



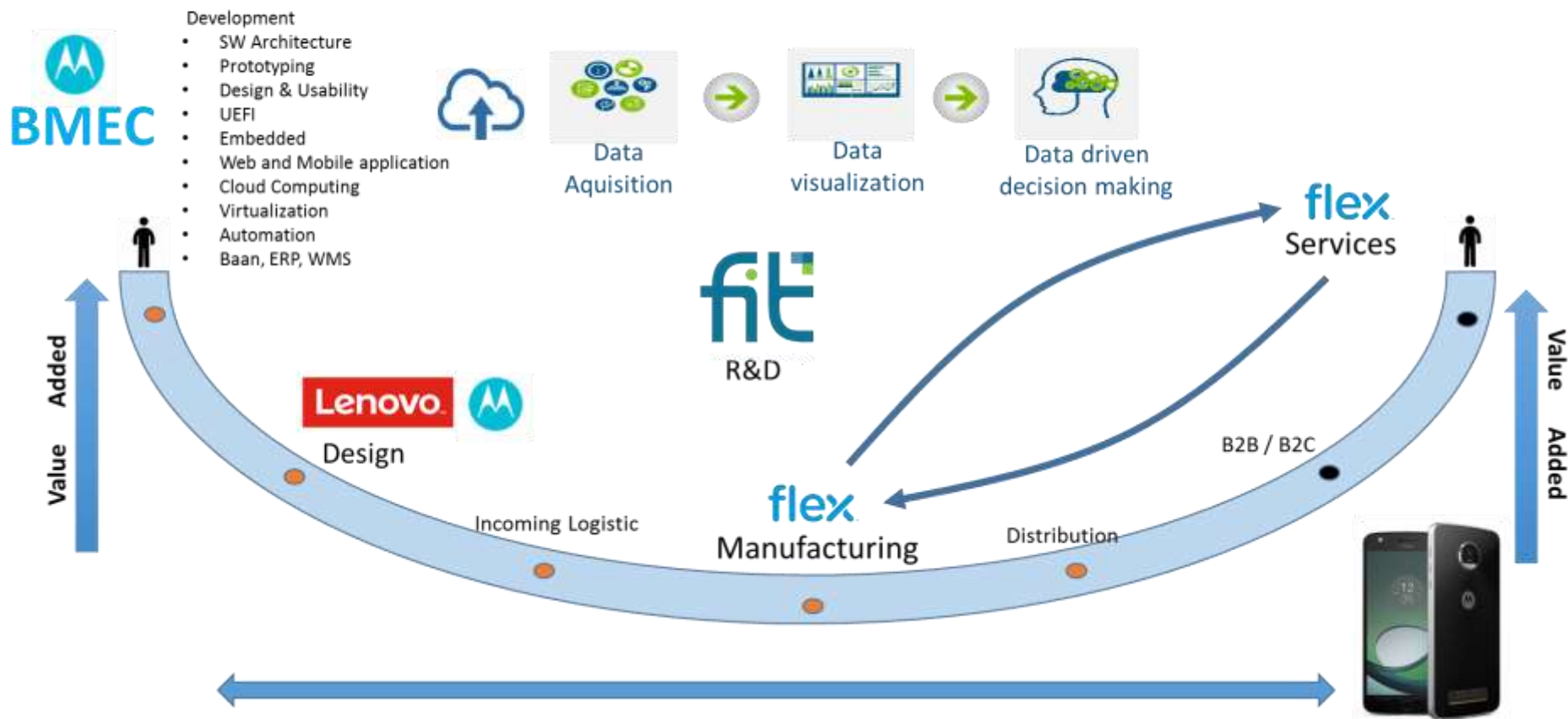


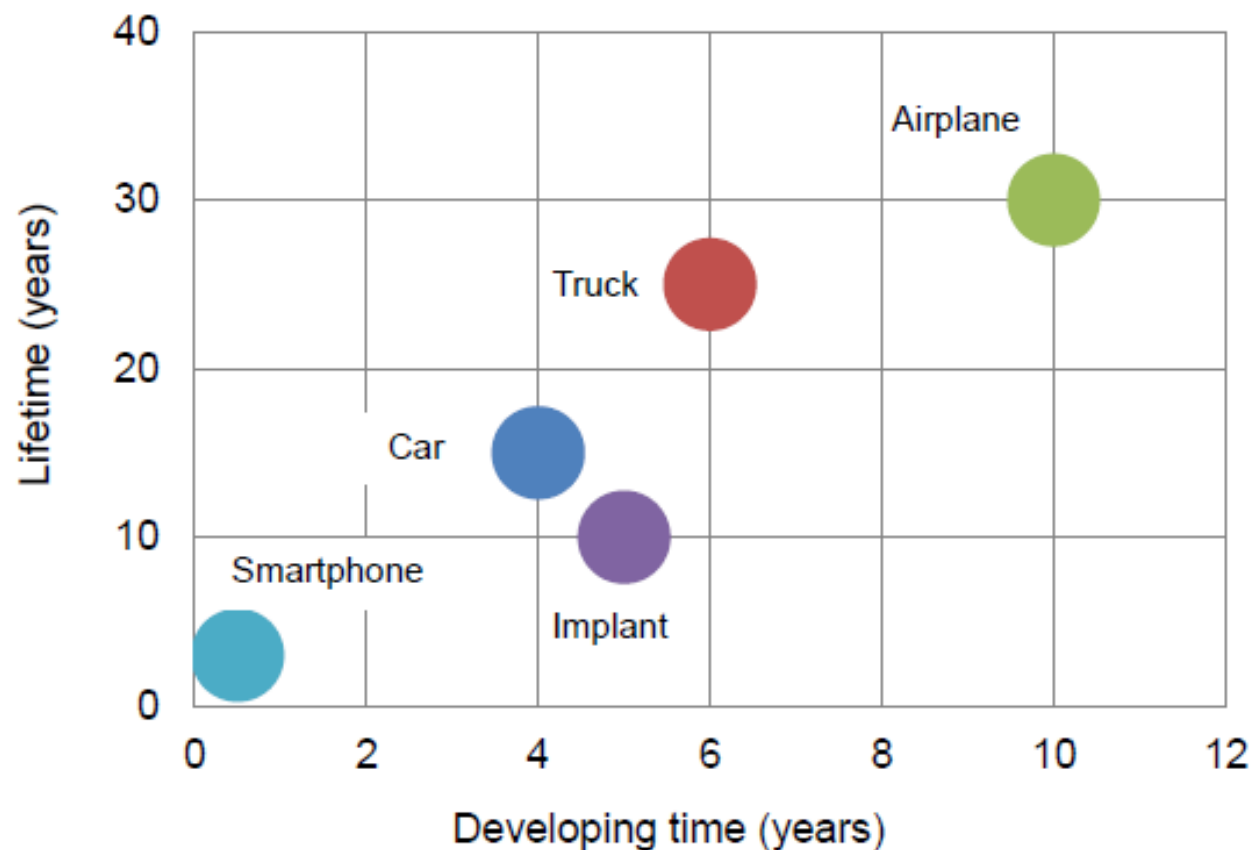
INOVAÇÃO E
NEGÓCIOS TECNOLÓGICOS

***Competitive leverage in cell phone manufacturing:
Lenovo Moto Company strategy on packaging design***

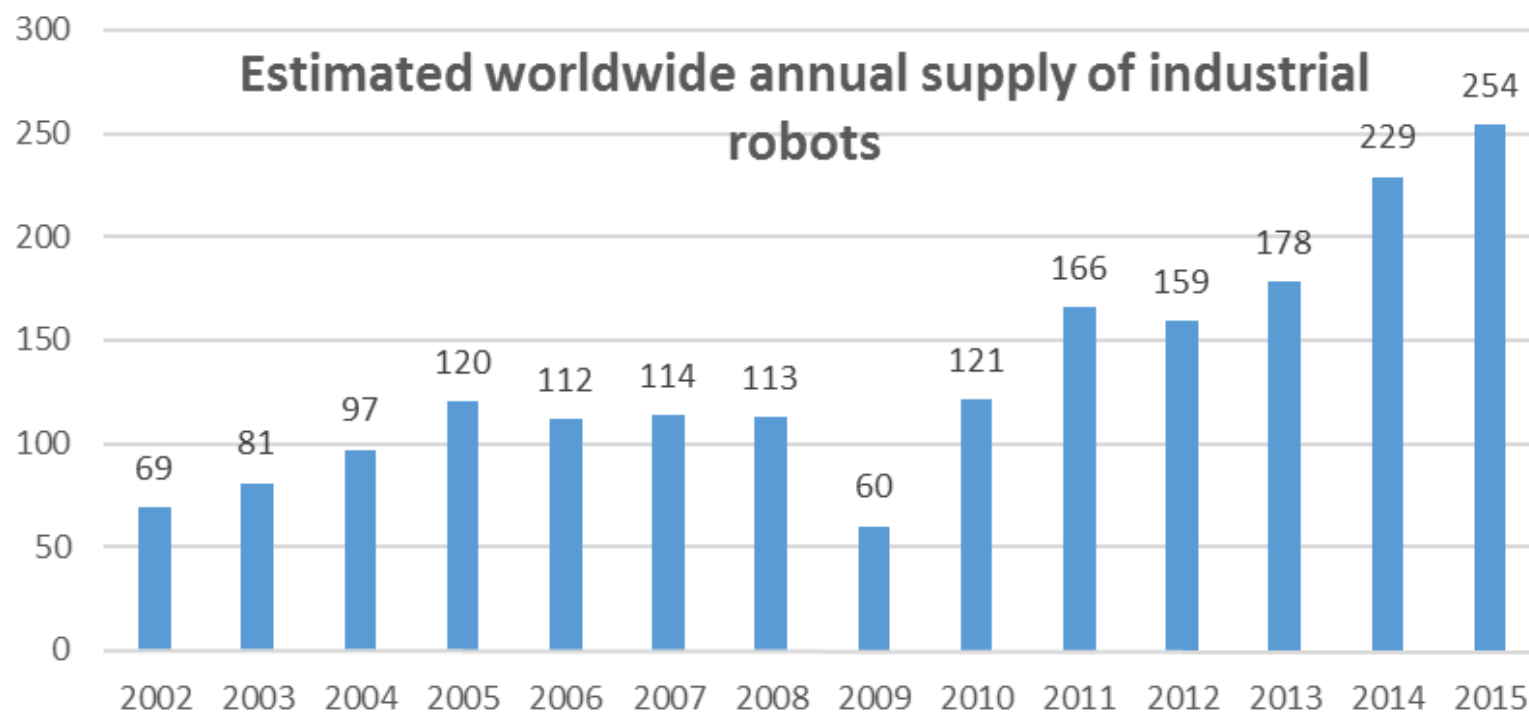
Future Factory – End to End Solution

WHAT



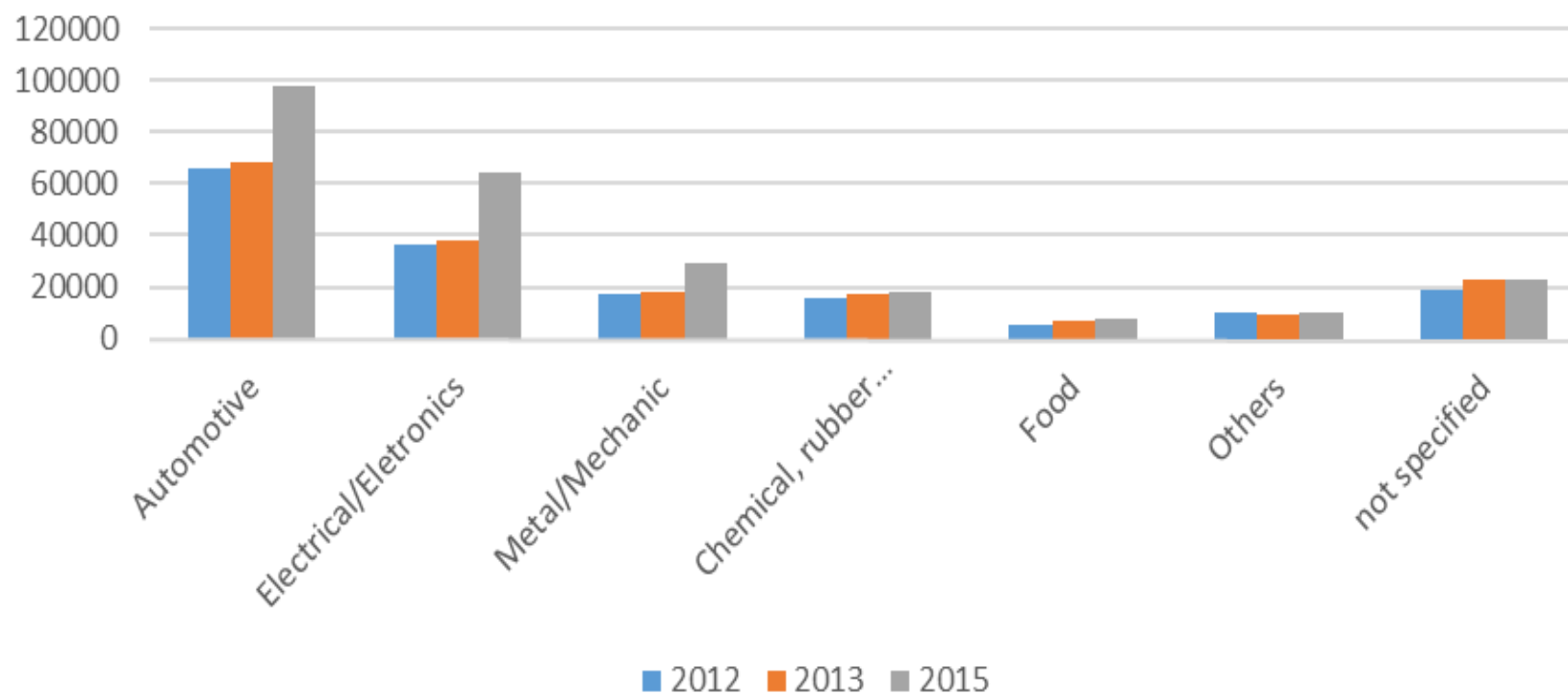







Source: H. Kück, Vorlesungsskript, „Aufbau- und Verbindungstechnik - Sensor- und Systemaufbau“



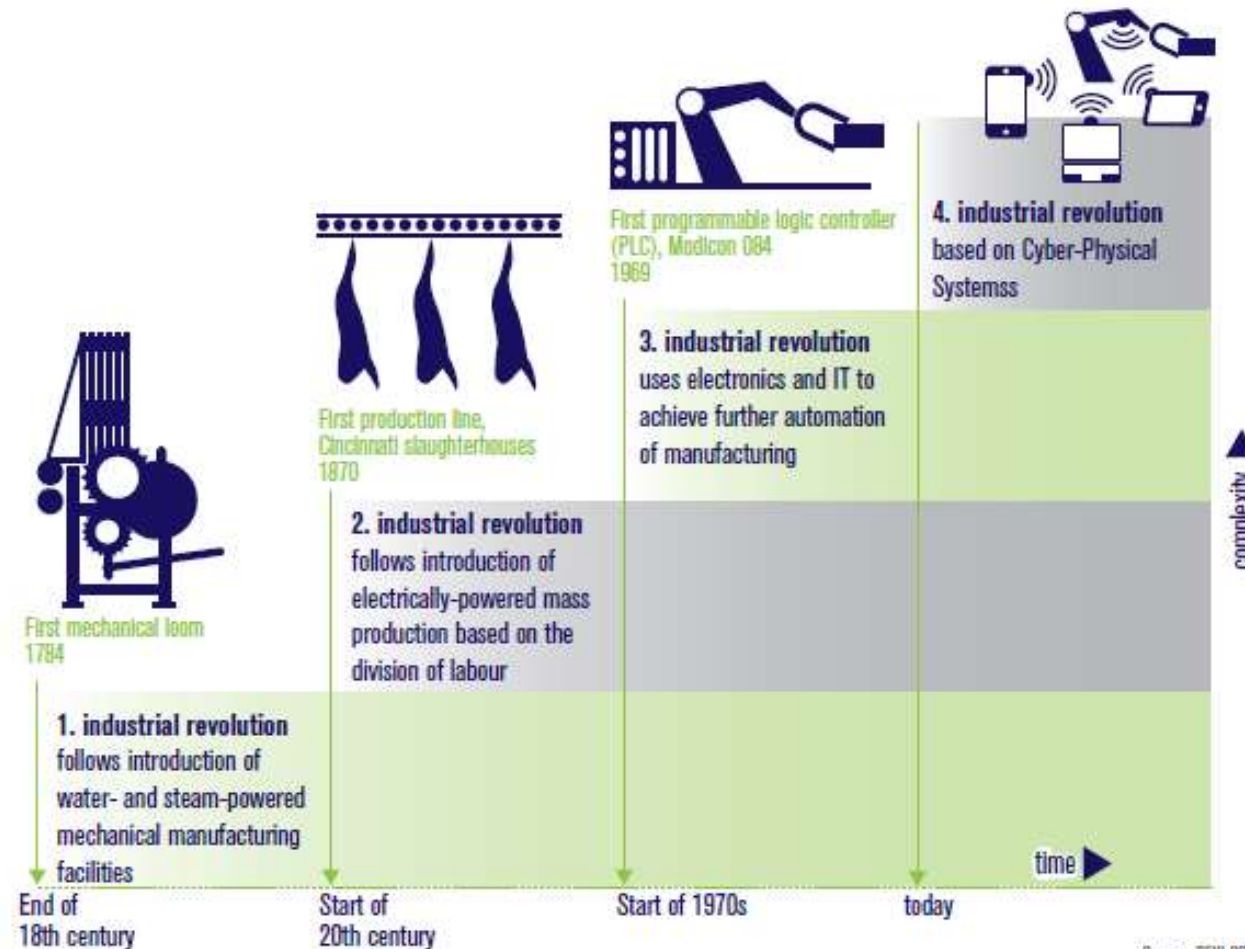
Estimated worldwide annual supply of industrial robots. Word Robotics, 2016

Estimated worldwide annual supply of industrial robots at year-end
by industries 2013 - 2015 (K units)



	Carry	Machine	Discharge	Transport
 Level 1	MANUAL	MANUAL	MANUAL	MANUAL
 Level 2	MANUAL	AUTO	MANUAL	MANUAL
 Level 3	MANUAL	AUTO	AUTO	MANUAL
 Level 4	AUTO	AUTO	AUTO	MANUAL
 Level 5	AUTO	AUTO	AUTO	AUTO

Automation levels. Source: Rother & Harris, 2001



Source: DFKI 2011



Printed circuit
board assembly

Level – 4/5
3rd revolution



Programming &
Testing

Level 2
2rd revolution



Application of
chemical
substances

Level 4
3rd revolution



Mechanical
Assembly

Level 2
2rd revolution



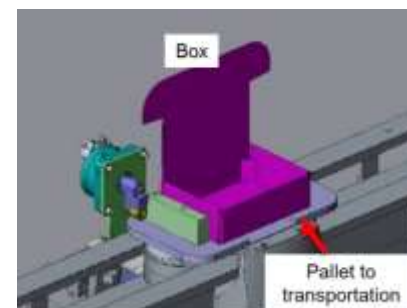
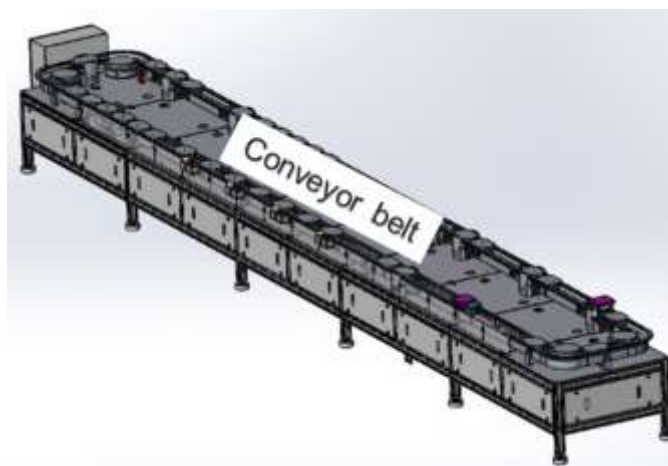
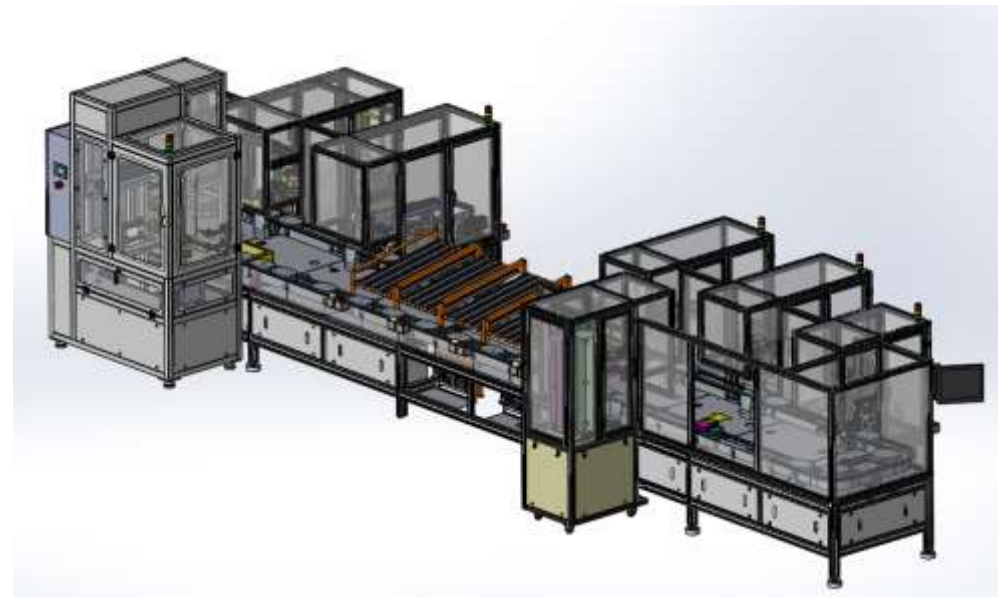
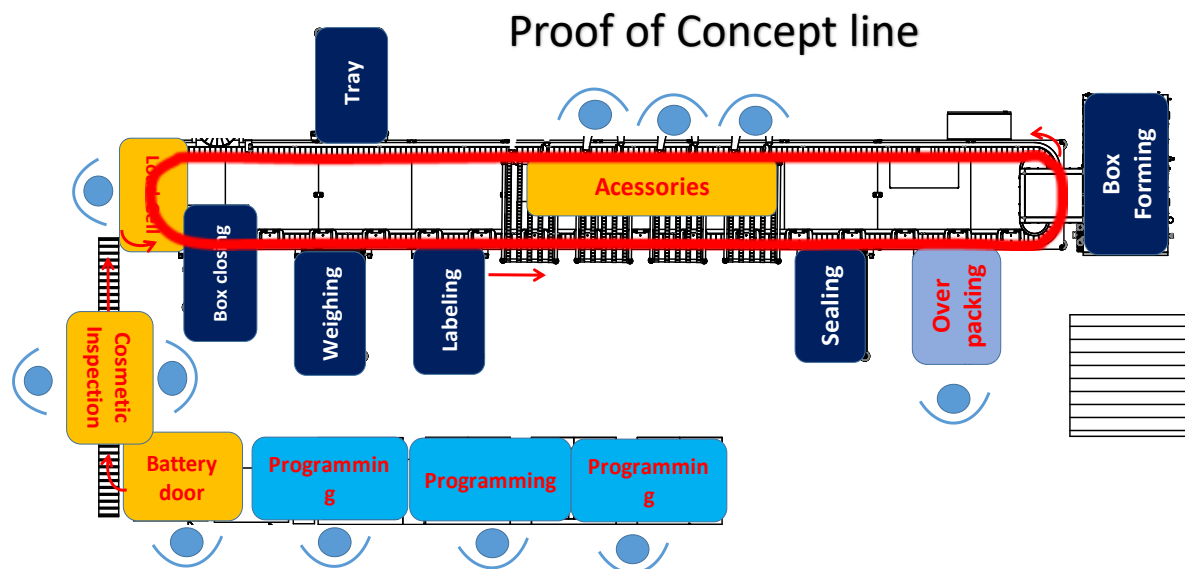
Packaging

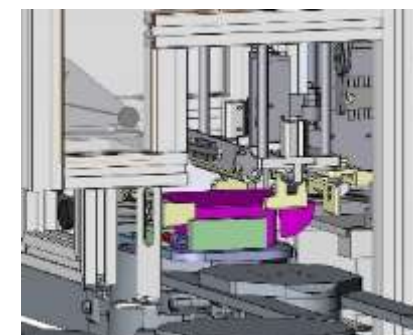
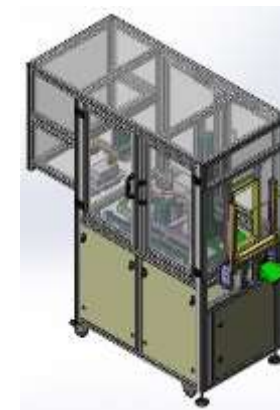
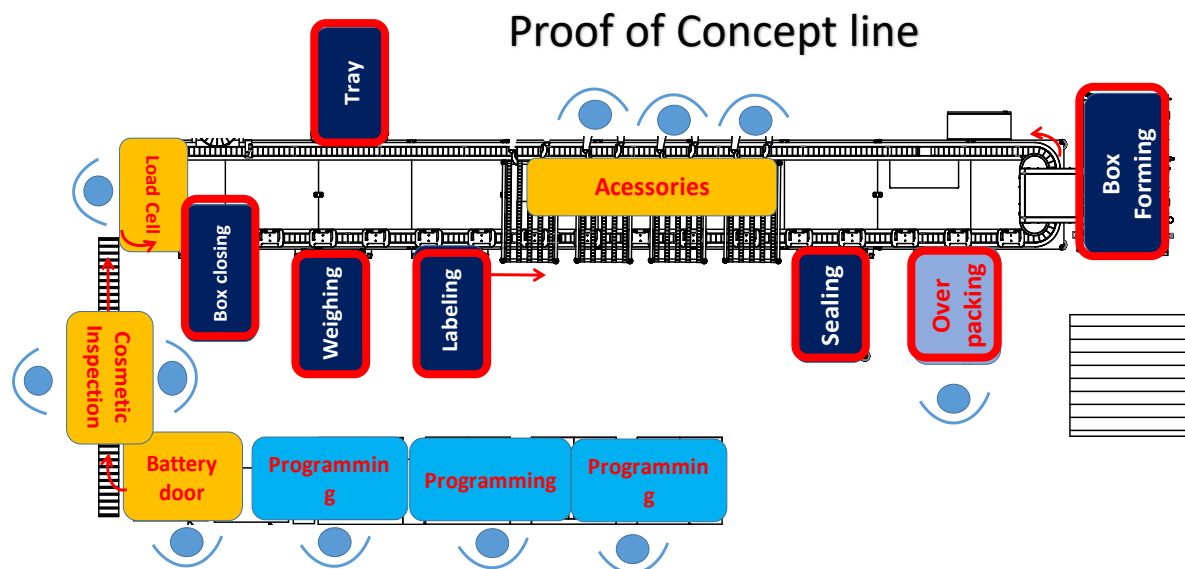
level 2
2rd revolution










	Carry	Machine	Discharge	Transport
Level 1	MANUAL	MANUAL	MANUAL	MANUAL
Level 2	MANUAL	AUTO	MANUAL	MANUAL
Level 3	MANUAL	AUTO	AUTO	MANUAL
Level 4	AUTO	AUTO	AUTO	MANUAL
Level 5	AUTO	AUTO	AUTO	AUTO





	Carry	Machine	Discharge	Transport
 Level 1	MANUAL	MANUAL	MANUAL	MANUAL
 Level 2	MANUAL	AUTO	MANUAL	MANUAL
 Level 3	MANUAL	AUTO	AUTO	MANUAL
 Level 4	AUTO	AUTO	AUTO	MANUAL
 Level 5	AUTO	AUTO	AUTO	AUTO



CTQs	Unit of measurement	Before (manual line)	After (automated line)	% Improved	
Capacity	units/hour	310	500	61%	↑
Crew size	qty	11	13	-18%	↓
Productivity	units/hour/person	28.18	38.46	36%	↑
Automation - Level #1	% of stations	0.82	0.62	25%	↓
Automation - Level #2	% of stations	0.18	0.15	15%	↓
Automation - Level #3	% of stations	0.00	0.08	6%	↑
Automation - Level #5	% of stations	0.00	0.46	38%	↑

- ✓ **Multiple module integration requires high individual reliability**
- ✓ **DFA needs (design for automation)**
- ✓ **Slower Learning Curve**
- ✓ **Difficulties in cellulosic packaging (humidity problems)**
- ✓ **Increase in the qualification of the workforce**
- ✓ **Very short life cycle**
- ✓ **Financial economic viability**
- ✓ **Line in process of replication**



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From individual knowledge
to collective thinking

Thank You