

# **ARE WE THERE YET: RESEARCH AND INNOVATION TOWARDS INDUSTRIAL REVOLUTION 4.0**

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# THE CHALLENGES TO ACHIEVE A DEVELOPED NATION STATUS

- FRASCATI MANUAL (OECD,2002) DEFINES R&D AS COMPRISING BOTH PRODUCTION OF NEW KNOWLEDGE AND NEW PRACTICAL APPLICATIONS OF KNOWLEDGE
- R&D IS CONCEIVED AS COVERING : BASIC, APPLIED AND EXPERIMENTAL DEVELOPMENT
- HOWEVER IT'S THE LINKAGES BETWEEN R&D, ENGINEERING, ENTREPRENEURSHIP AND COMMERCIALISATION THAT GENERATE VALUE FOR WHAT WE CALL INNOVATION THAT DRIVE THE NATION
- THE CAPACITY TO IMPROVE PRODUCTION SYSTEMS DEPENDS ON WHAT TECHNOLOGY WE APPLY
- OUR PRODUCTION SYSTEMS WILL HAVE NO CHOICE BUT TO RELATE TO THE TYPES OF CYBER-PHYSICAL SYSTEMS MACHINERIES MANUFACTURED BY COUNTRIES LIKE GERMANY, JAPAN, UNITED STATES, CHINA AND OTHERS.
- IT IS IMPORTANT THAT THE GLOBAL TRADE CANNOT AFFORD FOR A COUNTRY LIKE MALAYSIA TO BE ISOLATED FROM WHATS HAPPENING IN THE WORLD

# INDUSTRIAL REVOLUTION 4.0

- THE ORIGIN OF THE **TERM IR4.0** RELATES TO THE FIRST INDUSTRIAL REVOLUTION OF 1800 WITH THE INTRODUCTION OF STEAM ENGINE AND HOW IT CHANGED THE INDUSTRIAL GROWTH
- **FIRST INDUSTRIAL REVOLUTION** (PHYSICAL SYSTEMS)1700-1750 :WATER AND STEAM
- **SECOND INDUSTRIAL REVOLUTION** 1800: MASS PRODUCTION POWERED BY ELECTRICITY
- **THIRD INDUSTRIAL REVOLUTION** (THE CYBER SYSTEMS) ELECTRONIC & IT AUTOMIZE PRODUCTION 1950-2000:
- **FOURTH INDUSTRIAL REVOLUTION** (THE CYBER-PHYSICAL SYSTEMS) 2000-2020
- THE TERM **“REVOLUTION”** SIGNIFIES A RAPID AND FUNDAMENTAL CHANGE COMPARED TO THE TERM **“DEVELOPMENT”**

# FOURTH STAGE

- THE FOURTH STAGE IS CHARACTERISE BY THE **CYBER-PHYSICAL SYSTEMS (CPS)**
- THE CPS IS A CONSEQUENCE OF **INTEGRATION OF PRODUCTION, SUSTAINABILITY AND CUSTOMER-SATISFACTION FORMING THE BASIS OF INTELLIGENT NETWORK SYSTEMS AND PROCESSES**

# CYBER-PHYSICAL SYSTEMS

- **MICROPROCESSORS** ARE THE BRAIN OF DIGITAL DEVICES AND SYSTEMS
- THE EXPLOSIVE GROWTH COMES FROM DEVELOPMENT OF VIDEO CAMERAS, RFID READERS, TABLETS, ENTRANCE TICKETS ETC.
- **INDUSTRIAL IP ADVANTAGE CONSORTIUM** ESTABLISHED IN 2013 ENGAGED IN THIS DOMAIN OF EXPERTISE

# INDUSTRIAL IP

- PROVIDES THE COMMUNICATION FABRIC NECESSARY TO SUPPORT THESE DEVICES
- BETWEEN MACHINES AND EQUIPMENTS – PERSONAL DEVICES – REAL TIME CONTROL AND ANALYTICS –SENSORS AND ACTUATORS – SECURITY DEVICES
- IT PROVIDES GREATER INFORMATION FLOWS FROM PRODUCTION AND AUXILLARY PROCESSES

# INDUSTRIAL AUTOMATION

- THE INTERNET OF THINGS AND SERVICES ARE LARGELY RESPONSIBLE FOR STAGE 4 CURRENTLY TAKING SHAPE
- CAPACITY TO LINK PHYSICAL TO VIRTUAL WORLD
- A MARRIAGE BETWEEN OPERATIONAL (AIR SERVICES ENGINES AND TRANSPORTATION) TECHNOLOGY AND INFORMATION TECHNOLOGY THAT SUPPORTS THE BUSINESS SERVICES

# ROBOTISATIONS

- INDUSTRIALISATION REQUIRES ROBOTS
- FOR MALAYSIA IT WILL DISPLACE FOREIGN WORKERS
- SAVES FOREIGN EXCHANGE REPATRIATIONS
- ROBOTS DO THE 3 D JOBS : DIRTY, DAMGEROUS AND DULL WORK
- THESE ARE INTELLIGENT MACHINES THAT LEARN INDEPENDENTLY AND ARE FLEXIBLE AND COLLABORATE ORGANICALLY WITH THEIR HUMAN COLLEAGUES
- TRADITIONAL INDUSTRIAL DOBOTS ARE EVOLVING TO BE ASSISTANTS TO HUMAN BEINGS; IN THE IR 4.0 HUMANS AND INTELLIGENT MACHINES WILL PERFORM JOINTLY PRODUCTION TASKS
- BETWEEN 2013 AND 2016 A TOTAL OF NEW GENERATION ROBOTS WILL BE SOLD TO A TOTAL VALUE OF ABOUT 14 BILLION DOLLARS
- **AI** ROBOTICS EMPHASIZES MOBILITY, PERCEPTION (SIGHT, HEARING, SMELL AND TOUCH) – CONTROL BY DIGITAL CENTRAL NERVOUS SYSTEM AND DIGITAL BRAIN FUNCTION – UNMANNED VEHICLES WATER, LAND AND AIR

# **ARTIFICIAL INTELLIGENCE**

**THE THEORY AND DEVELOPMENT OF  
COMPUTER SYSTEMS ABLE TO PERFORM  
TASKS NORMALLY REQUIRING HUMAN  
INTELLIGENCE, SUCH AS VISUAL PERCEPTION,  
SPEECH RECOGNITION, DECISION-MAKING,  
AND TRANSLATION BETWEEN LANGUAGES**

# INDUSTRY 4.0

- IN 2011 IN GERMANY AS A CONCEPT OF GERMAN ECONOMIC POLICY BASED ON HIGH TECH STRATEGIES HAS LAUNCHED THE FOURTH TECHNOLOGICAL REVOLUTION
- CONCEPTS AND TECHNOLOGIES THAT INCLUDE CYBER-PHYSICAL SYSTEMS, THE INTERNET OF THINGS (IoT), INTERNET OF SERVICES (IoS) BASED ON PERPETUAL INTERNET COMMUNICATION ALLOWING CONTINUOUS INTERACTION AND EXCHANGE BETWEEN HUMANS (C2C) AND HUMAN TO MACHINES (C2M) BUT ALSO BETWEEN MACHINES TO MACHINES (M2M)

# HOW DOES IT AFFECTS DEVELOPING COUNTRIES

- WHAT IS THE CONTEXT OF DEVELOPMENT IN RELATION TO INDUSTRY 4.0
- ROSTOW'S 5 STAGES OF GROWTH
  1. STAGE 1: TRADITIONAL SOCIETY
  2. STAGE 2: TRANSITIONAL STAGE
  3. STAGE 3: TAKE OFF
  4. STAGE 4: DRIVE TO MATURITY
  5. STAGE 5: HIGH MASS CONSUMPTION

# COMPLEX SOCIETY

- IN THE CONTEXT OF COUNTRIES THERE ARE DIFFERENT STAGES OF DEVELOPMENT WE ARE IN THE 3<sup>RD</sup> 4<sup>TH</sup> AND 5<sup>TH</sup> STAGES OF DEVELOPMENT
- THE PRESENCE OF IR4.0 OR INDUSTRY 4.0 TAKES PLACE IN MANUFACTURING INDUSTRIES WHERE THE CYBER SYSTEMS PHASE OF DEVELOPMENT AND NOW IN THE CYBER-PHYSICAL SYSTEMS
- THE OTHER PHASES THAT DO NOT INVOLVE THE CPS PHASES STILL INVOLVE AGRICULTURE, FOOD PRODUCTION, SINGLE LINE PRODUCTION SYSTEM WHICH MAY INVOLVE CPS

# RESEARCH IN INDUSTRY 4.0

- AT BEST IF WE ARE ADDRESSING INDUSTRIAL MANUFACTURING PROBLEM OF INTEGRATING IT AND OT
- IT IS TO MANUFACTURE A MECHANICAL CREATURE THAT CAN FUNCTION AUTONOMOUSLY – A ROBOT IN THE MANUFACTURING INDUSTRY
- THE APPLICATIONS OF ROBOTS CAN ALSO BE FOUND IN INTENSIVE AGRICULTURE AND FOOD PRODUCTION
- THE INVOLVEMENT OF DIGITAL TECHNOLOGIES INTEGRATED WITH INTERNET OF THINGS OR INTERNET OF SERVICES, WILL MOVE US TOWARDS

**THANK YOU**