APPLICATIONS OF INDUSTY 4.0

Malaysia has put in place the National Policy on Industry 4.0 - **Industry4WRD** - that provides a concerted and comprehensive transformation agenda for the manufacturing sector and its related services.

INDUSTRY 4.0 & TECHNOLOGY

will bring about fundamental changes in the way products and services are **produced, delivered and consumed.**

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- ADDITIVE MANUFACTURING /3D PRINTING
- ADVANCED MATERIALS
- ARTIFICIAL INTELLIGENCE
- AUGMENTED REALITY
- AUTONOMOUS ROBOTS
- BIG DATA ANALYTICS
- CLOUD COMPUTING
- CYBERSECURITY
- INTERNET OF THINGS
- SIMULATION
- SYSTEM INTEGRATION

As the next wave of technology advancement promises to bring about positive changes to the industry, the impact of adopting new technology to improve manufacturing and related services will boost productivity in many ways including:

1 DIGITAL INFRASTRUCTURE & ECOSYSTEM

Productivity and efficiencies are boosted with the adoption of digital information.

2 HUMAN CAPITAL DEVELOPMENT & EMPLOYMENT

Employment will be affected where the demand for employees with high competencies will be increased.

3 BUSINESS ENVIRONMENT & POLICY

The introduction of new technologies is creating entirely new ways of serving existing needs thus significantly disrupting existing value chains.

4 STRATEGIC INVESTMENT

Investment in adopting new technologies will positively impact product development and its processes in order to help industry players gain international lead.

INDUSTRY 4.0: ADVANTAGES & APPLICATIONS

Industry 4.0 will bring a new face to the manufacturing industry by creating factories that are smart, agile, flexible and more responsive.

ADVANTAGES

AUTOMATION

Industrial environment becomes fully automated as a result of digitalisation transforming the industrial environment.

AI
Data management
Machine learning-based data cleaning and wrangling tools can automatically identify "dirty" data and decide whether to remove or correct it.

CLOUD
Automated analytics
Digital twin cloud platforms collect information regarding the use and performance of complex physical objects, and model the information in a virtual environment with simulation and analytics tools.

AUTONOMOUS ROBOT

Production applications
Robots for handling (packaging, selecting and placing parts) will improve welding and assembly applications.

Autonomous navigation
Robots deliver raw materials and parts for manufacturing, and handle distribution and logistics throughout the supply chain.

FLEXIBILITY

The environment becomes unified with connected systems enabling interactions within and between systems to allow self-configuration, failure predictions and adaptation to changes.

BIG DATA
Data science self-configuration applications
An application that helps data scientists to minimise and reduce the work of data cleaning-up and feature selection.

3D PRINTING
Customisation
Customers can design and produce products based on their specific requirements for sizes, shapes, and design preferences, thereby creating personalised products.

CLOUD
Predictive maintenance and asset optimisation
Cloud computing predicts when failures are likely to happen in the future based on historical machine data, usage information, and likely environmental conditions—rather than just flagging a potential issue that has been detected in real-time.

SIMULATION
Self optimisation
Simulation of manufacturing processes uses a myriad of production settings in order to find optimal ways to manufacture products. Simulations will also be used to test products under varying degrees of operating environments with different types of materials.

INTEGRATION

Operator interactions remain the same regardless of the types of control or system architectures. Uniformity of information offers real benefits for users and forms the basis of the economy for manufacturing plants.

ADVANCED MATERIALS
Graphene
As one of the key nanomaterials to add value to four high-growth sectors: electronic devices & systems, energy & environment, food & agriculture, and healthcare wellness & medicine.

SYSTEM INTEGRATION
Sensors and smart appliances
System integration fosters improvement in communication for both, M2M (machine to machine) and M2H (machine to human) operations. It expands efficiency in the industrial environment through improved communication and data sharing channels across multiple value chains.

SIMULATION
Virtual reality in design development
VR aids design builds and collaborations between teams that are located physically apart. Design teams use VR to simulate various stages of the manufacturing process.

GREATER EFFICIENCY

Traditional production relationships among suppliers, producers, and customers will be altered, as well as interactions between humans and machines.

IOT
Smart enterprise control
Smart glasses (google glasses)
IoT technologies enable a tighter integration of smart connected machines and smart connected manufacturing assets.

CYBERSECURITY
Cybersecurity on IoT devices
The system focuses on safeguarding systems and networks against cyber-attacks and supports systems' distributed operations. Software engineering and artificial intelligence will be used to embed autonomic capabilities into systems for intelligent operations.

AUGMENTED REALITY
Smart glasses (google glasses)
AR takes photos and videos to document deviations during pre-series production testing, providing a faster and more precise means of subsequent analysis.

3D PRINTING & ADVANCED MATERIALS
Lighter and stronger materials
In aerospace and automotive, Airbus has 3D-printed metal parts for its 300-series aircraft that are 50% lighter and stronger.

INDUSTRY 4.0 : WHAT ARE THE CHANGES?

NEW
What new trends have shown up?

SHIFT
What has shifted from one form to another?

DISCONTINUED
What has been discontinued?

ADDITIVE MANUFACTURING/ 3D PRINTING

- Produces complex parts that require less post-processing steps.
- Brings limitless applications from preproduction to end user products.
- Cuts down on waste and cost due to overproduction and overhead expenses.

From: Over production of products.

To: Lean manufacturing; cutting down on waste and cost.

- Limitation on design to cut cost production.
- The need for tooling, moulds and dyes.

ADVANCED MATERIALS

Materials with the ability to interact with their surroundings to improve and adapt performance e.g. respond to light and other forms of electromagnetic waves, and translate related signals into behaviour.

From: Producing products that are static.

To: Multi-functional products that are sensitive and reactive to their surrounding.

Limitation on product flexibility and functions.

ARTIFICIAL INTELLIGENCE (AI)

The development of programs that can teach themselves to learn, understand, reason, plan and act when exposed to new data in the right quantity.

From:
- Time consuming manual programming and analytics.
- One size fits all products.

To:
- Real-time, automated programming and analysis through advanced machine learning.
- Hyper personalisation of products and services.

- Manual programming and analysis that require human intervention and take up a long processing time to produce results.
- Data update—AI has the ability to process information and learn from input data.

AUGMENTED REALITY

- Allows augmented imaginary (virtual information) to be placed in front of physical infrastructure in real world.
- Showcases customer information about products; in terms of design, function and actual size without creating the physical copy.

From: Workers operating machines based on information displayed on dials, gauges or screens.

To: Using sensors, cameras and motion sensors to accumulate information and displaying the images into real world during work (virtual image on top of real things or devices).

- Human error and inefficient methods.
- Decreased output and increased operation cost.

AUTONOMOUS ROBOTS

Robots can do more on their own, including learning on the job and teaming up with other robots and humans.

From: Leveraging human labour to operate.

To: Effective use of human labour that channels energy on value-added activities.

- Time limitation on production since robots can be automated and not bound to working time.
- Dangerous and risky job processes and testing, especially for prototyping.

BIG DATA ANALYTICS

- Improves customer experience and product quality, realises energy efficiency and conducts predictive maintenance.
- It is now possible to collect masses of data from several different sources to direct decisions that anticipate product or equipment failure.

From: Data for improving internal operations.

To: Using customer data to optimise products and pricing strategies.

Product failures—by correlating all of the data captured in the operational process, allowing identification of patterns helps to discharge fault early in the process and improves production quality.

CLOUD COMPUTING

- Cloud computing offers a network of remote servers to store, manage and process data.
- Brings new intelligence and knowledge to the environment that change the roles and functions of existing operating systems.

From: Managing hardware and software to operating systems.

To: Data driven processes with intelligence that change the roles and functions of existing operating systems.

High capital for data storage or servers. Cheaper and faster technologies are making cloud computing economically viable.

CYBERSECURITY

Industrial communication is expanding and it is strongly connected. As such, digital security becomes a critical aspect that must not be overlooked in the industrial environment.

From: Security of internal networks.

To: Security of networks and IoT devices.

Data exploitation and Intellectual property (IP) theft, especially on trade secrets.

INTERNET OF THINGS (IoT)

The embedding of physical devices with sensors, network connectivity and other components allows data to be collected and exchanged.

From: Disjointed data all over the system, making it difficult to obtain a real-time view of assets, people and transactions.

To: Enabling real-time data sharing between all parts of the system, and all connected parties.

- Human analytics for decision making.
- False communication between various working departments in production.

SIMULATION

Technology that forms imitations of situations, processes and environments by projecting it through virtual reality (VR).

From: Complicated and time consuming tools that are unable to adapt well enough to the rapidly changing manufacturing techniques.

To: Reflecting reality and the physical world in virtual form (virtual form of the machines, products and humans).

Training—a dangerous ecosystem can be practically trained through a virtual ecosystem that mimics the real world.

SYSTEM INTEGRATION

System integration occurs in vertical (within the industry value chain) and horizontal systems (across multiple value chains), eventually achieving end-to-end digital integration across the entire value chain.

From: Countless devices running separately, information not being fully utilised.

To: Improved overall communication throughout the value chain across vertical and horizontal systems.

Data redundancy or the requirement of re-entering data created by manual data entry.

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