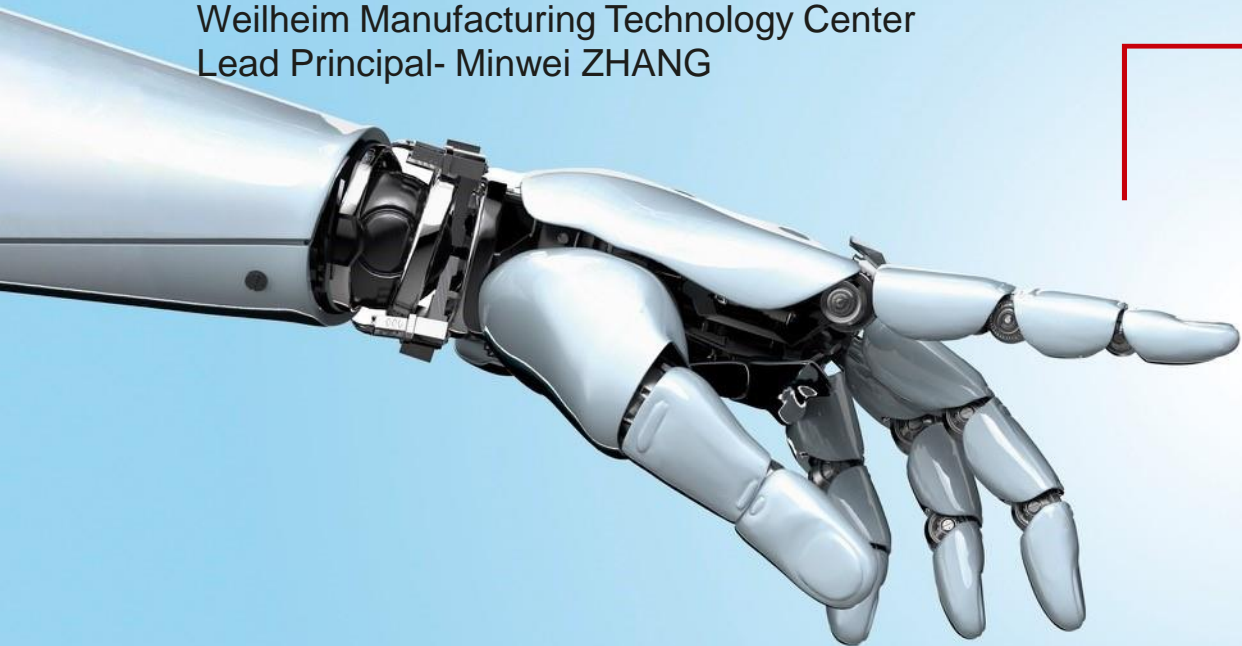


Automation from physical to virtual

Huawei Technologies Duesseldorf GmbH
Weilheim Manufacturing Technology Center
Lead Principal- Minwei ZHANG



History view: The Evolution & Revolution of the factory has been contributing to a more sustainable world



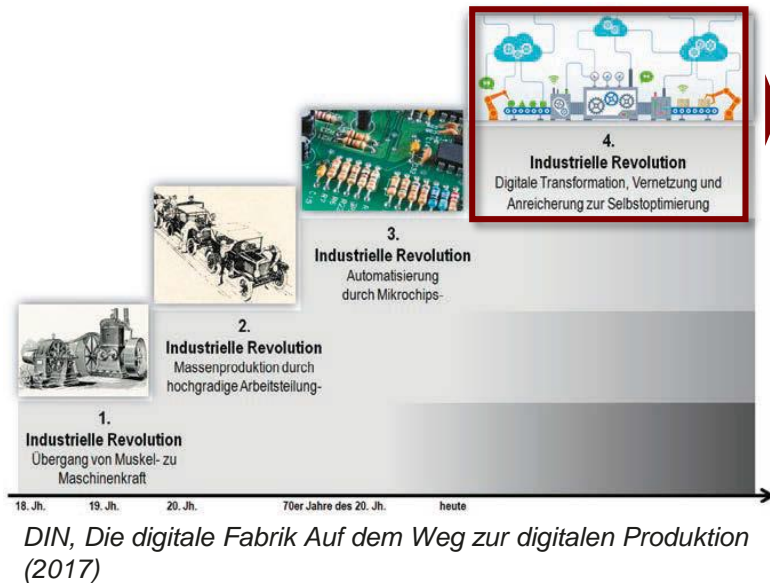
Sustainability



Resilience

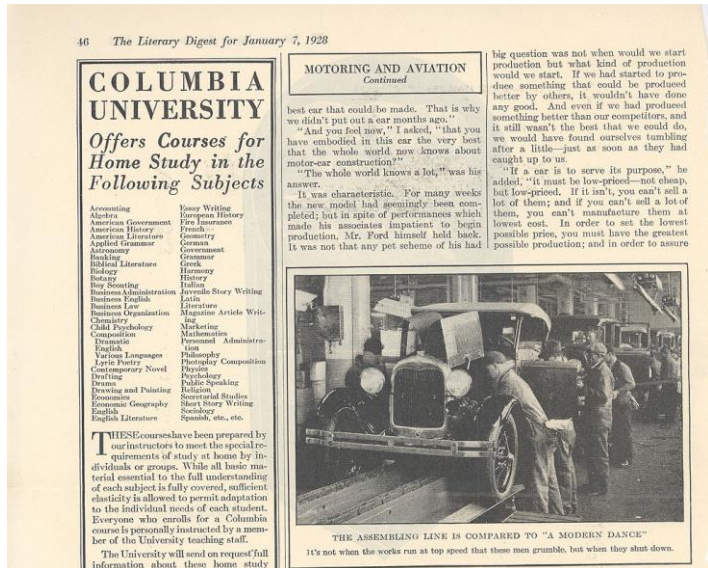


... and yet many more challenges

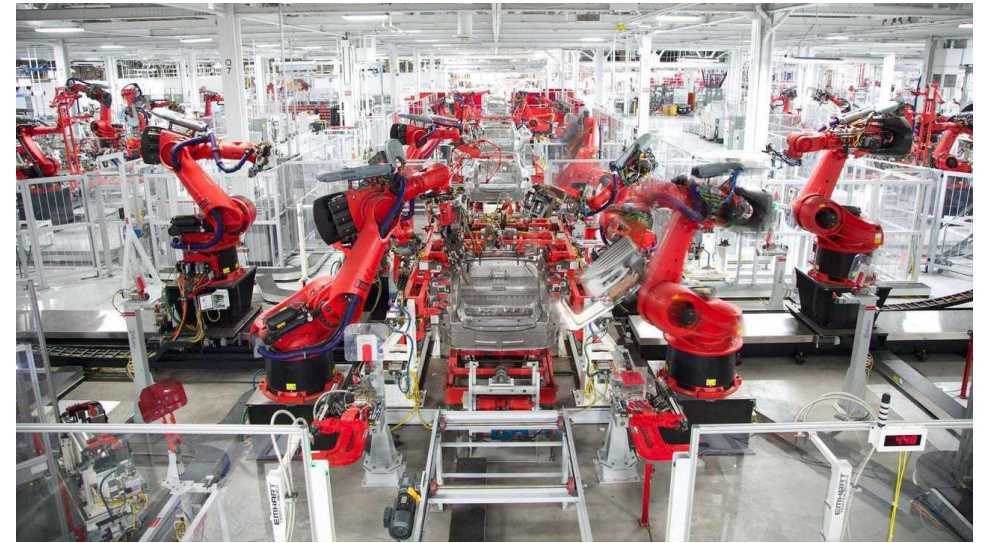


World Economic Forum and Mckinsey & Company lighthouse site analysis (2019)

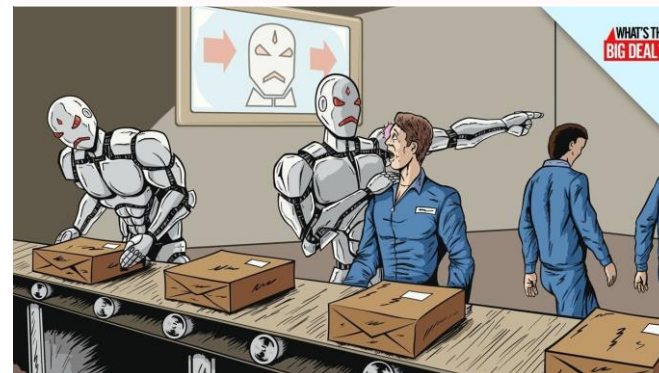
Advancing of the AUTOMATION has been the main driving force, keeping transforming the factory in the last decade



Ford Motor Company assembly line, 1928



Tesla Fremont Factory assembly line, 2021



<https://movietvtechgeeks.com>

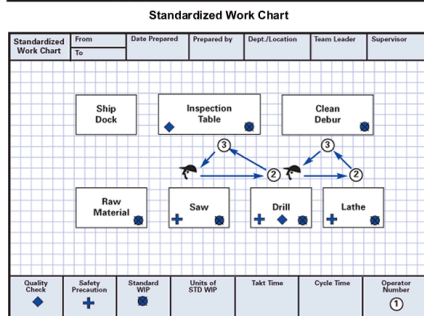
Nowadays, AUTOMATION can be deployed easily in a factory, where rule based standardized work is implemented

Process Capacity Sheet

#	Process name	Machine #	BASIC TIME			TOOL CHANGE		Processing capacity per shift
			MANUAL	AUTO	COMPLETION	CHANGE	TIME	
1	Cut	cc100	5	25	30	500	2 min.	896
2	Rough Grind	gg200	5	12	17	1000	5 min.	1570
3	Fine Grind	gg300	5	27	32	500	5 min.	823

Standardized Work Combination Table

Work Elements	Time (sec)		Seconds																
	min	max	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85
Get all tools, place on conveyor	1	2																	
Get work table, place for assembly	1	2																	
Get connector, place and clamp	1	2																	
Get hose, place	1	2																	
Start Assembly cycle	1	2																	
Get finished piece, attach connector	1	2																	
Get finished piece, attach connector	1	2																	
Place to Assembly & Return	1	2																	
Get hose, cut, remove, assemble	1	2																	
Place to Assembly & Return	1	2																	
Get finished piece, place for Return	1	2																	
Start Assembly cycle	1	2																	
Get finished piece, place for Return	1	2																	
Totals																			

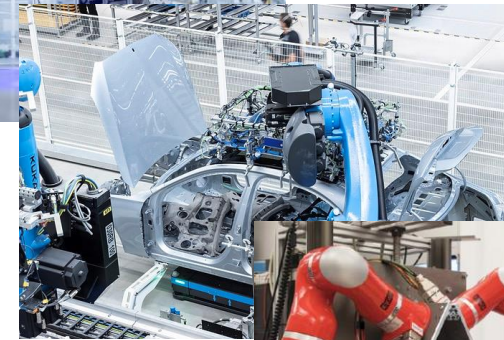


Essentials about standardized work

- Steps of defining **rules**
 - Describe the standard
 - Detect deviations
 - Define workflow
- Effects** of standardized work
 - Create **transparency** in the work flow
 - Provide the **basis** for the **CIP** (Continuous Improvement Process)



Mercedes Benz Factory 56, Sindelfingen
Mercedes-Benz Group Media



A cocktail freshly blended by Topsy Robot Las Vegas

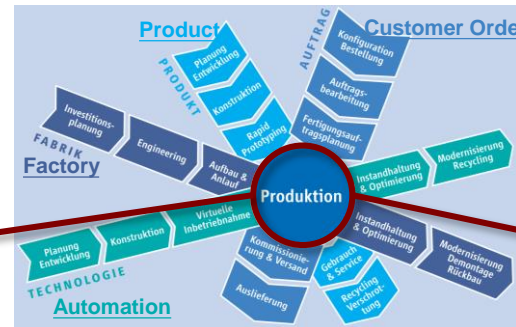
<http://thetipsyrobot.com/los-angeles-times/>

<https://www.lean.org/lexicon-terms/standardized-work/>

In a Digital Factory, the visible Real world is handling value streams, while invisible virtual world is mainly handling business processes & info. flows

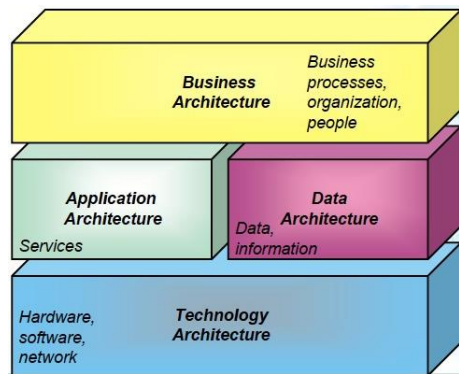
Main business processes include,

- Product,
- Factory/Production,
- Automation
- Customer order

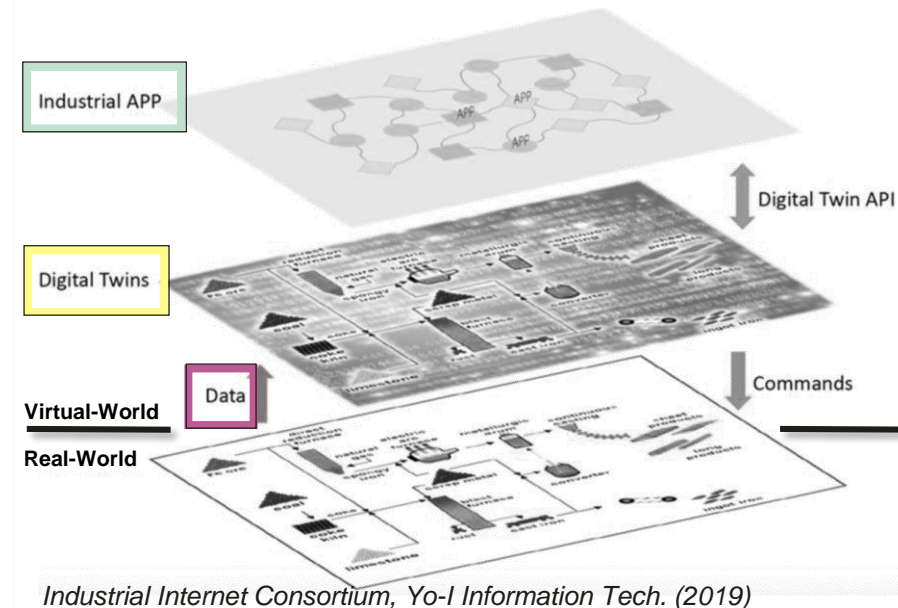


ZVEI, Industrie 4.0 (2017)

Digital Factory stands in the center, where all **business processes** meet, and where all their **information flows** merge

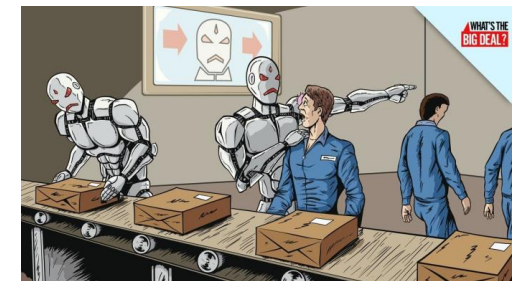


TOGAF® - The Open Group Architectural Framework



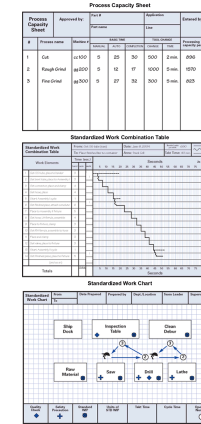
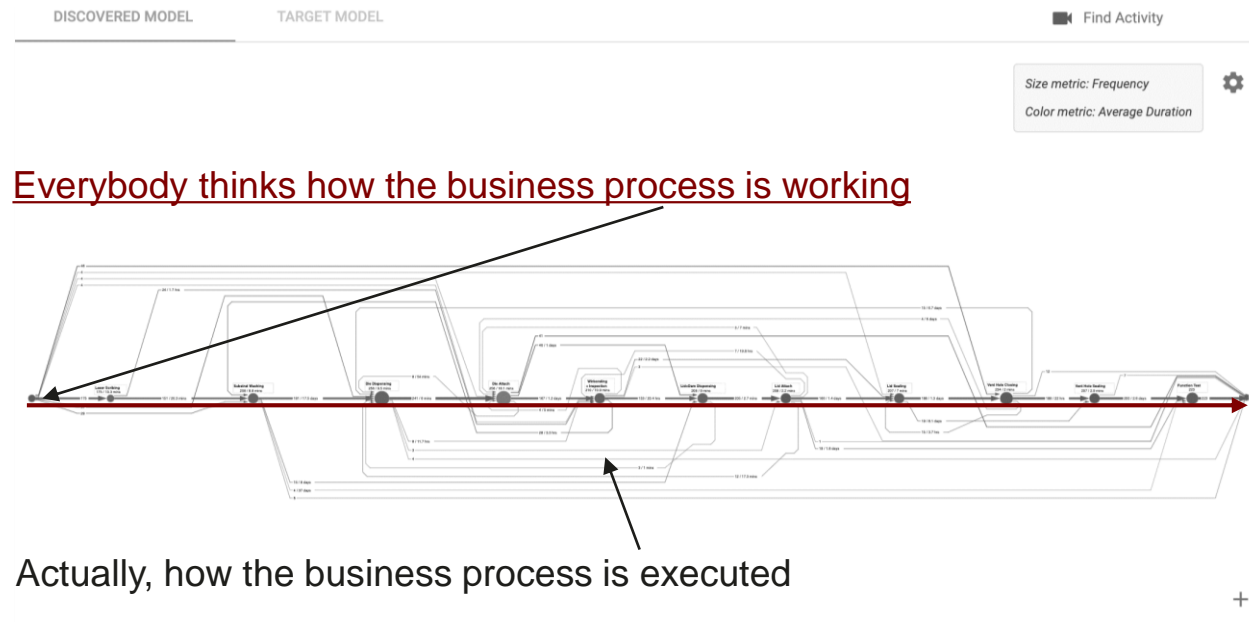
Industrial Internet Consortium, Yo-I Information Tech. (2019)

BUT,
where is the place for
Automation in the virtual world?



With the same success recipe- rule based standardized work, **AUTOMATION** also applies in the virtual world

The invisible virtual world is more wild than you think
 A real life example of a business process @ a small sample shop

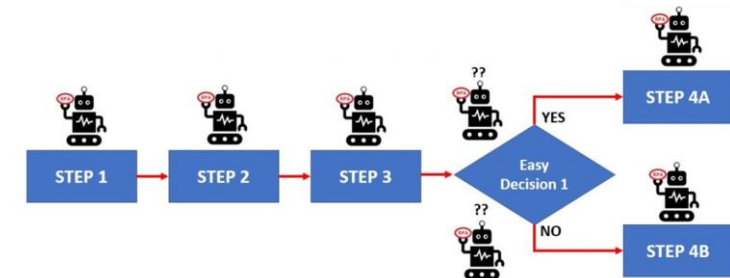


Essentials about standardized work in **virtual world**

- Steps of defining rules
 - Describe the standard
 - Detect deviations- **Process mining**
 - Define workflow- **Robotic Process Automation(RPA)**

2. Effects of standardized work

- Create **transparency** in the work flow
- Provide the **basis** for the **CIP**



Success stories from banking industries are inspiring... BUT, in a Digital Factory, challenges can be quite different



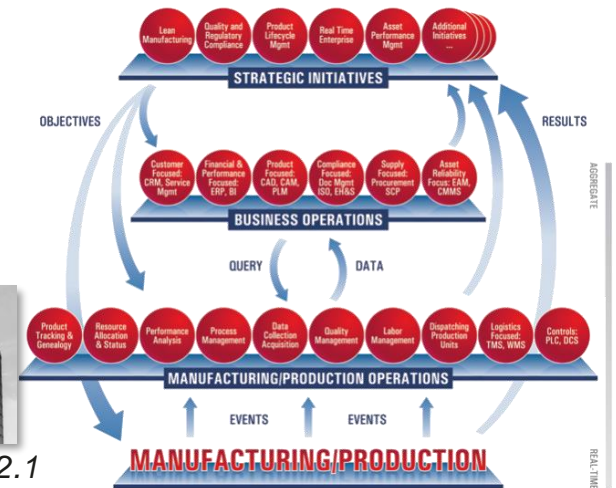
1. Technical & Organizational aspect

- A sword has two blades

- People digitalize data, but in a matrix organization, data is managed in **silos**



MESA Strategic Initiatives, V2.1



2. Human aspect

- Upskilling of workforce

- Analog Automation offloading **shopfloor workers**, the journey of Automation offloading **office workers** requires **upskilling** of the workforce



Drafter working in Seattle Engineering Department, 1959



Rules based Automation,
powered by data driven AIOT,
has the potential to push Digital Factory to the next level



Thank you.

Bring digital to every person, home and organization for a fully connected, intelligent world.

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