



# i4.0 – Life Planning Ed. for Future Digital Talents

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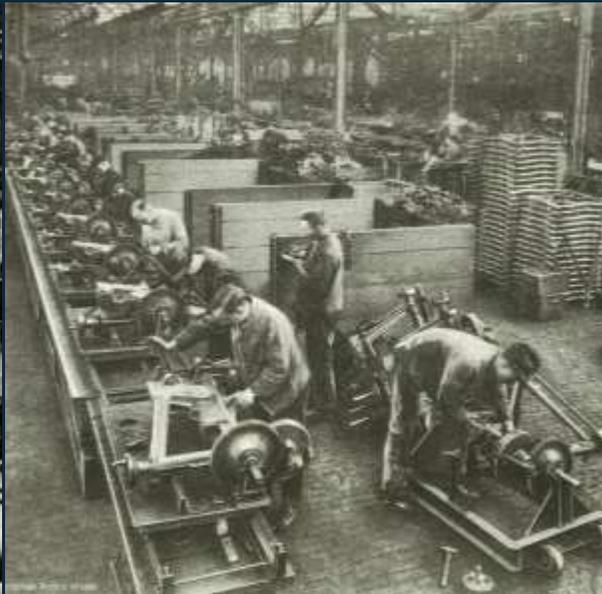
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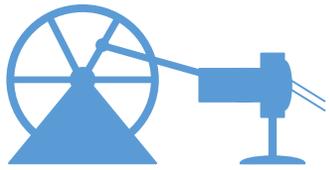
# Industry 4.0



# Industry R(E)volution



Power machines  
(1861)



1<sup>st</sup> Industrial Revolution

Taylorism  
(1930s)



2<sup>nd</sup> Industrial Revolution

Automation  
(1989)



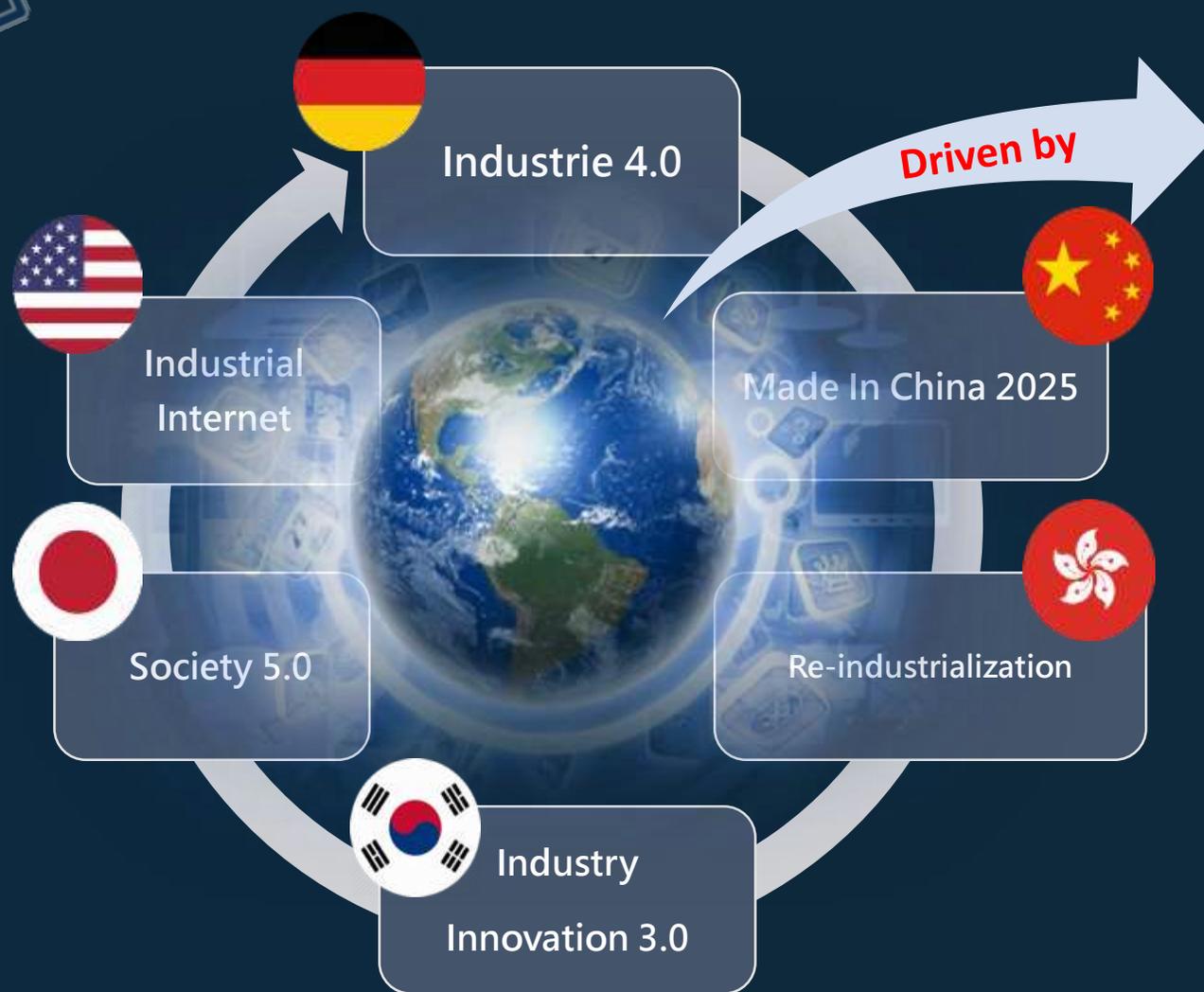
3<sup>rd</sup> Industrial Revolution

Cyber Physical System  
(CPS)  
(2014)



4<sup>th</sup> Industrial  
Revolution

# Global Initiative



## ICT Trend

*Internet Plus*: Mobile Networking, Cloud Computing, Social Media Data, Data Analytics, Industrial APPS, etc.

## Technology Trend

Disruptive Technology, New Materials, Light Weight, Renewable Energy, Digitalization, IoT, Autonomous, etc.

## Market Trend

Globalization, Personalization, Mass Customization, Aging Society, Health & Care, etc.

# Interpretation >156+ 2014

Industrial Internet    Artificial Intelligence  
Smart Services    **Cyber-Physical Systems**  
Internet of Services    Smart Production  
Internet of Things    **Industrie 4.0**  
Digitalization    Factories of the Future  
Smart Cities    Smart Products  
Smart Factory    Smart Home    Smart Manufacturing Automation

**Too  
Many  
Fancy  
Jargon!**



# Founder of Industry 4.0 - acatech

 NATIONAL ACADEMY OF SCIENCE AND ENGINEERING | DEUTSCHE AKADEMIE DER TECHNIKWISSENSCHAFTEN

## acatech - NATIONAL ACADEMY OF SCIENCE AND ENGINEERING

### Welcome to acatech

The content on our English website is limited to selected information, including general information relating to acatech, its objectives, responsibilities, its structure and activities. In-depth reports to all ongoing projects, events, and publications are available on our German pages. If you have any questions, please feel free to get in touch with one of our offices.

#### Profile



acatech - the NATIONAL ACADEMY OF SCIENCE AND ENGINEERING - represents the German scientific and technology communities, at home and abroad. As a working academy, acatech supports policy-makers and society by providing qualified technical evaluations and forward-looking recommendations.

#### Organisation



acatech is composed of three organs: the Executive Board, the General Assembly and the Senate.

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#### acatech Members at



acatech brings together the best minds from science and business to generate ideas between these two sectors, which generates sustainable growth and innovation.

[> More about acatech Members](#)  
[> More about the Senate](#)

#### Academy Staff

Forschungsunion  
Wirtschaft und Wissenschaft  
begleiten die HighTech-Strategie

 acatech  
NATIONAL ACADEMY OF  
SCIENCE AND ENGINEERING

Securing the future of German manufacturing industry

## Recommendations for implementing the strategic initiative INDUSTRIE 4.0

Final report of the Industrie 4.0 Working Group

April 2013

 Federal Ministry of Education and Research

# i4.0 Definition – acatech, Germany

“The term Industry 4.0 stands for the fourth industrial revolution. Best understood as a new level of organisation and control over the entire value chain of the life cycle of products, it is geared towards increasingly individualised customer requirements. This cycle begins at the product idea, covers the order placement and extends through to development and manufacturing, all the way to the product delivery for the end customer, and concludes with recycling, encompassing all resultant services. The basis for the fourth industrial revolution is

the availability of all relevant information in real time by connecting all instances involved in the value chain. The ability to derive the optimal value-added flow at any time from the data is also vital. The connection of people, things and systems creates dynamic, self-organising, real-time optimised valueadded connections within and across companies. These can be optimised according to different criteria such as costs, availability and consumption of resources.”

Source: Platform Industry 4.0  
*Translated from German*

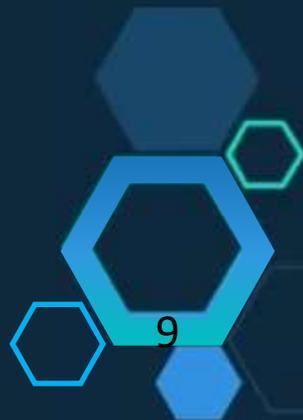
# Ultimate Goal of Industry 4.0 Self-organizing Eco-System



# Agility like this!



**Increase flexibility**



# Fraunhofer IPT Certified Industrie 4.0

+ Industry Advisor

+ Expert

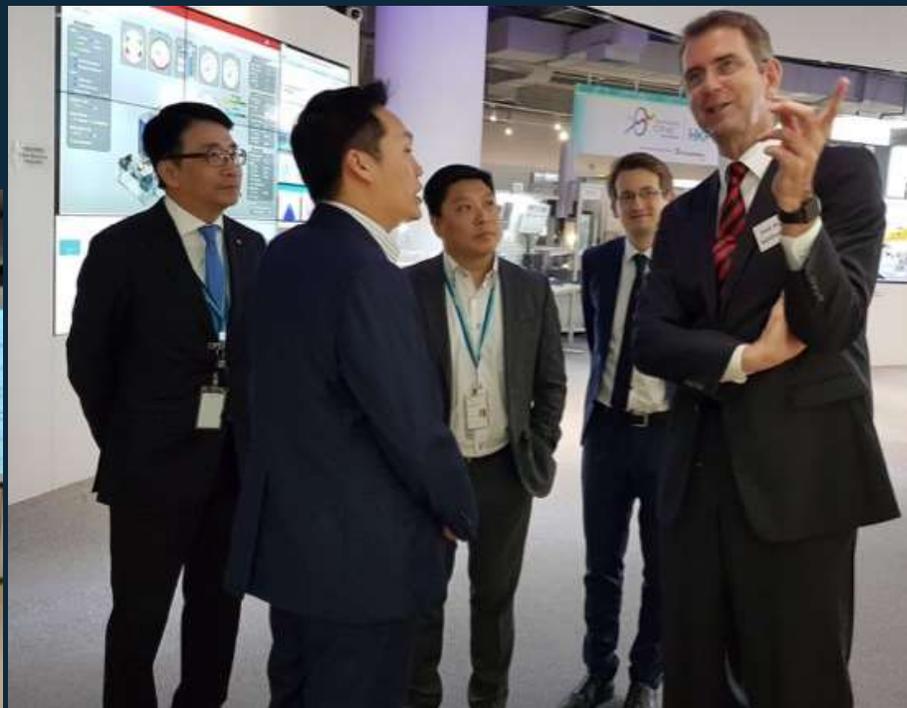
+ Trainer

+ Implementation Consultant

## Our Industry 4.0 People Professionalism

A key member of the board of the National Academy of Science and Engineering (acatech)

- Prof. Günther Schuh



# Our Key i4.0 Experts



# Industry 4.0 Recognition Programme

HKPC & Fraunhofer IPT developed an “Industry 4.0 Smart Operation, Manufacturing & Enterprise Upgrade and Recognition Programme”



i4.0 Certified Training



i4.0 Smart Enterprise Maturity Assessment



i4.0 Pilot Project Identification & Deployment



i4.0 Advisory & Consultancy Services



i4.0 Smart Enterprise Recognition

An upgrade model for OBM, ODM & OEM to evaluate industries' readiness & come up “i4.0 Migration Strategy”

# Migration Model towards i4.0

		Smart Enterprise Level		Smart Enterprise Characteristics
↑ Smartification Level	4i	i4.0 - <b>Intelligent, Autonomous Processes &amp; Self Organizing System (4i)</b>	Self-optimizing processes and autonomous control of product and process along the value chain	<ul style="list-style-type: none"> <li>Autonomous automation (<b>Smartify!</b>)</li> <li>Self-learning, self-organizing and self-optimization</li> <li><b>Horizontal integration along value chain</b></li> </ul>
	3i	i4.0 - Integration of <b>Cyber-Physical System (3i)</b>	Mobile assistance systems and human-machine/machine-machine collaboration for decentralized decision-making	<ul style="list-style-type: none"> <li>Decentralized decision-making</li> <li>HMI/MMI, Industrial apps</li> <li>Mobile assistance systems</li> <li><b>Close-loop process optimization</b></li> </ul>
	2i	i4.0 - <b>Real-time Data Processing &amp; Integration (2i)</b>	Development of knowledge and insights through the analysis and aggregation of all available information and data sources	<ul style="list-style-type: none"> <li>Full digitalization &amp; aggregation of real time data</li> <li><b>Smart Data analytics</b></li> <li>Improving forecast ability &amp; decision making</li> </ul>
	1i	i4.0 - <b>Real-time Data Generation (1i)</b>	Generation and availability of data and information of all activities in real time	<ul style="list-style-type: none"> <li>Data acquisition by sensor and machine <b>IoT (M2M)</b> in real time for process understanding</li> <li><b>Vertical integration</b> (Business &amp; Production)</li> <li>Well established "Single Source of Truth"</li> </ul>
	0i	i4.0 - <b>Frame Condition (0i)</b>	Organizational and infrastructural enablers for the implementation of Industry 4.0	<ul style="list-style-type: none"> <li>Industry 4.0 awareness and culture built</li> <li>IT-infrastructure and data security</li> <li>Lean processes &amp; reasonable automation</li> <li>Advanced tools adopted &amp; mastered</li> </ul>
i2.0 / i3.0	-1	Industry 3.0	Predominantly Industry 3.0 process (Discrete Automation)	<ul style="list-style-type: none"> <li>Discrete automation</li> <li>Discrete IT system application adopted</li> </ul>
	-2	Industry 2.0	Predominantly Industry 2.0 process (Division of Labour)	<ul style="list-style-type: none"> <li>Strong division of labour</li> <li>No information technology/system adopted</li> </ul>

Germany

HK/GBA

# Successful Case of i4.0 Migration@HK

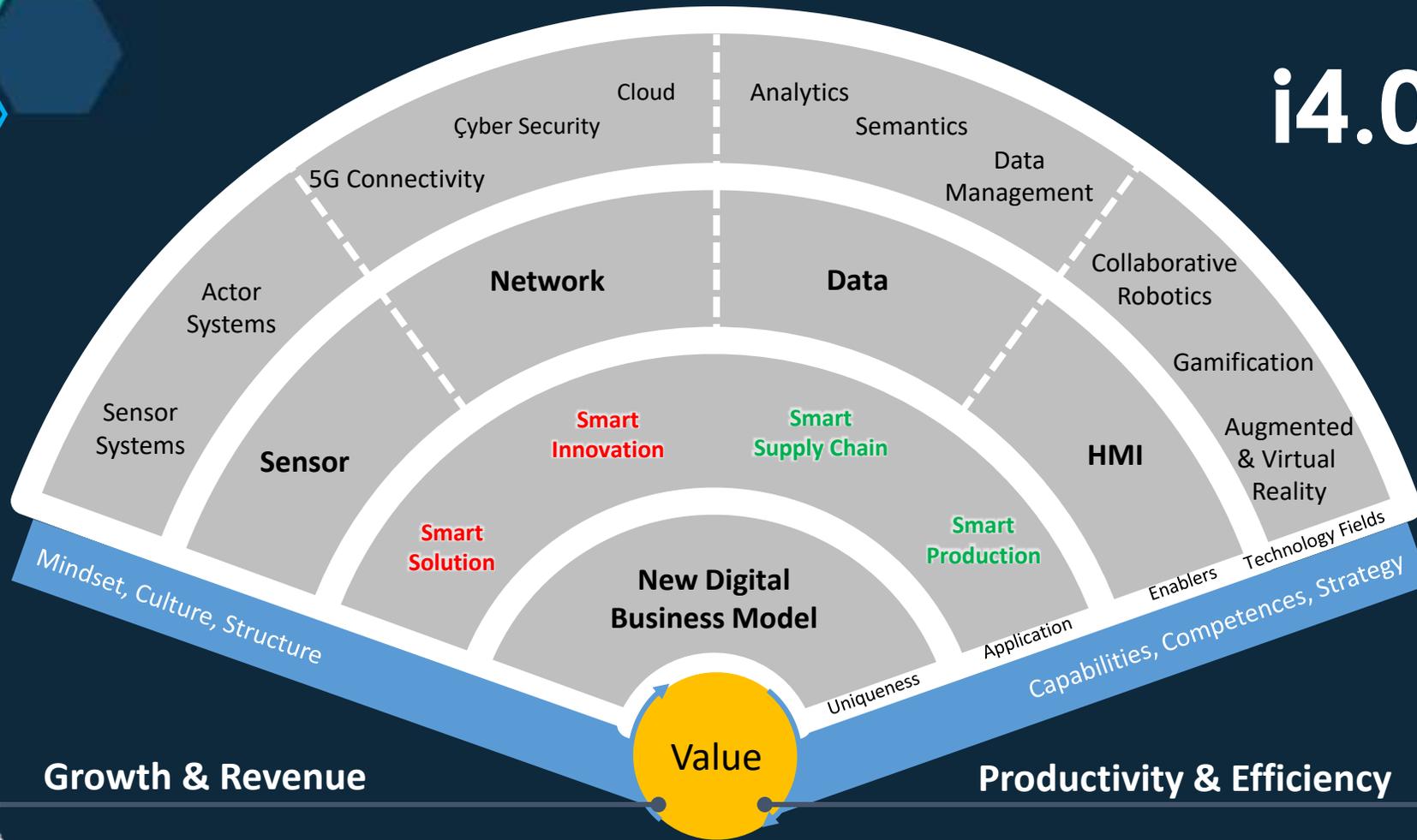




# i4.0 and Life Planning Ed.



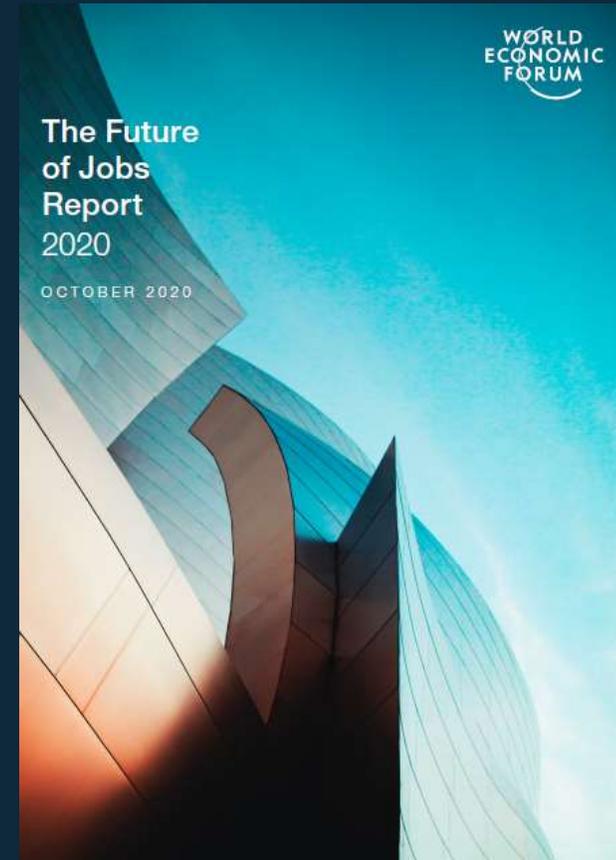
# Framework of Industry 4.0



## i4.0 Key Enabler



# Benchmarking



## White Paper: Industry 4.0

A Discussion of Qualifications and Skills in the Factory of the Future:  
A German and American Perspective  
VDI / ASME, 2015

## The Future of Jobs Report

World Economic Forum, 2018 & 2020

# i4.0 - Growth & Evolution of Organizations

## Technology Innovation

- Remove the barrier of communications between human and machine (including IoT)
- Radical change of company culture & working environment

## Tools & Technologies



## Communication without Boundary



## Organization & Structure



## Environment

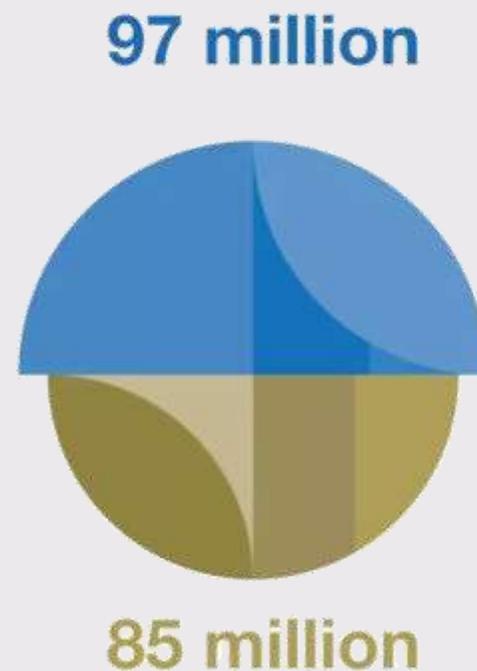


# Out of Adversity Comes Opportunity.

- Benjamin Franklin-

“By 2025, **85 million jobs may be displaced** by a shift in the division of labour between humans and machines, while **97 million new roles** may emerge that are more adapted to the **new division of labour between humans, machines and algorithms.**”

By 2025, new jobs will emerge and others will be displaced by a shift in the division of labour between humans and machines, affecting:



#### Growing job demand:

1. Data Analysts and Scientists
2. AI and Machine Learning Specialists
3. Big Data Specialists
4. Digital Marketing and Strategy Specialists
5. Process Automation Specialists
6. Business Development Professionals
7. Digital Transformation Specialists
8. Information Security Analysts
9. Software and Applications Developers
10. Internet of Things Specialists

#### Decreasing job demand:

1. Data Entry Clerks
2. Administrative and Executive Secretaries
3. Accounting, Bookkeeping and Payroll Clerks
4. Accountants and Auditors
5. Assembly and Factory Workers
6. Business Services and Administration Managers
7. Client Information and Customer Service Workers
8. General and Operations Managers
9. Mechanics and Machinery Repairers
10. Material-Recording and Stock-Keeping Clerks

# Importance of Lifelong Learning & Continuous Professional Development



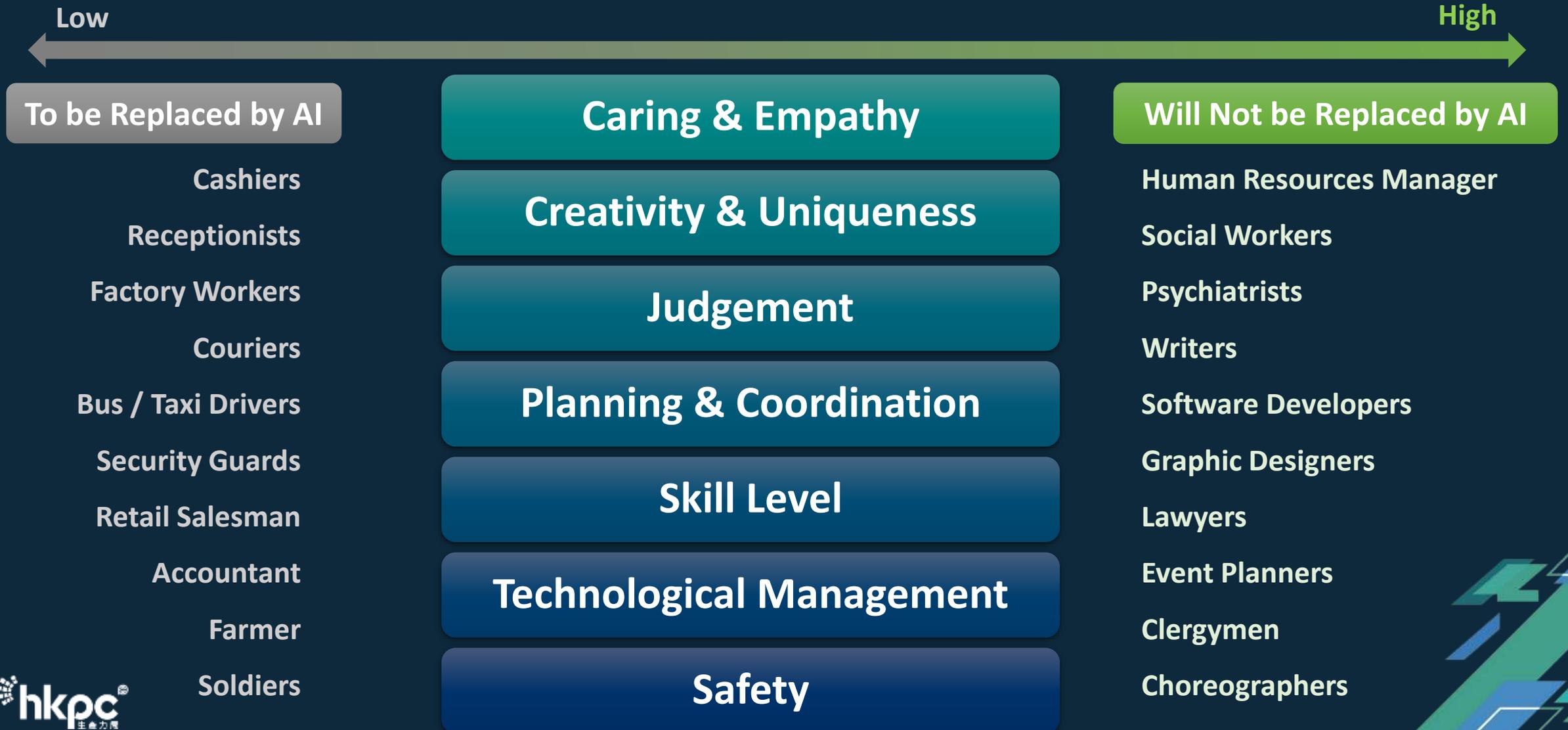
“**Automation**, in tandem with the **COVID-19** recession, is creating a ‘double- disruption’ scenario for people.”

“Despite the current economic downturn, the large majority of employers recognize the **value of human capital investment.**”

The Future of Jobs Report – World Economic Forum (WEF)



# Human Distinctiveness vs A.I.



# Global Trend of Digital Talents Development

- Common focus: Balance of Technical & Personal Abilities
- Both parties emphasize the importance of self-management, teamwork & social skill apart from practical knowledge



	Must... <i>...be included in the skillset of the skilled labor of the future.</i>	Should...	Could...
Technical D&S	IT knowledge and abilities	Knowledge Management	Computer programming/coding abilities
	Data and information processing and analytics	Interdisciplinary / generic knowledge about technologies and organizations	Specialized knowledge about technologies
	Statistical knowledge	Specialized knowledge of manufacturing activities and processes	Awareness for ergonomics
	Organizational and processual understanding	Awareness for IT security and data protection	Understanding of legal affairs
	Ability to interact with modern interfaces (human-machine / human-robot)		
	Self- and time management	Trust in new technologies	
Personal D&S	Adaptability and ability to change	Mindset for continuous improvement and lifelong learning	
	Team working abilities		
	Social skills		
	Communication skills		

## Top 10 skills of 2025

-  Analytical thinking and innovation
-  Active learning and learning strategies
-  Complex problem-solving
-  Critical thinking and analysis
-  Creativity, originality and initiative
-  Leadership and social influence
-  Technology use, monitoring and control
-  Technology design and programming
-  Resilience, stress tolerance and flexibility
-  Reasoning, problem-solving and ideation

### Type of skill

-  Problem-solving
-  Self-management
-  Working with people
-  Technology use and development

# Essential Q&S of Digital Talents

- Highlighted qualifications & skills to be equipped
- Important to develop since Early Education

## Technical Q&S

## Personal Q&S

Technical

Problem Solving

Team Work

Self-Management



Awareness for  
IT Security



Analytical Thinking  
& Statistical Knowledge



Understanding of  
Organization &  
Process



Self & Time  
Management



Social &  
Communication  
Skills



Active Lifelong  
Learning

Legal

Computer  
Coding

Knowledge of  
Manufacturing  
Process



IT Knowledge +  
Machine & Robot  
Interaction  
Ability



Innovation, Creativity  
Ability to Change



Team Work Ability  
& Leadership

Trust in  
New Technology

Complex  
Problem  
Solving

# Early Education

## Trust in New Technology



### Artificial Intelligence Training

1. Design a service robot to carry out low skill & dangerous tasks
2. Popularization can reduce the cost of production & hence market price

Technology Awareness Christmas@Fraunhofer IPT



# Early Education

## Ability to Interact with Machine / Robot Interface



# Smart Technology@Production & City



Drone Waiter



Exo-skeleton



# Advanced HMI : Gesture Control



# Sports with Robot



# Smart Archer

Funded by



**Innovation and Technology Bureau**

The Government of the Hong Kong Special Administrative Region of the People's Republic of China



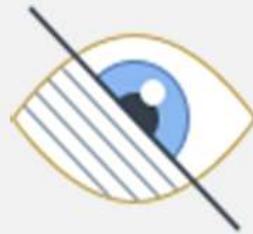
## Smart Device for Visual Impaired ( VI ) Archers

- ❖ Applied in VI Archery activity to help the society
- ❖ i4.0 Smart technologies adopted
- ❖ Silver Award presented by Geneva, 2019



**Archery Assistant**

Intelligent target aiming device



**Machine Vision**

Detect & feedback aiming position



**Laser Aiming Unit**

Design for VIPs with 3D printed parts



**Cloud**

Connect cloud platform database



**Big Data Analytic**

Analyse user training habit

# Life Planning Ed. Model

- Capture essential Q&S from early education to lifelong learning
- New challenge: Commercial & Academic Partnership Training & CPD

## Start with...

### Mandatory Subjects\*

- IT, Computer & Technical Knowledge
- **STEM**  
basic knowledge in Science, Technology, Engineering & Mathematics

### School Internship/Open Day\*

- Start of
- Specific Knowledge
  - Understanding of Organization
  - Trust in New Technology
  - Mindset of Improvement

### Professional Development Course\*\* / Degree\*\* / Workshops\*\*

- Effective for **Primarily Technical Qualification and Skills Development**
- Initiate **Personal Skills** (e.g. Teamwork, Social & Communication Ability) & **Business Communication**

### Workshops\*\*

- **Tailor-made & goal-oriented for specific skills**  
Effective for both **Technical & Personal Skills** (e.g. i4.0/Self-management focus)

### Professional Course\*\* / Massive Open Online Course\*

- **Continuing Professional Development (CPD)**
- **Professional Certification** (e.g. 6sigma)
- **Mindset of Improvement**
- **Keep up with New Technologies**
- **Flexible and Tailored for Exact Career Needs**

### University + Industry Collaboration\*\*

- **Self, Time & Project Management**
- **Reinforcing organizational understanding**
- **Specialized Technical Knowledge Enhancement**
- **Ability to Change**

**Effectiveness of Activities**  
 ++: Very Effective (>70%)  
 +: Effective (>50%)



## Early Education

- Primary & Secondary School
- **Fundamental Knowledge**
- **Discovering Interest Area & Goal Setting** for career planning



## Transition from School to Work

- College & University Education
- **Specific Professional Courses** prepare for working life e.g. Manufacturing, Robotic, Engineering, etc.
- **Develop Necessary Skills** in Workforce



## Continuous Vocational Training

- **On-the-job Training**
- **Continuous investment** on talented employees
- **CPD in workplace is a must** in view of the rapid technological changes

Continuous Lifelong Learning..



# Technology & Technical Education (TechEd) Support by HKPC



# A Life Planning Ed. Facilitator

- HKPC continuously support over all stages of life planning, targeting primary to university students, teachers and corporate

## TechEd for Students & Tutors from Primary School to Secondary School

**TechEd Experience Day**  
TechEd 體驗日  
9 October 2020, Friday  
2pm - 6pm

**Train the Trainer**  
設計思維101  
免費網上研討會 | STEM 導師專輯

### Mandatory Subjects\*

- STEM

### School Internship/Open Day+

### Professional Development Course\*\* / Degree \*\* / Workshops\*\*

### University + Industry Collaboration\*\*

### Professional Course\*\* / Massive Open Online Course\*

- Professional Certificate
- Tailored for Exact Career Needs

### Partnership with Business and Academy

### Professional Workshop & Training for Enterprise

**RITTP**  
Reindustrialisation and Technology Training Programme  
再工業化及科技培訓課程



### Workshops\*\*

- Tailor-made & goal-oriented for specific skills

Continuous Lifelong Learning...



知創空間  
iNNO SPACE  
POWERED BY hkpc



Your Technology &  
Technical Education  
Partner  
TechEd

## *“We Nurture Homegrown Technology Talent”*

- An **innovation hub** to nurture technology talent
- Be the **catalyst** that sparks synergies between multiple parties
- Promote **TechEd** to include advanced **technology + technical applications** in **education**

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Inno Prototype



Inno Network



Aviation Lab



Inno Idea

# Inno Space STEM Network – School Talent Scheme



## Design & Build “Cultivate Innovations”

- Access to Inno Space
- Makers workshops
- Makers events
- Design thinking & Prototypes workshop
- 3D printing and laser cutting services



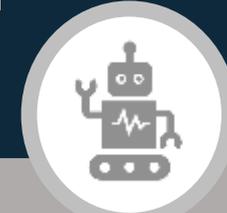
## TechEd “Develop TechEd Talent”

- STEM workshops
- Train-the-Trainers
- STEM competitions
- Overseas/Mainland study missions on STEM
- Inno Star / Inno Ambassador Programme



## Advisory & Support “Empower Schools”

- STEM lab setup advisory
- STEM education support
- Tailor-made subject curriculum
- Advisory on STEM Day



## Entrepreneurship & Career “Broaden Horizons”

- Tech Tour & Talk @HKPC
- Career talk
- Company visits on VPET
- A Taste of MIT Entrepreneurship
- A Taste of HKPC Innovations

# Events at a glance...



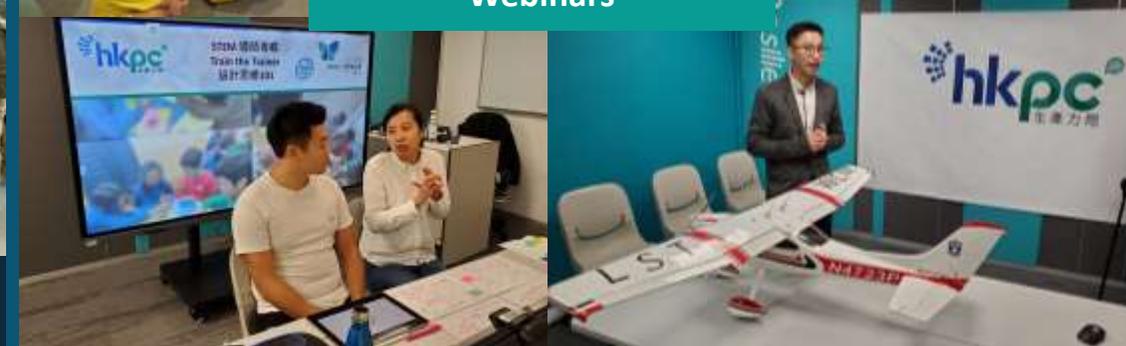
Symposium, Competition & Inno Fair



STEM Training & Workshops  
For teachers and students



Webinars



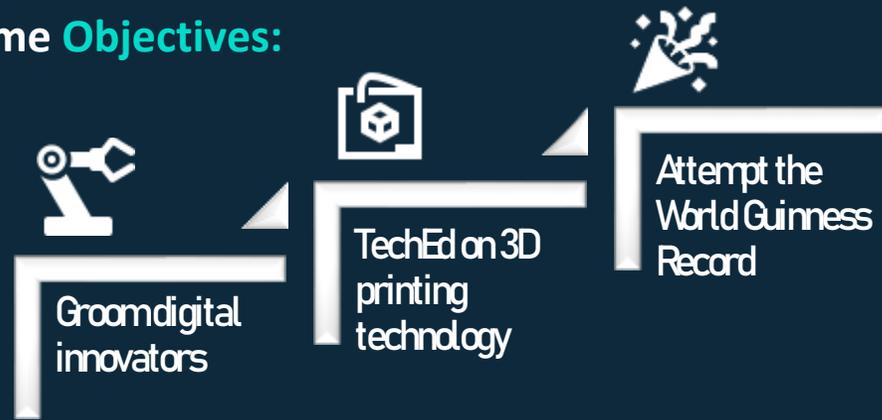
And more...

# Innovative Use of 3D Printing Technology

- Cultivating Hong Kong Secondary School Students
- HKPC will continue to offer training and promotion on 3D printing technology public



## Programme Objectives:



Theme: *Glamorous Victoria Harbour*



## Activities Highlights:

- 123 schools
- >1,200 students
- >230 entries



## Funded By



## Supported By



&



14 supporting organizations



# Innovative Use of Industry 4.0 Enabling Technology

- Promotion target to HK Secondary School Students by **“Gamification”**

## Programme Objectives:

GAMIFICATION  
IN EDUCATION

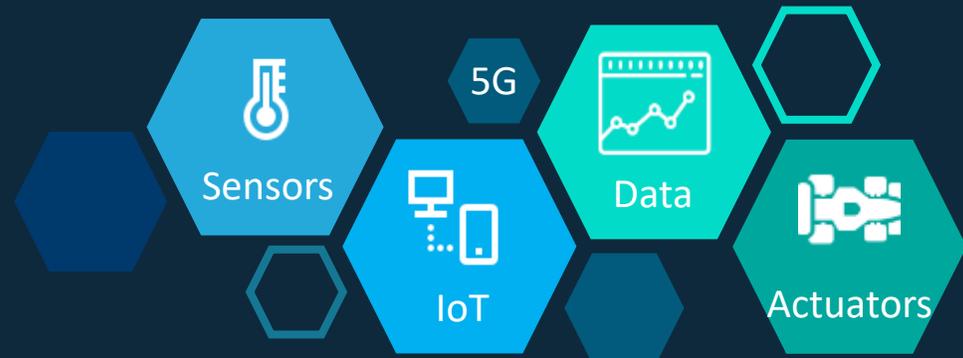
Life planning

14.0 technology

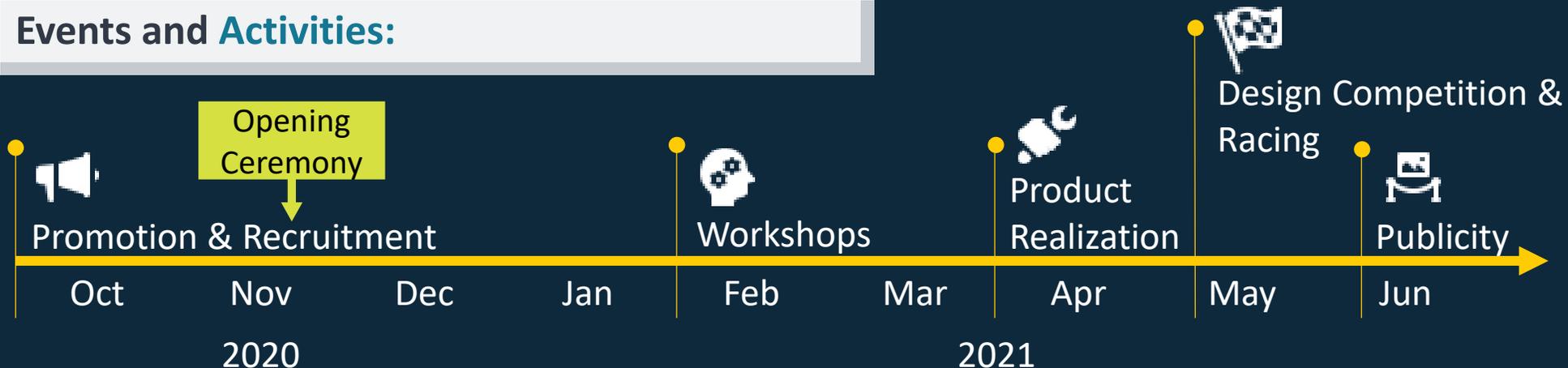
STEM education



## CPS Based Model Car Technologies:



## Events and Activities:



## Funded By



## Supported By

13 supporting organizations



And more...



# Smarthank!



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