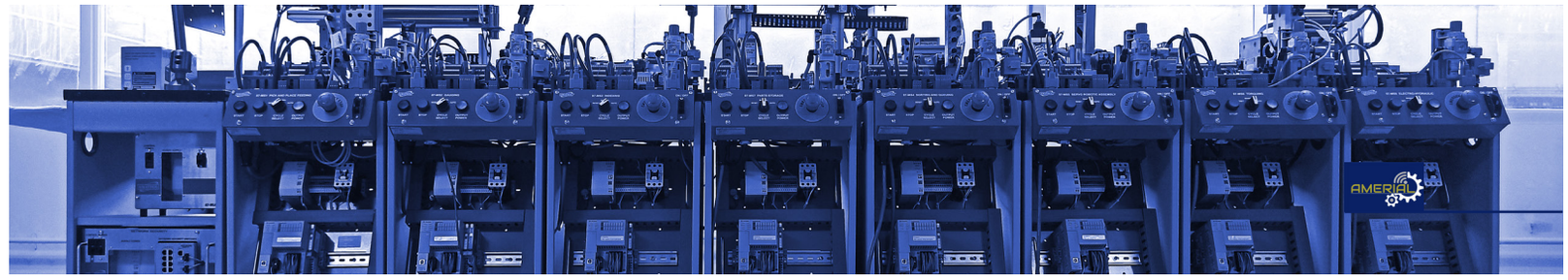
Government agencies, such as the Department of Trade and Industry and the Department of Information and Communications Technology, should collect and analyze data about the technological capability of MSMEs. This will lead to the development of more accurate plans and programs related to technology upgrading and digital transformation.

The government can also develop an online platform where MSMEs can connect to fabricators, suppliers, system integrators, training centers, demo factories and farms, R&D and funding institutions, the academe, government, and other stakeholders to develop innovative solutions for technology upgrading and overall business growth.

4. Assist local solutions providers in supporting the technology upgrading of the MSMEs

There is a need to survey and assess the existing pool of technical solutions providers in the regions that offer fabrication, maintenance, and consultancy services to MSMEs. Their products and services can enable faster technology upgrades and deliver technology solutions directly to local clients. The government can make policies and programs that foster effective linkages between MSMEs and solutions providers.

Further, R&D institutions can tap these solutions providers to facilitate and promote the widespread adoption of their respective developed technologies.



AMERIAL: Providing Local MSMEs with a Strong Foundation in Preparation for Technology Upgrading

DOST-MIRDC established the AMERIAL as a complementary facility to create advanced manufacturing systems and enable technology-based processes to be accessible to more industries.

In its aim to build a strong foundation for the Fourth Industrial Revolution or I4.0, AMERIAL provides the support to advance the technology, improve the workforce, and increase the competitiveness of MSMEs in various industries that will benefit from the adoption of advanced manufacturing systems.

AMERIAL is open to partnering with you, the country's decision- and policy-makers, in realizing the vision of having competitive and productive MSMEs empowered through the accelerated utilization of technologies to upgrade and enhance the productivity of local enterprises.

Figure 8. The AMERIAL project team with DOST-MIRDC Executive Director and AMERIAL Project Leader, Engr. Robert O. Dizon (center).

DOST-MIRDC Offers R&D Interventions and Collaborations to Boost MSME Competitiveness

Attuned and responsive to the requirements of MSMEs, the DOST-MIRDC has started to roll out various activities in line with its long-term R&D plan spanning 10 years. The Center is leveraging its pool of experts and optimizing the use of its resources to carry out R&D programs in the fields of surface engineering, metalcasting, additive manufacturing, smart farming, engine development, biomedical implants and components, mass transportation, and advanced defense system. All these R&D programs fall under specific areas identified as top R&D priorities of the Center: agro-industrial machinery; health; mass transportation system; and defense and security.

AMERIAL's experts and technology portfolios contribute significantly to the implementation of R&D projects that cover all the above-mentioned priority areas. The mechatronics, robotics, and industrial automation capabilities of the AMERIAL provide significant technology-based interventions that allow various projects to achieve major milestones and ultimately reach completion.

Automation has been utilized in several of the Center's projects: those related to medical devices and control systems; agro-industrial applications; alternative mass transportation technologies such as the Automated Guideway Transit System, Hybrid Electric Road Train, and the Hybrid Electric Train; and the BUHAWI project, which is a remote-control weapon station intended for use of sea vessels of the Philippine Navy.

These are just some of the projects that address all four priority areas of the DOST-MIRDC.

The Center's R&D capabilities are continuously enhanced through the various technologies housed in its facilities. DOST-MIRDC established another technology hub, the Advanced Manufacturing Center (AMCen), whose focus is on

additive manufacturing. AMERIAL and AMCen are two of the Center's facilities that embody the DOST-MIRDC's proactive pursuit of optimizing the use of modern technologies to serve the metals, engineering, and allied industries.

AMERIAL, AMCen, and the rest of the Center's facilities showcase the DOST-MIRDC's R&D capabilities which may be accessed by the government, industry, and the academe through collaborations. R&D interventions and collaborations offered by the DOST-MIRDC will support local MSMEs and help transform businesses and stakeholders into more resilient and competitive organizations, more capable of facing challenges effectively through science, technology, and innovation.

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References

[1] 2020 MSME Statistics, Retrieve from: https://www.dti.gov.ph/resources/msme-statistics/

[2] Lavilla, D. S. (2020), Innovation and digital transformation: How are Philippine MSMEs Performing?, Retrieved from: https://www.pwc.com/ph/en/business-unusual/innovation-and-digital-transformation-how-are-philippine-msmes-performing.html

[3] Industrial Revolution - From Industry 1.0 to Industry 4.0, Retrieve from: https://www.desouttertools.com/industry-4-0/news/503/industrial-revolution-from-industry-1-0-to-industry-4-0

[4] The Industrial Revolution 4.0, Retrieve from: https://www.thedualarity.com/industrial-revolution-4-0-2/

[5] Industry 4.0: Opening a door to new opportunities for the food and beverage industry, Retrieve from: https://www.foodengineeringmag.com/articles/97496-industry-40-opening-a-door-to-new-opportunities-for-the-food-and-beverage-industry

[6] Sony M. (2020), Pros and cons of implementing Industry 4.0 for the organizations: a review and synthesis of evidence, Production & Manufacturing Research, 8:1, 244-272

[7] What Is Digital Transformation?, Retrieved from: https://www.salesforce.com/ap/products/platform/what-is-digital-transformation/#:~:text=Digital%20transformation%20is%20the%20process,digital%20age%20is%20digital%20transformation.

[8] The Smart Industry Readiness Index, Retrieved from: https://www.tuvsud.com/en-ph/resource-centre/white-papers/smart-industry-readiness-index

[9] Yun, Mikyung (2019), Technological Capability of MSMEs and Implications for Innovation Policy: A Case Study of Vietnam. © Korea Institute for International Economic Policy. http://hdl.handle.net/11540/11384

[10] Small Enterprise Technology Upgrading Program. Retrieved from: https://ncr.dost.gov.ph/program_setup.php