Maturity model and Assessment Method of Chinese Intelligent Manufacturing Capability

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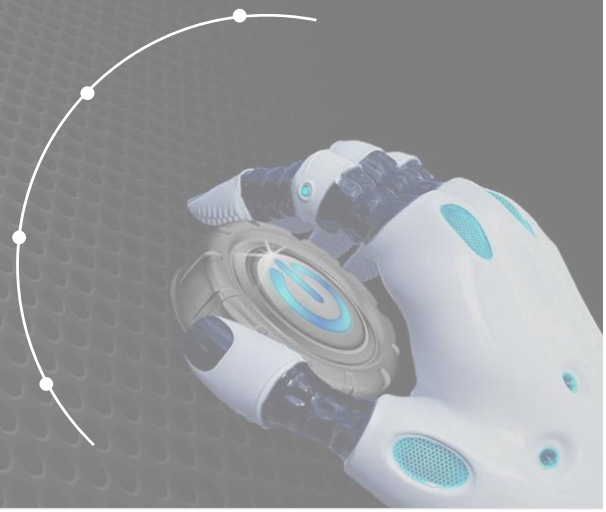
Content

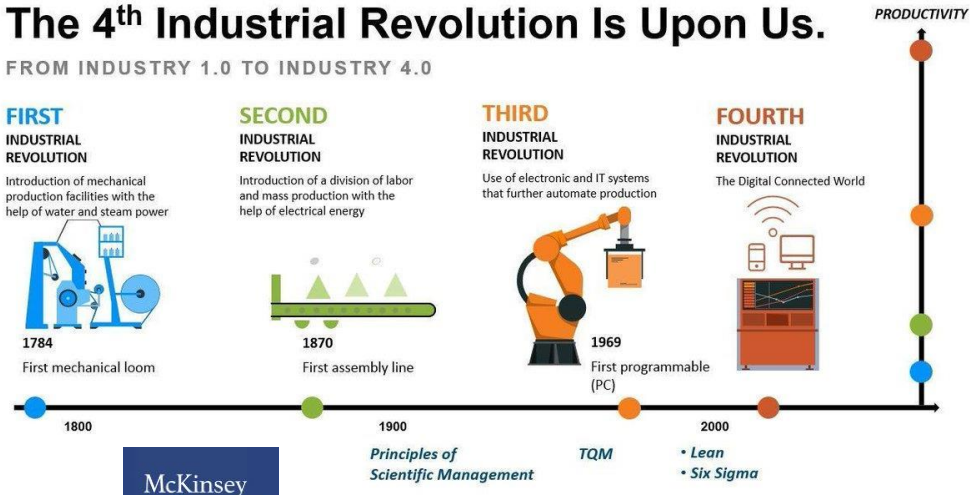


Introduction 01

Introduction

- Hong Kong government has initiated “re-industrialization” policy since 2016.
- HKPC industry 4.0 approach based on the Fraunhofer Institute for Production Technology (Fraunhofer IPT) in Germany.
- HKPC cooperates with Fraunhofer IPT to develop HK i4.0 maturity level from 0i, 1i to 4i.
- Quality shifts the control-oriented focus from process operators to process designers and considers to integrate cyber-physical interfaces and automated working environments.

Major Trends in Industrial Evolution



"Industry 4.0 is more than just a flashy catchphrase. A confluence of trends and technologies promises to reshape the way things are made."

The Evolution of Quality and Innovation Management Tools during different Industrial Revolution Period

Time	Quality Evolution	Innovation Evolution	*Human Capability Extension
1800 – Industrial Revolution		Trial & Error	Power extension through Machine (Arm) (手的延伸)
1800 – 1900	Inspection		***(Industry 1.0)***
1900 – 1950	QC, SPC, QA	Creative problem-solving (1939) (Former name of Brainstorming)	Power extension through Car, Train, (Foot) (腿的延伸) Telephone (Ear) (耳朵的延伸) & TV (Eye) (眼的延伸) ***(Industry 2.0)***
1950 – 1970	Juran/Deming/ Crosby, TQC, TQM	Brainstorming (1953) TRIZ (1956) Creatology (Japan) NM Method (1970)	
1970 – 2000	ISO 9000 series (1987) Six Sigma, Lean	Extenics (1983) Six Thinking Hats (1985) Design Thinking (1987) Thinkertoys (1991) USIT (1995)	Power of computer and network (Part of Brain Power) (大腦部分功能的延伸) (Information Society – 信息社會) ***(Industry 3.0)***
2000 & after	**Quality 4.0** -Digitization, self-induced correction, self-regulate		Power of AI (Human Intelligent Extension) (人類智力的延伸) (Intelligent Society – 智能社會) ***(Industry 4.0)***

智能制造能力成熟度解释——标准研制历程

2015

工信部智能制造专项《智能制造能力成熟度模型标准化与试验验证系统》项目

2016

《智能制造能力成熟度模型白皮书》（1.0版）

2017

2项国标立项
《智能制造能力成熟度模型》
《智能制造能力成熟度评估方法》
中国智能制造评估公共服务平台上线
www.c3mep.com

2018~2019

标准持续优化
诊断评估推广应用
平台数据5000以上
人才培养400+
支撑标杆企业遴选

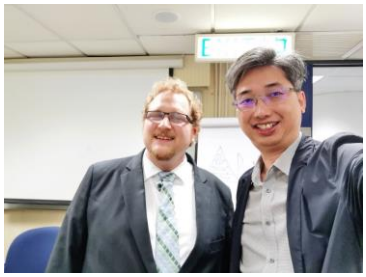
2020

标准发布实施
持续推广应用
标准优化修订

Fraunhofer IPT Approach 02

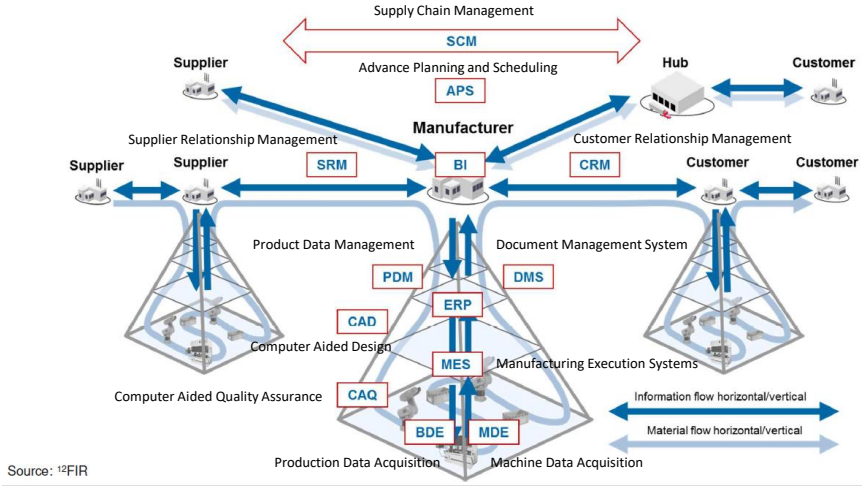
i4.0 In-house Training

- Fraunhofer Institute for Production Technology
- In-house 5 days Training
- 德国的弗劳恩霍夫生产技术研究所
- 工业4.0的内部培训

Smart Device Characteristics

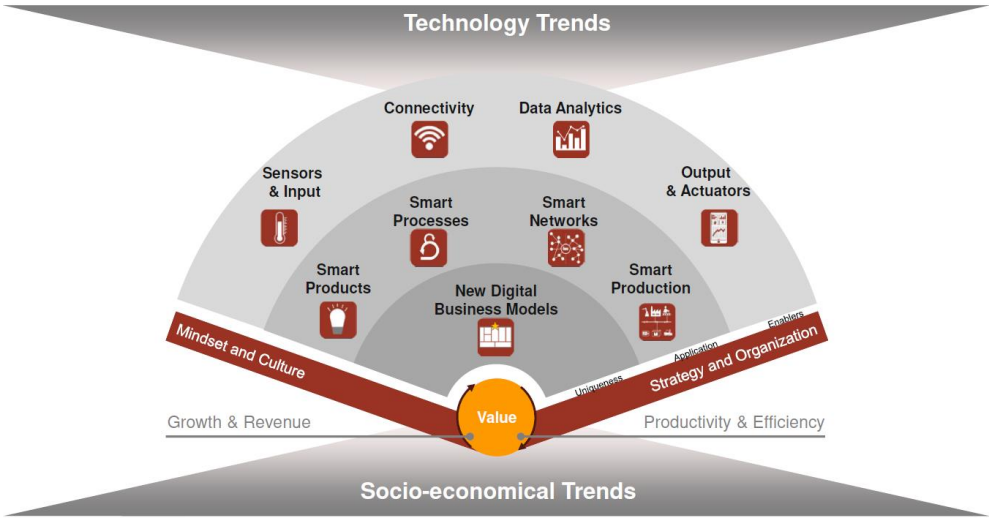
Digital Horizontal and Vertical Integration



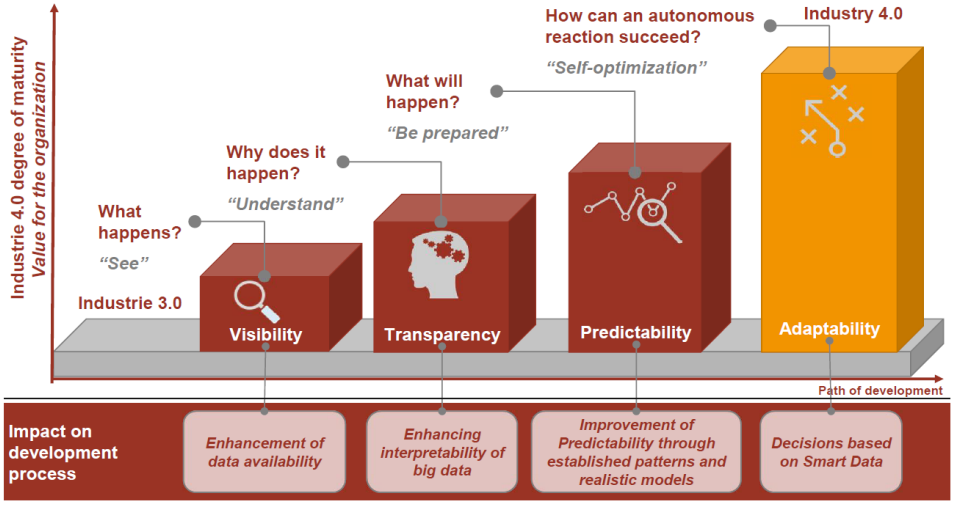
Information is collected by different IT-System-Modules

Fraunhofer

Smart i4.0 Navigator



Smart Production
(Improved Decision Making in Production)



i4.0 Maturity Level

		Level	Explanation	Characteristics
i3.0 / i2.0	-2	i2.x	Predomenientaly Industry 2.0 processes in the company	▪ Devision of labor ▪ No information technology/system
	-1	i3.x	Predomenientaly Industry 3.0 processes in the company	▪ Automation ▪ IT System Application
Maturity of Industry 4.0	0i	Frame conditions	Organizational and infrastructural enablers for the implementation of Industry 4.0	+ Industry 4.0 awareness + IT-infrastructure and data security + Lean processes + Advanced tools adopted & mastered
	1i	Real-time Information generation	Generation and availability of data and information of all activities in real time.	+ Digital horizontal and vertical integration into the value chain + Single Source of Truth by sensor data + Sensor, feedback, machine control
	2i	Real-time Information-processing and -integration	Development of knowledge and insights through the analysis and aggregation of all available information and data sources.	+ Aggregation of data + Big data analysis + Improving forecast ability
	3i	Integration of cyber-physical systems	Mobile assistance systems and human-machine/machine-machine collaboration for decentralized decision-making	+ Decentralizes decision-making + HMI/MMI, Industrial apps + Mobile assistance systems
	4i	Intelligent, autonomous & Self-organized processes	Self-optimizing processes and autonomous control of products in the value chain	+ High degree of automation + Self-learning and -optimization of processes and products

Hong Kong SMEs were evaluated in the range of **-1.7i to 0.7i**
(https://qualityalchemist.blogspot.com/2019/09/hksq-agm-seminar-on-industry-40-in.html)

03 Intelligent Manufacturing Capability Maturity Model

Background

- China officially proposed the **Smart Manufacturing 2025 Strategy** in 2015 that aims to solve the problem of low manufacturing levels in China and help to accelerate the pace of innovation.
- **Intelligent manufacturing** is an approach that integrates intelligent decision making, processes, operations and resources based on emerging information technologies in the network, human factors and physical spaces to enhance their performance and technical capabilities.
- Scientific intelligent manufacturing evaluation models and methods can effectively guide the manufacturing industry to optimize the production structure and assist policy formulation.
- The core idea of the Capability Maturity Model is continuous process improvement.

全国标准信息公共服务平台
National public service platform for standards information

首页 | 国家标准 | 行业标准 | 地方标准 | 团体标准 | 企业标准 | 国际标准 | 国外标准 | 示范试点 | 技术委员会

智能制造能力成熟度模型
Maturity model of intelligent manufacturing capability
国家标准 推荐性 现行

国家标准《智能制造能力成熟度模型》由339-1（工业和信息化部（电子））归口上报及执行，主管部门为工业和信息化部（电子）。

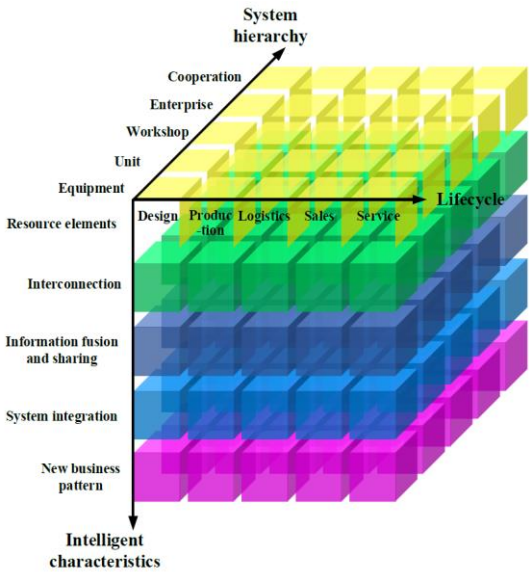
主要起草单位 中国电子技术标准化研究院、海尔集团、宁夏共享集团股份有限公司、中国石油化工集团公司、中国航空综合技术研究所、江苏极熵物联科技有限公司、北京机械工业自动化研究所有限公司、上汽通用汽车有限公司、机械工业第六设计研究院有限公司、郑州郑大智能科技股份有限公司、石化盈科信息技术有限责任公司、北京和利时系统工程有限公司、浙江中控技术股份有限公司、中国航空制造技术研究院、上海明匠智能系统有限公司、上海计算机软件技术开发中心、深圳赛西信息技术有限公司、中车株洲电力机车有限公司、安徽容知日新科技股份有限公司、中兴通讯股份有限公司、上海工业自动化仪表研究院、中国电子信息产业发展研究院、机械工业仪器仪表综合技术经济研究所、中国信息通信研究院、中国企业联合会、施耐德电气（中国）有限公司、思科（中国）有限公司、上海赛摩电气有限公司、四川长虹电器股份有限公司、江苏海宝软件股份有限公司。

主要起草人 于秀明、周平、郭楠、王程安、张星星、吴灿辉、王海丹、乃晓文、毕京洲、张维杰、杨梦培、索寒生、虞日跃、张保刚、李和林、宋成琳、俞文光、徐侃、胡静宜、李琳、翟中平、赵振威、王湘念、招庚、王冰、王凯、孙海旺、张巍、宫晓东、刘亚宾、吕雪、姬学庄、苏伟、贾超、程雨航、王伟忠、张文彬、王永耀、武丽英、张凤德、周峰、卢铁林、刘明、胡碧波、李小联、郭建祥、刘翊。

http://std.samr.gov.cn/gb/search/gbDetailed?id=B187EEDE6BF316D1E05397BE0A0A3342

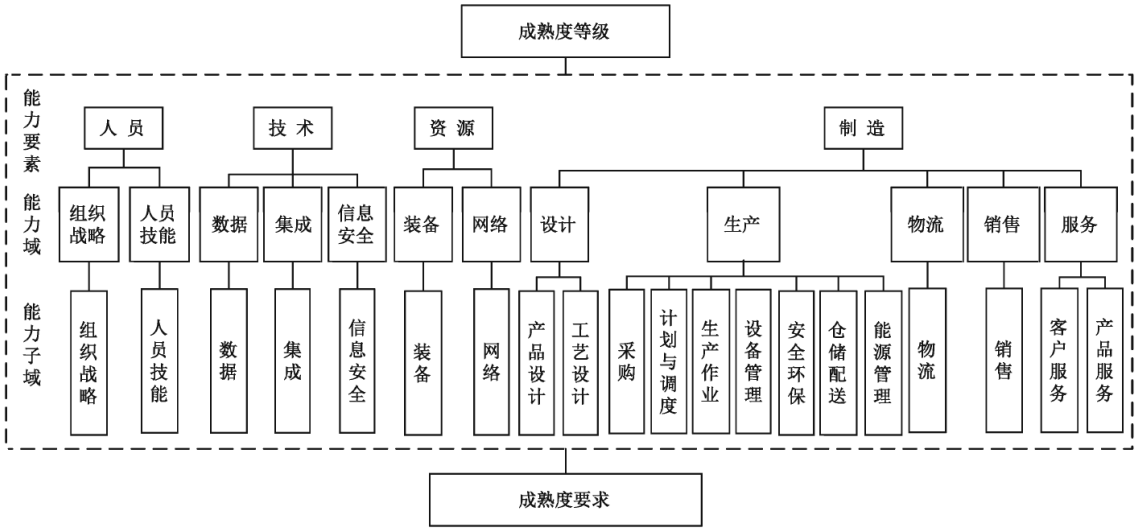
China Intelligent Manufacturing Capability Maturity Model

- China intelligent manufacturing system architecture is built from three dimensions: life cycle, system level, and intelligent function.
- It can be summarized into two dimensions of "manufacturing + intelligence" with overall consideration from 3 dimensions of intelligent functions, life cycle and system level.

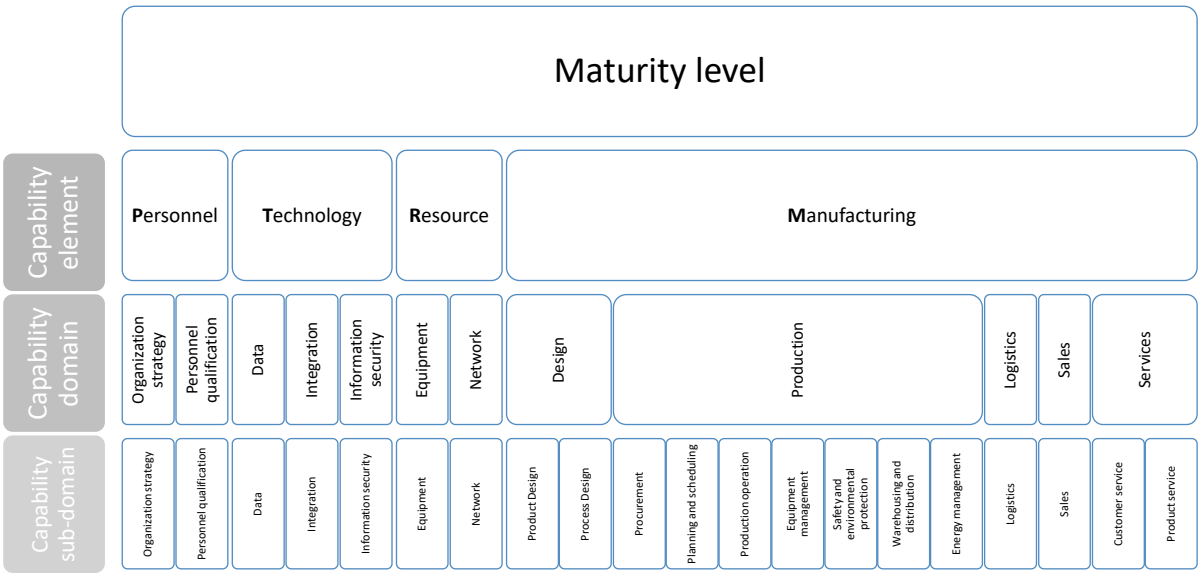


Jingyi Hu et al. (2019) " Research and application of capability maturity model for Chinese intelligent manufacturing ", *Procedia CIRP* 83, 794–799.

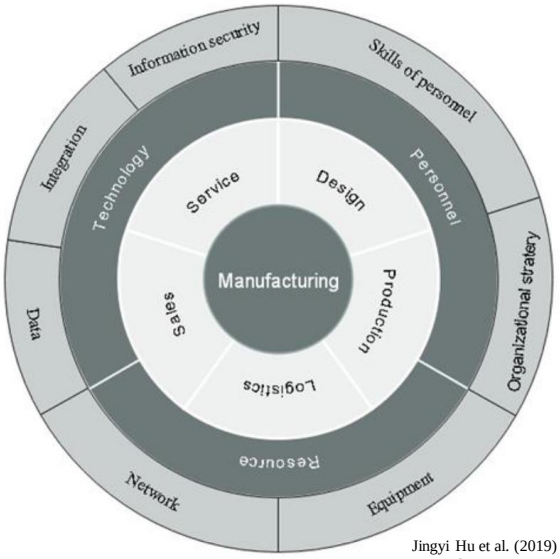
PTRM Model composition



PTRM Model composition



Capability Elements

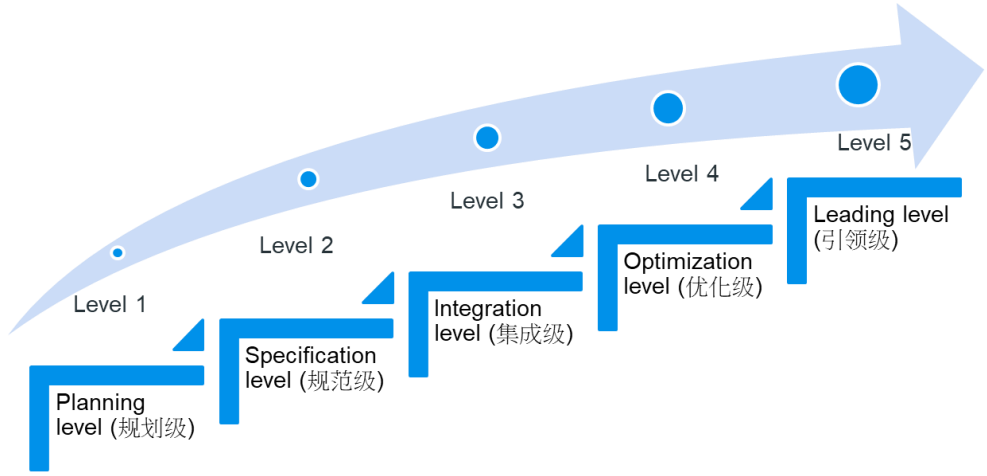


Jingyi Hu et al. (2019) " Research and application of capability maturity model for Chinese intelligent manufacturing ", *Procedia CIRP* 83, 794–799.

Maturity level

- There are five levels of maturity (from low to high):
  - Level I (planning level - 规划级),
  - Level II (specification level - 规范级),
  - Level III (integration level - 集成级),
  - Level IV (optimization level - 优化级), and
  - Level V (leading level - 引领级)
- The higher maturity level requirements cover the requirements of the lower maturity levels.

Maturity level



Maturity level

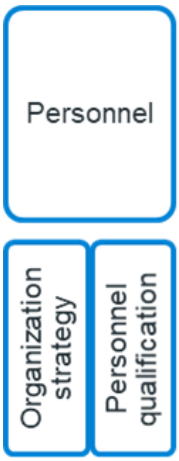
- **First-level** mainly means that the enterprise should ***start planning the basis and conditions*** for implementing intelligent manufacturing, as well as manage their core business in a ***streamlined manner***.
- **Second-level** is that the enterprises should ***adopt automation technology and information technology*** to transform and standardize core equipment and services, which can help to ***share the data*** of a ***single*** service.
- **Third level** includes the integration of enterprise equipment and systems to achieve ***data sharing between businesses***.
- **Fourth level** is refer to ***data mining*** of customers, resources and manufacturing, in order to form a certain knowledge and models, which can help to achieve ***accurate prediction and optimization*** of core business.
- **Fifth level** shows that enterprises should ***continue to drive business optimization and innovation*** based on the model, for realizing the synergy of the industry chain and deriving ***new manufacturing models and business models***.

Jingyi Hu et al. (2019) " Research and application of capability maturity model for Chinese intelligent manufacturing ", *Procedia CIRP* 83, 794–799.

Maturity requirements

- Maturity requirements specify the specific conditions that capability element shall meet at different maturity levels, and the maturity assessment method is described in GB/T 39117 2020.

- **Personnel**
- **Technology**
- **Resource**
- **Manufacturing**



Personnel

Levels	Organizational Strategy	Personnel Qualification
Level I	a) A ***development planning*** for intelligent manufacturing shall be developed; b) ***Investment*** shall be made in the resources required for development of intelligent manufacturing	a) The ***importance*** of intelligent manufacturing shall be ***fully realized***; b) Personnel required for development of intelligent manufacturing shall be ***cultivated or introduced***
Level II	a) The ***development strategy*** of intelligent manufacturing shall be formulated, and the organizational structure, technical architecture, resource investment and personnel allocation of intelligent manufacturing shall be planned, with a ***specific implementation plan*** formed; b) The responsible intelligent manufacturing department and the responsible person of each ***key post***, as well as the responsibilities of each post, shall be clearly defined	a) There shall be ***individuals or teams*** having the ***ability to make overall planning*** for intelligent manufacturing; b) There shall be personnel ***mastering the skills*** for IT fundamentals, data analysis, information security, system operation and maintenance, equipment maintenance, and programming and debugging. c) ***Suitable intelligent manufacturing personnel training system***, performance assessment mechanism, etc. shall be developed to enable the employees to acquire new skills and qualifications in a timely and effective manner to meet the development needs of intelligent manufacturing of enterprises

Personnel

Levels	Organizational Strategy	Personnel Qualification
Level III	a) The ***implementation of the intelligent manufacturing strategy*** shall be monitored and evaluated, and the strategy shall be ***continuously optimized***; b) A ***mechanism*** shall be established ***to optimize the post structure*** and regularly evaluate the suitability of the post structure and post duties, and post structure optimization and post adjustment shall be implemented based on the evaluation results	a) There shall be an ***innovation management mechanism*** to continuously carry out ***technological innovation*** and ***management innovation*** related to intelligent manufacturing; b) A ***knowledge management system*** shall be established to manage the knowledge and experience contributed by the personnel by means of information technology and analyze and apply such knowledge and experience in combination with the needs of intelligent manufacturing
Level IV		a) A ***knowledge management platform*** shall be established to realize the accumulation and dissemination of personnel knowledge, skills and experience. b) The personnel knowledge, skills and experience shall be ***digitized and software based***
Level V		

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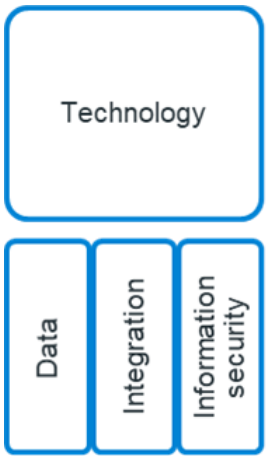


Technology

Levels	Data
Level I	a) Data required for business activities shall be ***collected***; b) ***Data analysis*** shall be conducted based on ***experience***
Level II	a) Data shall be ***collected*** based on ***QR codes, bar codes, RFID, PLC***, etc.; b) ***Data analysis*** shall be conducted based on ***information system data and human experience*** to meet the ***data usage needs*** within a specific range; c) Data and analysis results ***sharing online within the departments*** shall be realized
Level III	a) ***Sensor technology*** shall be used to realize ***automatic data collection*** in key links of manufacturing; b) ***Uniform*** data coding and data exchange formats and rules, etc. shall be established to integrate data resources and support cross departmental business coordination; c) Data and analysis results ***sharing online across departments*** shall be realized
Level IV	a) An ***enterprise level unified data center*** shall be established; b) A ***normal data analysis model*** base shall be established to support business personnel in conducting data analysis rapidly; c) ***Big data technology*** shall be adopted and various types of algorithmic models applied to predict the state of manufacturing links so as to provide ***optimization recommendations*** and ***decision support*** for manufacturing activities
Level V	a) The data analysis model shall be optimized ***in real time*** to realize model based accurate execution

Technology

Levels	Integration
Level I	a) The ***sense of system integration*** shall be possessed;
Level II	a) ***System integration planning*** shall be carried out, including network, hardware, software, etc.; b) Integration between ***equipment and system for key business activities*** shall be realized
Level III	a) A ***complete system integration architecture*** shall be formed; b) ***Technical specifications for integration*** between equipment, control system and software system shall be available, including integration specifications for heterogeneous protocols, interface specifications for industrial software, etc. c) Integration between ***equipment and system across business activities*** shall be realized through middleware tools, data interface integration platforms, etc.
Level IV	a) ***Integration of all business activities*** shall be realized by means of Enterprise Service Bus (ESB) and Operational Data Store (ODS)
Level V	

Technology

Levels	Information Security
Level I	a) The ***specifications*** for information security management shall be ***formulated and effectively implemented***; b) An ***information security coordination group*** shall be established
Level II	a) ***Information security risk assessment*** of ***critical industrial control systems*** shall be conducted on a ***regular basis***; b) Regular industrial ***anti-virus software*** shall be installed on the industrial host. c) ***Security configuration and patch management*** shall be performed on the industrial host
Level III	a) Industrial control network perimeter shall have ***perimeter defense capabilities***; b) ***Remote access*** to industrial control equipment shall be securely managed and reinforced
Level IV	a) Security devices with ***deep packet parsing capabilities (深度包解析功能)*** shall be deployed for the industrial networks; b) ***Offline test environment*** shall be built for one own to test the security of device used in industrial sites; c) In the industrial enterprise management network, security protection measures with ***self-learning and self-optimizing functions*** shall be adopted
Level V	

Maturity Assessment Method 04

Scope & Terms

- Specify the assessment ***content, process and method*** of the maturity of intelligent manufacturing capability.
- Apply to manufacturing enterprises, intelligent manufacturing system solution providers and ***third parties*** to conduct maturity assessment activities of intelligent manufacturing capability.
- Terms:
  - **Assessment domain:** the set of core clauses for maturity assessment of intelligent manufacturing capability
  - **Assessment criteria:** the set of policies, procedures or requirements used as a reference against which objective evidence is compared
  - **Assessment findings:** the results of assessment of the collected evidence against assessment criteria

Assessment Domain of Repetitive Manufacturing Enterprises

表 1　流程型制造企业评估域

要素	人员		技术			资源		制造									
能力域	组织战略	人员技能	数据	集成	信息安全	装备	网络	设计	生产							物流	销售	服务
评估域	组织战略	人员技能	数据	集成	信息安全	装备	网络	工艺设计	采购	计划与调度	生产作业	设备管理	仓储送	安全环保	能源管理	物流	销售	客户服务

Element	Personnel		Technology			Resource		Manufacturing										
Capability domain	Organizational strategy	Personnel skills	Data	Integration	Information security	Equipment	Network	Design	Production							Logistics	Sales	Service
Assessment domain	Organizational strategy	Personnel skills	Data	Integration	Information security	Equipment	Network	Process design	Procurement	Planning and scheduling	Production operation	Equipment management	Warehousing and distribution	Safety and environmental protection	Energy management	Logistics	Customer service	Product service

Assessment Domain of Discrete Manufacturing Enterprises

表 2　离散型制造企业评估域

要素	人员		技术			资源		制造											
能力域	组织战略	人员技能	数据	集成	信息安全	装备	网络	设计		生产						物流	销售	服务	
评估域	组织战略	人员技能	数据	集成	信息安全	装备	网络	产品设计	工艺设计	采购	计划与调度	生产作业	设备管理	仓储配送	安全环保	能源管理	物流	销售	客户服务	产品服务

Element	Personnel		Technology			Resource		Manufacturing												
Capability domain	Organizational strategy	Personnel skills	Data	Integration	Information security	Equipment	Network	Design		Production						Logistics	Sales	Service		
Assessment domain	Organizational strategy	Personnel skills	Data	Integration	Information security	Equipment	Network	Product design	Process design	Procurement	Planning and scheduling	Production operation	Equipment management	Warehousing and distribution	Safety and environmental protection	Energy management	Logistics	Sales	Customer service	Product service

The weight of Assessment Domain (Repetitive Manufacturing Enterprises)

Repetitive Manufacturing

Repetitive manufacturing is a *period-based production* and not an order or lot based.

The *same product* will be manufactured over *specific periods of time*, and they might *not change frequently*.

The product is processed at a constant flow, and *interim products are not stocked*.

Order confirmation is done from *back-flushing*, and the settlement is carried through the product cost collector.

Planned orders are sufficient to carry out the shop floor activity.

Examples of production companies utilizing a repetitive manufacturing process would be *durable goods, cars, and electronic products*.

表 4 流程型制造企业主要评估域及权重

能力要素	能力要素权重	能力域	能力域权重	能力子域	能力子域权重
人员	6%	组织战略	50%	组织战略	100%
		人员技能	50%	人员技能	100%
技术	11%	数据应用	46%	数据应用	100%
		集成	27%	集成	100%
		信息安全	27%	信息安全	100%
资源	15%	装备	67%	装备	100%
		网络	33%	网络	100%
制造	68%	设计	4%	工艺设计	100%
		生产	63%	采购	12%
				计划与调度	14%
				生产作业	23%
				设备管理	15%
				安全环保	12%
				仓储配送	12%
				能源管理	12%
		物流	15%	物流	100%
		销售	15%	销售	100%
		服务	3%	客户服务	100%

 https://www.yash.com/blog/rem-discrete-sap-manufacturing/

The weight of Assessment Domain (Discrete Manufacturing Enterprises)

Discrete Manufacturing

Discrete Manufacturing is about the manufacture of a product based on production orders and is characterized by requirements that *do not occur on a regular basis*.

The Discrete Manufacturing scenario can be used in different variants, in production by *lot size, make-to-order production*, and *assembly processing*.

The variants differ mainly in the planning conducted before-hand and about the sales order.

Confirmation and costs will be settled order wise.

Examples of discrete manufacturing could include: *vehicles, aircraft, smartphones, computers*, etc.

表 5 离散型制造企业主要评估域及权重

能力要素	能力要素权重	能力域	能力域权重	能力子域	能力子域权重
人员	6%	组织战略	50%	组织战略	100%
		人员技能	50%	人员技能	100%
技术	11%	数据应用	46%	数据应用	100%
		集成	27%	集成	100%
		信息安全	27%	信息安全	100%
资源	6%	装备	50%	装备	100%
		网络	50%	网络	100%
制造	77%	设计	13%	产品设计	50%
				工艺设计	50%
		生产	48%	采购	14%
				计划与调度	16%
				生产作业	16%
				设备管理	14%
				仓储配送	14%
				安全环保	13%
				能源管理	13%
		物流	13%	物流	100%
		销售	13%	销售	100%
		服务	13%	产品服务	50%
				客户服务	50%

 https://www.yash.com/blog/rem-discrete-sap-manufacturing/

Assessment Procedure

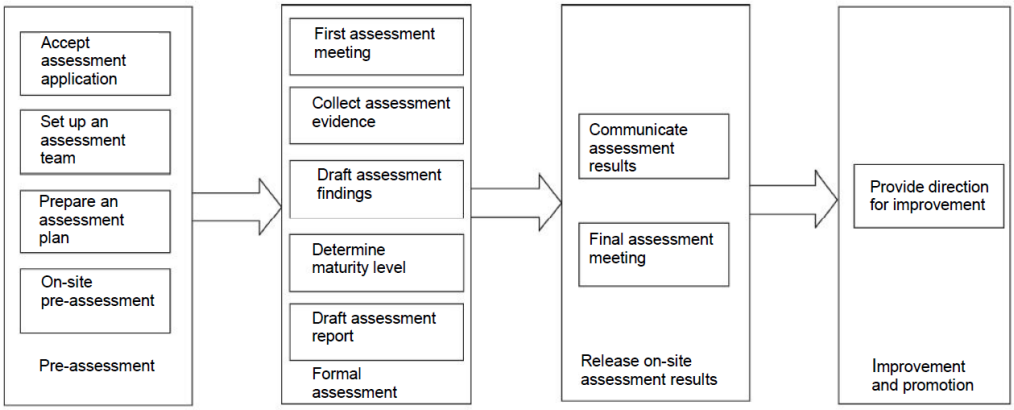


Figure 1 Maturity assessment procedure of intelligent manufacturing capability

Determination method for maturity level

- When the score of the assessed object at a certain maturity level is higher than the lowest score of the scoring interval, it is deemed to satisfy the requirements of the level; otherwise, it is deemed to be dissatisfied.
- When calculating the overall score, the maturity score of the satisfied level shall be 1, while the maturity score of the dissatisfied level shall be the actual score of the level.
- The overall maturity score of intelligent manufacturing capability is the cumulative sum of the scores of each maturity level.

Satisfaction of maturity requirements	Score
All satisfied	1
Mostly satisfied	0.8
Partially satisfied	0.5
Dissatisfied	0

Scoring method

Satisfaction of maturity requirements and corresponding scores

Maturity level	Corresponding scoring interval
Level 5 (leading level)	$4.8 \le S \le 5$
Level 4 (optimized level)	$3.8 \le S < 4.8$
Level 3 (integrated level)	$2.8 \le S < 3.8$
Level 2 (specified level)	$1.8 \le S < 2.8$
Level 1 (planning level)	$0.8 \le S < 1.8$

Determination method for maturity level

- The self-evaluation results are divided into 1-5 grades from low to high according to the requirements of the standard.
- **Maturity level 1:** Enterprises should ***begin to plan*** for the implementation of intelligent manufacturing, and can ***carry out process management*** of core business such as design, production, logistics, sales and service;
- **Maturity level 2:** Enterprises should ***use digital equipment*** and ***information technology*** methods to digitally transform core business ***to realize data sharing*** within a ***single business***;
- **Maturity level 3:** The company has formed ***an integrated solution***, and networked integration of equipment and systems to achieve ***data sharing between businesses***;
- **Maturity level 4:** The enterprise ***mines data*** such as personnel, equipment, products, environment and production process, and ***realizes accurate prediction*** of core business and ***optimization control*** of some businesses through knowledge and **models**;
- **Maturity level 5:** Enterprises should ***drive business optimization and continuous innovation*** based on **models** to achieve synergy in the industry chain and derive new manufacturing models and business models.

Jingyi Hu et al. (2019) " Research and application of capability maturity model for Chinese intelligent manufacturing ", *Procedia CIRP* 83, 794–799.

Case Study - Intelligent Manufacturing Development Index Report (2021)

In December 2021, eight departments including the Ministry of Industry and Information Technology jointly issued the "***14th Five-Year Plan for the Development of Intelligent Manufacturing***", which clearly put forward the transformation and upgrading goal of industry by 2025, so the maturity level of intelligent manufacturing capabilities will be significantly improved.

It is pointed out to establish a long-term evaluation mechanism.

"Intelligent Manufacturing Capability Maturity Model" (GB/T 39116-2020) officially released and implemented in May 2021.

The report reflects the development process of intelligent manufacturing in the manufacturing industry in 2021.
https://www.eet-china.com/mp/a117969.html

Development Status of Intelligent Manufacturing

- As of December 2021, more than **20,000** enterprises across the country have carried out self-diagnosis of intelligent manufacturing capability maturity through service platforms.
- Jiangsu (江苏), Shandong (山东), Beijing (北京), Ningxia (宁夏), Shanxi (陕西), Jiangxi (江西) and other industries participated.

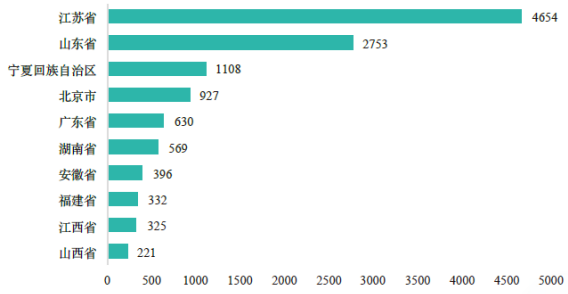


图 2 全国智能制造能力成熟度自诊断企业数量 TOP10 地区

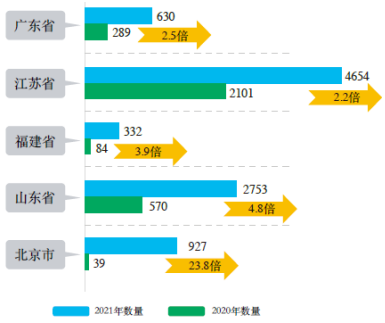
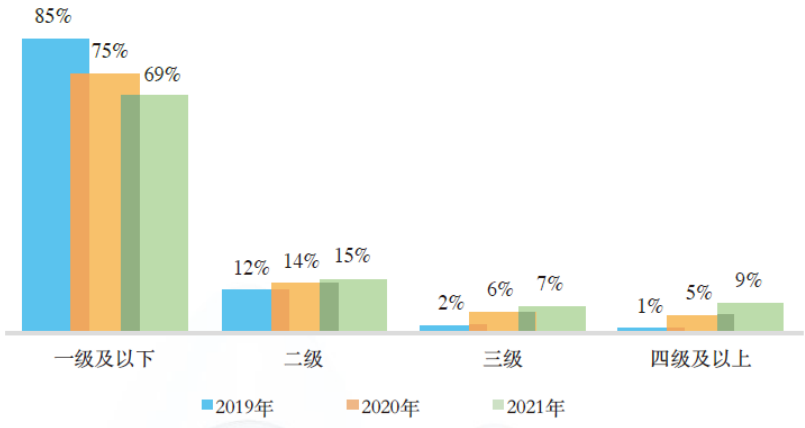


图 3 全国智能制造能力成熟度自诊断企业增量 TOP 5

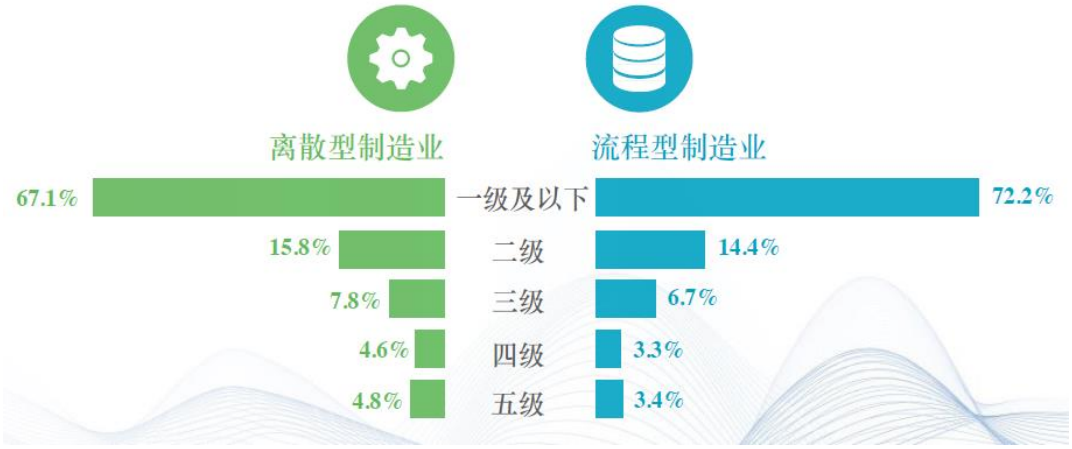
Development Status of Intelligent Manufacturing

- At present, 69% of China's manufacturing enterprises are at the first-level or lower level, the second-level and third-level manufacturing enterprises account for 15% and 7% respectively, and the fourth-level and above manufacturing enterprises account for 9%.

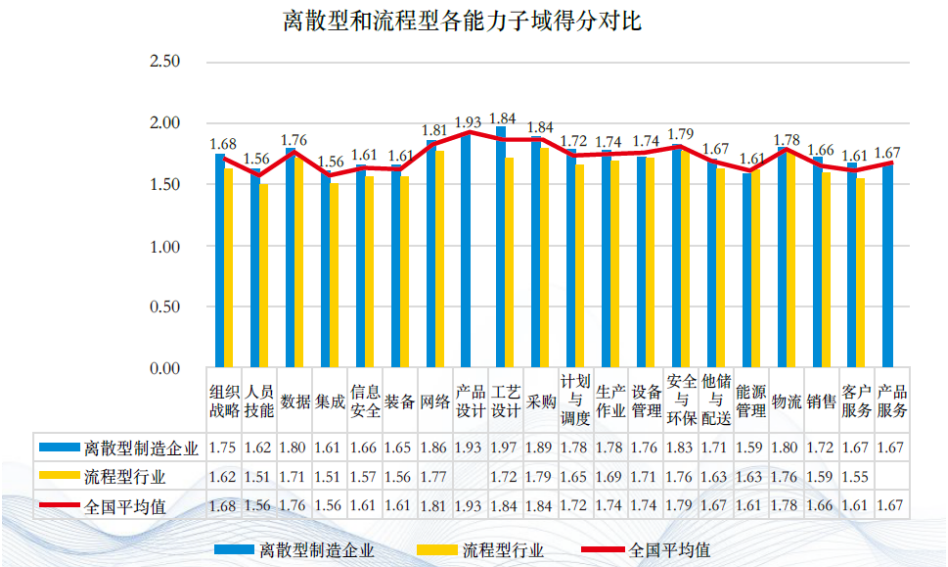


Maturity Level between Discrete Manufacturing and Repetitive Manufacturing Enterprises

- From an industry perspective, the maturity level of discrete manufacturing is generally higher than that of process manufacturing.

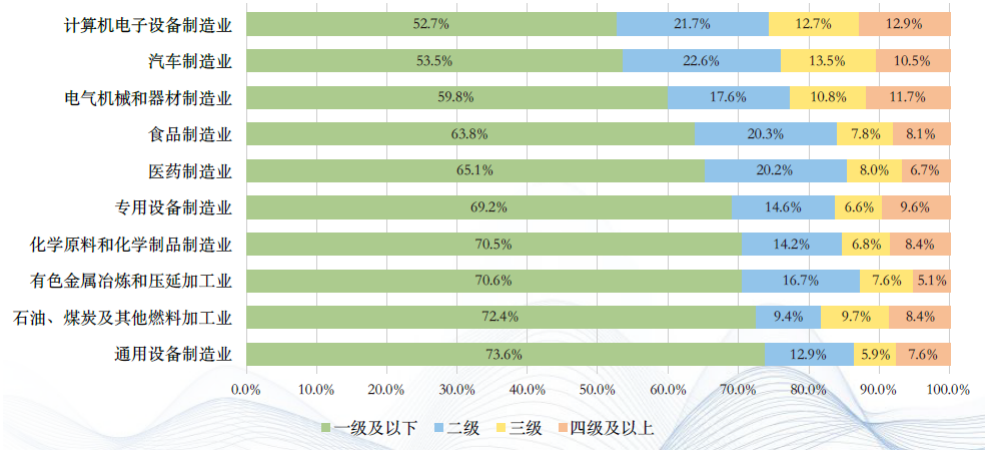


Sub-domain Score Comparison between Discrete Manufacturing and Repetitive Manufacturing Enterprises



TOP 10 Industries' Intelligent Manufacturing Capability Maturity Level Distribution

- The results show that the maturity level of intelligent manufacturing capabilities in industries such as computer electronic equipment, automobiles, electrical appliances, food, medicine, special equipment manufacturing, chemical raw materials and products, and non-ferrous metal smelting ranks among the top domestically.



China intelligent manufacturing evaluation public service platform (中国智能制造评估评价公共服务平台)

https://www.c3mep.cn/home?subPlatformId=1

Platform Self-diagnostic Process

平台流程

智能制造是IT与OT的融合，是庞大的、复杂的系统工程；

- 填报人员应为：
  1. **对标准内容有了解**
  2. **能协调智能制造能力提升涉及部门的一名或多名人员**，部门至少应包括：业务部门、设备、人力、信息系统运维、信息技术、网络等部门；
- 全条款填报时长大约为：**2个小时**左右；
- 填报方式：**多部门人员采用会议等形式一起作答**，或同一账号分别作答；
- 填报须知：客观真实，切勿盲目的追求高分

Report

报告解读

Conclusion

- Introduction of HKPC industry 4.0 approach (Fraunhofer IPT) and China standards “Made in China 2025” approach.
- China Capability Maturity Model of Intelligent Manufacturing (CMMM) background and PTRM model (GB/T 39116-2020)
- CMMM Assessment Method (GB/T 39117-2020)
- Intelligent Manufacturing Development Index Report (2021)
- China Intelligent Manufacturing Evaluation Public Service Platform

Understand details before self-diagnostic on Intelligent Manufacturing!