Restructuring Existing Workforce Towards Higher-skilled Workers.

Industry 4.0 – Centre Of Excellence

Leading the Factory of the Future

13 September 2017
INDUSTRY 4.0: Challenges in Malaysia

1. THE MIDDLE CLASS
   - Population 🚀 Job Opportunities 🔻

2. LOW INTEREST IN ENTRY-LEVEL JOBS
   (eg General, Mundane, Repetitive Work, 3D-Related Jobs)

3. HIGH UNEMPLOYABILITY
   Prevalent Among Non-Engineering and ‘Relevant’ Information Technology Graduates, which Covers 85% of Graduates.

4. SMALL POPULATION (30 MILLION)
   - Low Consumer Utilisation
   - High labour Cost Due to Less Competition

INDUSTRY 4.0: Solution for the above challenges.
PSDC ROLE: TO ADDRESS 2 KEY ISSUES

SME as Support Pillar for Industry 4.0

- To be led by SMEs, not by Principals

Supply Chain
Industrial Internet of Things
Horizontal & Vertical Integration
Cybersecurity
Cloud
Big Data Analytics
Autonomous Robot
Simulation & Augmented Reality
Additive Manufacturing

Talent

Current
✓ Pneumatic
✓ Hydraulic
✓ Electrical Motor

Future
✓ Pneumatic
✓ Hydraulic
✓ Electrical Motor
✓ Simulation & Augmented Reality
✓ Horizontal & Vertical Integration
✓ Industrial Internet of Things
✓ Cybersecurity
✓ Cloud
✓ Additive Manufacturing
✓ Supply Chain
✓ Big Data Analytics
✓ Autonomous Robot
THE 11 TECHNOLOGY PILLARS

11 Pillars of Technological Advancement

- Autonomous Robot
- Simulation & Augmented Reality
- Horizontal & Vertical Integration
- Industrial Internet of Things
- Cybersecurity
- Artificial Intelligence
- New Business Models
- Cloud
- Additive Manufacturing
- Supply Chain
- Big Data Analytics
INDUSTRY 4.0: HUMAN CAPITAL

Distinct abilities in complexity management, problem solving and learning aptitude as well as high flexibility

Interdisciplinary experts with comprehensive IT knowledge and in-depth expertise in processes, production and logistic

Qualification for short-term and less predictable activities

Planning, control and analysis as work priorities
INDUSTRY 4.0: TECHNOLOGY Vs SKILL

Mechanisation
- Mechanical System
  - Mechanical Assemblies

Electrification
- Mechatronics System
  - Electronics
  - Mechanical Assemblies

Digitalisation
- Automated System
  - IT & IP numerical-digital controls/CNC, PLC
  - Electronics
  - Mechanical Assemblies

Cyber-Physical System (CPS)
- CPS System
  - Embedded ICT communicate with Physical things
  - IT & IP
  - Electronics
  - Mechanical Assemblies
INDUSTRY 4.0: GOVERNMENT

KEY ACTIONS NEEDED

MAXIMIZE JOB CREATION THROUGH I4.0

NATIONWIDE STRATEGIC ROAD MAP ACROSS MINISTRY

PROMOTING & ENFORCEMENT

REVIEW, REVISE POLICIES
INDUSTRY 4.0: INDUSTRIES

KEY ACTIONS NEEDED

- Retrain/Upskill Current Employees
- Adapt & Adopt New Org Structures & Culture
- Industry 4.0 Recruitment
- Strategic Workforce & Retention Planning
INDUSTRY 4.0: EDUCATION

KEY ACTIONS NEEDED

- Broader Skill Set (Multi-Discipline)
- Close the IT Skill Gap
- New Format for Further Study
- Hybrid Program
INDUSTRY 4.0: TRAINING STRATEGY

TALENTED & COMPETENT WORKFORCE
(SMART PEOPLE)

INDUSTRIES
GRADUATES (UNEMPLOYED)
TERTIARY (TVET & ACADEMIC)
INDUSTRY 4.0: TRAINING STRATEGY

ORGANIZATION

Corporate Culture
- Corporate Framework
- Strategic (Vision, Mission)

Program Management
- Master project planning
- Project deliverables

Execution
- Project lead
- Sustainability

PSDC

- Industry 4.0: Leading the factory of the future
- Industry 4.0: Balancing ROI & Productivity improvement

- Industry 4.0: Step 1 to 6
- Predictive Maintenance through Industry 4.0
- IT for OT (Non-IT)

- IoT design using Adriano / Raspberry
- 2D AR Design Lab
- Advance Image processing Architecture

- Industry 4.0 National Conference
- PSDC member’s sharing/competition
INDUSTRY 4.0: TRAINING STRATEGY

ACADEMIC LEVEL

SECOND DEGREE
- Data Scientist
- Strategic System Integrator

FIRST DEGREE
- System Developer/Designer
- Cloud/Cyber security experts

DIPLOMA/CERT./TVET
- Industry Specialist
- Automation & Robot Specialist

PSDC

- Statistical data modelling for predictive action plan
- Industrial technology & challenges

- Augmented Reality system development for 2D & 3D
- Cyber security for SSL, HA for IoT embedded system

- What is predictive maintenance?
- What is M2M interconnectivity?
- Robot system programming & safety

- Special grant for Industry 4.0 entrepreneurship among unemployed graduates
INDUSTRY 4.0: TRAINING STRATEGY

ACADEMIC LEVEL

SECOND DEGREE
• Data Scientist
• Industry 4.0 System Integrator

FIRST DEGREE
• Product Developer/Designer
• Cloud/Cyber security experts

DIPLOMA/CERT./TVET
• System Integrator Specialist
• Industrial IoT Specialist

• Industrial Trainee program @ Industry 4.0 compliance site
INDUSTRY 4.0: FRAMEWORK

DSN - BLOCKCHAIN

Supplier → Manuf’rg → Customer

TECHNOLOGICAL TOOLS

SENSORS & ACTUATORS

NETWORK

INTEGRATION

Data → Information → Alert → Trigger point

IaaS → PaaS → SaaS

Private → Public → Hybrid

M - Measure
A - Analyse
A - Act

INTERNET

BIG DATA ANALYTICS

- Data analysis with mathematical techniques from statistics, data mining, and machine learning.
- Used to uncover hidden patterns that yields competitive advantage.

Diagnostic analysis
- What happened and why?
- Used for customer segmentation.
- Diagnostic with clustering or classification techniques.

Predictive analysis
- What will happen in the future?
- Forecasting and propensity to buy.
- Predict with time series, neural networks, regression, ansvar, etc.

Prescriptive analysis
- What is the next best action?
- Channel or portfolio optimization.
- Linear programming, Monte Carlo simulation (Risk analysis), or game theory.
### INDUSTRY 4.0: & THE PILLARS

<table>
<thead>
<tr>
<th>WHAT IS IT?</th>
<th>TYPICAL APPS</th>
<th>BENEFITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply Chain</td>
<td>TYPICAL APPS</td>
<td>BENEFITS</td>
</tr>
<tr>
<td>o Digital Supply Chain Network (DSN)</td>
<td>o Manufacturing process</td>
<td>o Zero Defects</td>
</tr>
<tr>
<td>o Digitalization of the supply chain</td>
<td>o Digital Value Stream Mapping (DVSM)</td>
<td>o Zero variance</td>
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<tr>
<td>o Fully integrated</td>
<td>o Digital Spaghetti Mapping</td>
<td>o Reduce man hours and man power</td>
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<tr>
<td>o Multi-Directional End To End</td>
<td>o On Time Delivery</td>
<td>o Real time decision making process</td>
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<tr>
<td>o Real-time data exchange</td>
<td>o TIMWOOD reduction</td>
<td>o Increase productivity &amp; efficiency</td>
</tr>
<tr>
<td>o Fully integrated Supplier to Customer</td>
<td>o High Value Adds</td>
<td>o Achieve Digital LEAN manufacturing</td>
</tr>
<tr>
<td>Horizontal: Integrate through network &amp; value chain from Suppliers, the company itself, and the customers.</td>
<td>o SAP Hana, Oracle</td>
<td>o Improve OEE &amp; Business performance</td>
</tr>
<tr>
<td>Vertical: Integrate through network &amp; value chain across functional department ie.,Sales, R&amp;D, Procurement until customer services.</td>
<td>o Shop Floor system</td>
<td></td>
</tr>
<tr>
<td>Horizontal and Vertical Integration</td>
<td>o ERP (Enterprise Resource Planning)</td>
<td>o Paperless &amp; fully digitalize</td>
</tr>
<tr>
<td>o The used of IoT in the industrial apps</td>
<td>o MES (Mfg Execution System)</td>
<td></td>
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<tr>
<td>o Interconnectivity between sensor via cyber physical system</td>
<td>o Paperless Lot traveller</td>
<td></td>
</tr>
<tr>
<td>o Complete cycle involve Measure, Analyse and Act (MAA)</td>
<td>o RFID tag</td>
<td></td>
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<tr>
<td>o Sensor replace human (ears, eyes, nose, touch, etc.)</td>
<td>o Data, information, location</td>
<td></td>
</tr>
<tr>
<td>o Allows M2M and M2H communications &amp; data exchange</td>
<td></td>
<td></td>
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<tr>
<td>Industrial Internet of Things</td>
<td>o Critical process, machine, products parameter monitoring</td>
<td>o Reduce man hours and man power</td>
</tr>
<tr>
<td>o Self correction and adjustment closed loop control system</td>
<td>o Self optimization and improvement</td>
<td>o Real time decision making process</td>
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<td>o Self optimization and improvement</td>
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<td>o Ability to perform Big Data Analytics</td>
<td></td>
<td>o Achieve Digital LEAN manufacturing</td>
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<td>o Data for Predictive Analytics</td>
<td></td>
<td>o Closed loop system monitoring and control</td>
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## INDUSTRY 4.0: & THE PILLARS

### WHAT IS IT?
- Robot that work independently
- Interconnectivity & interoperability
- M2M & M2H communication
- Collaborative robot with Human

### TYPICAL APPS
- Loading & unloading of materials
- Inspection
- Logistic of materials
- Hazardous operation
- Warehousing management
- Assembly, test
- Drone, COBOT, Industrial Robot, AGV, Mobile Robot

### BENEFITS
- Zero Defects
- Zero mistake & zero discipline issues
- Reduce man hours and man power
- Increase productivity & efficiency
- Improve OEE & Business performance
- Optimize layout
- Eliminate people manager time
- No human constraint opn
- Replace foreign worker

### Autonomous Robot
- Simulation: 3D simulation by merging virtual and physical world together.
- Augmented Reality: Its an environment that includes both Virtual Reality and the Real world

### Simulation & Augmented Reality
- A process by which digital 3D design data is used to build up a component in layers by depositing material.
- The term ‘3D printing’ is increasingly used as synonym for AM.

### Additive Manufacturing
- Gaming

### Paperless organization
- Security & Proprietary control
- Interactive learning process
- Simplify problem solving approach
- Real time merging of data, information & action
- Improve compliance to regulatory standard
- New innovation & skills

### High-mixed Low-volume products
- Consumer & industrial apps
- Obsoleted spare part, JIT parts
- Metal: Stainless steel, palladium, aluminium, titanium
- Plastic: Polyamide, prime grey, transparent resin, ABS
- Fused Deposition Modelling (FDM)
- Stereo lithography
- Powder, Liquid and Solid materials

### Fast turn around time
- No need to stock up materials
- No design constraint anymore
- Eliminate components assembly
- Eliminate waste from Subtractive Manufacturing
- Support personalization and mass customization new demand patterns
# Industry 4.0: & the Pillars

## What is it?
- A technologies, processes, & practices designed to protect networks, computers, programs, data & machines from attack, damage, or unauthorised access.
- It includes all aspect of inter-connected devices, machines & systems in whole ecosystem.

## Typical Apps
- System, network, program, data
- BYOD for personal devices
- Internal & external treats
- Cyber terrorism, hacking, ransom ware, malware, virus attack
- IIoT system protection
- Firewall, System patching, encryption of password, penetration test and etc.

## Benefits
- Zero downtime
- Zero loss (money, resources)
- Security & privacy
- Protection of confidentiality of sensitive, highly classified information

### Cybersecurity
- A model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services).
- Service models: SaaS, PaaS, IaaS
- Deployment model: Public, Private, Hybrid

### Cloud
- Big data analytics is the process of examining large data sets to uncover hidden patterns, unknown correlations, market trends, customer preferences, and other useful business information.
- The analytics is a form of data automation for accurate and fast decision making process.

### Big Data Analytics
- Apps
- Data
- Runtime
- Middleware
- O/S
- Virtualisation
- Servers
- Storage
- Networking

- Apps
- Data
- Runtime
- Middleware
- O/S
- Virtualisation
- Servers
- Storage
- Networking

- Diagnostic, Descriptive, Predictive, Prescriptive Analytics
- Repair & maintenance optimization – reduce major breakdown & spare part management
- Customer demand pattern, trend & preference
- Process, products & industrial data, information analysis

- Zero Capex & internal resources
- Broad network access
- Rapid elasticity & development
- Measured service
- On demand self service
- Shared service & scalable
- Resource pooling
- Location independence
- Zero upgrade cost

- Reduce man hours and man power
- Real time decision making process
- Increase productivity & efficiency
- Data automation
- Closed loop system monitoring and control
- Drive for positive business results
- Dashboard real time visibility
INDUSTRY 4.0: Roles & Responsibilities

**CURRENT**
- Fire fighting
- Manual data tracking & analysis
- Manual recording
- Reactive problem solving
- Human dependant operation
- Just focus on IT
- Outsourced to 3rd party
- CLOUD adoption
- General IT
- Centralisation
- Lack of operation knowledge
- Fragmented system
- Too much of paperwork
- Document for compliance
- MBO (Management By Obj.)
- On site, Remote
- Micro & Macro Managing
- TRUST on PEOPLE

**INDUSTRY 4.0**
- Data driven
- BIG Data & auto analysis
- Electronics data pull
- Proactive problem solving
- Autonomous machineries
- Need to know operation
- In house expertise
- CLOUD and integration to IIoT
- System integrator (S/H/SI)
- Cross functional
- Must well verse with operation
- Integrated system
- Electronics based system
- Auto reporting for compliance
- MBD (Management By Data)
- Virtual but Visible
- SMART Management
- TRUST on DATA

**CONVERGENCE OF OT + IT**

**NEW PARADIGM**
INDUSTRY 4.0: Best things to happen to Malaysia

- I4.0 will address high un-employability and growing middle class populations.
- Jobs for non Engineering & Information Technology graduates.

- I4.0 will address Influx of Foreign workers.
- Automation and digitization will replace foreign labours

- High Degree of complexity in manufacturing and High Labour cost.
- The manufacturing can stay in Malaysia.

- Only if we choose to address the challenges collaboratively and systematically.
Thank You

www.psdc.org.my