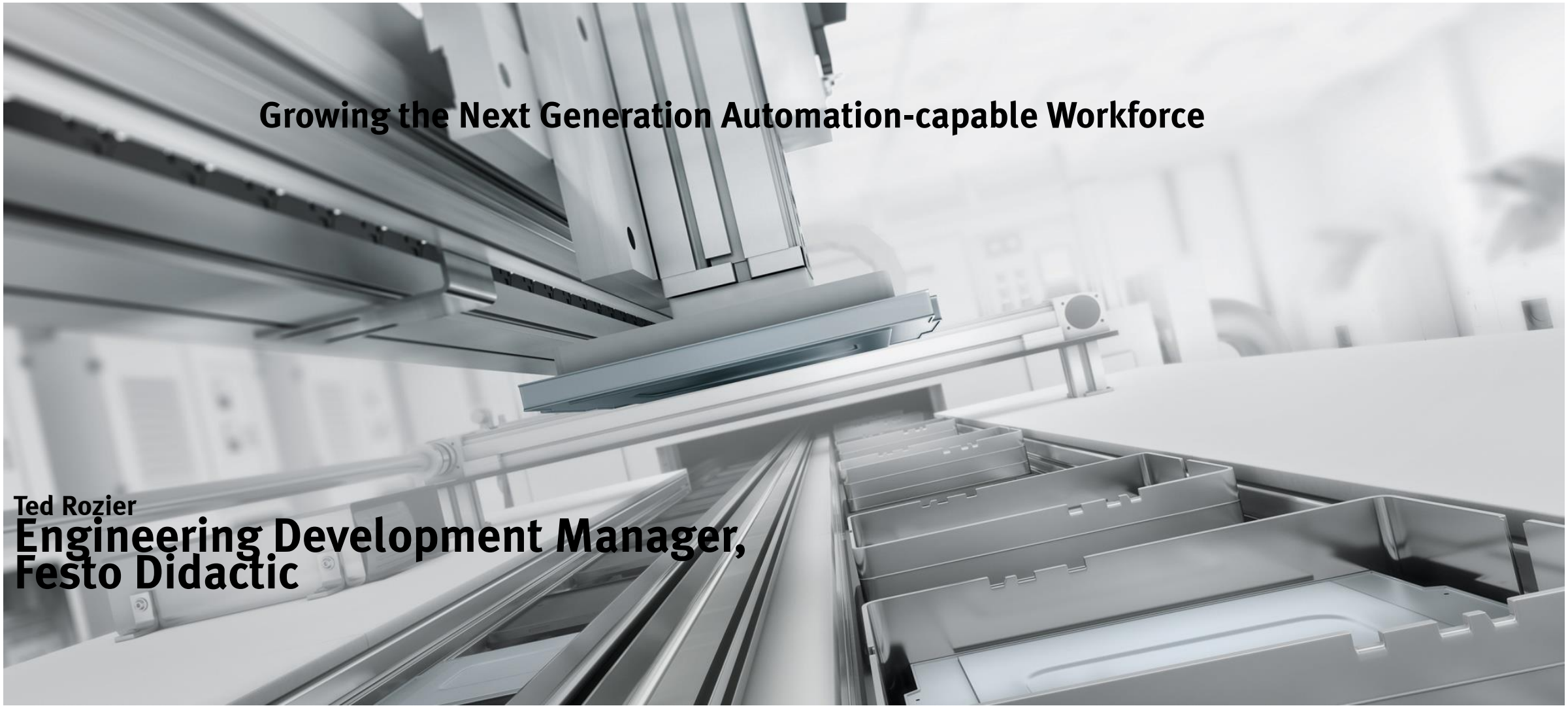

Growing the Next Generation Automation-capable Workforce
Ted Rozier
Engineering Development Manager,
Festo Didactic

Systems Projects







WHO ARE WE

Festo would be defined as– a global player in Industrial Automation Industry

Festo Group

Festo has been offering components and solutions in Factory and Process Automation for **75** years.

- Head Quarters Esslingen Germany
- **Represented in 176 countries**
- Over 16,700 employees



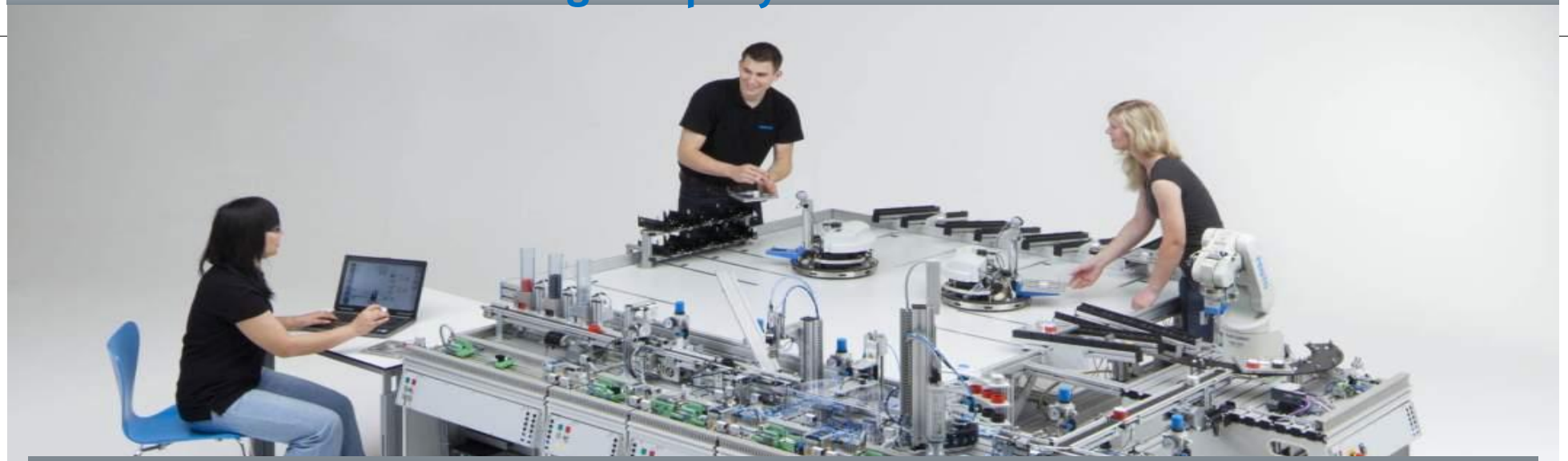
WHO ARE WE

Festo Didactic – a member of the Festo Group

Automation		Productivity	Festo Didactic Education	
Components	Systems / Solutions	Machines/ Systems	Training / Consulting	Automation Learning Systems
		People/ Organisations		

Increase Productivity of 300,000 Customers worldwide.

WHO ARE WE– Global Training Company in Industrial Automation and Production



Festo Didactic

- Member of the Festo Group
- 80% Automation Manufacturing components/20% Training
- **We practice what we teach**
- Head Quarters Denkendorf Germany , Eatontown NJ. Quebec CA
- Offers **Industry specific training modules** that assist in **closing the skill gap** between the classroom and the Industry. Within the last 40 years in over 36,000 technical schools and universities (Festo currently Inside)
- Provides 500,000 hours of Technical Training and Seminars in 26 languages to over 42,000 Participants– worldwide (Festo Qualified)

WHO ARE WE (Hannover Messe)



The Bionic Learning Network

Inspired by nature to AUTOMATE

The Bionic Learning Network is a cooperation between Festo and renowned universities, institutes and development companies with the goal to allow nature Inspire creativity in the automation technology field.



Exo Hand



Bionic Kangaroo

The Bionic Learning Network



Technical Education & Qualification - The Foundation Stone for Development

Does the education system provide the right **quality** and **quantity** of skilled graduates?



Do enough jobs exist in the labor market? **What are the skill requirements of these jobs?**



Didactic



Qualification and HR Development



Economic Growth/Development



Industry

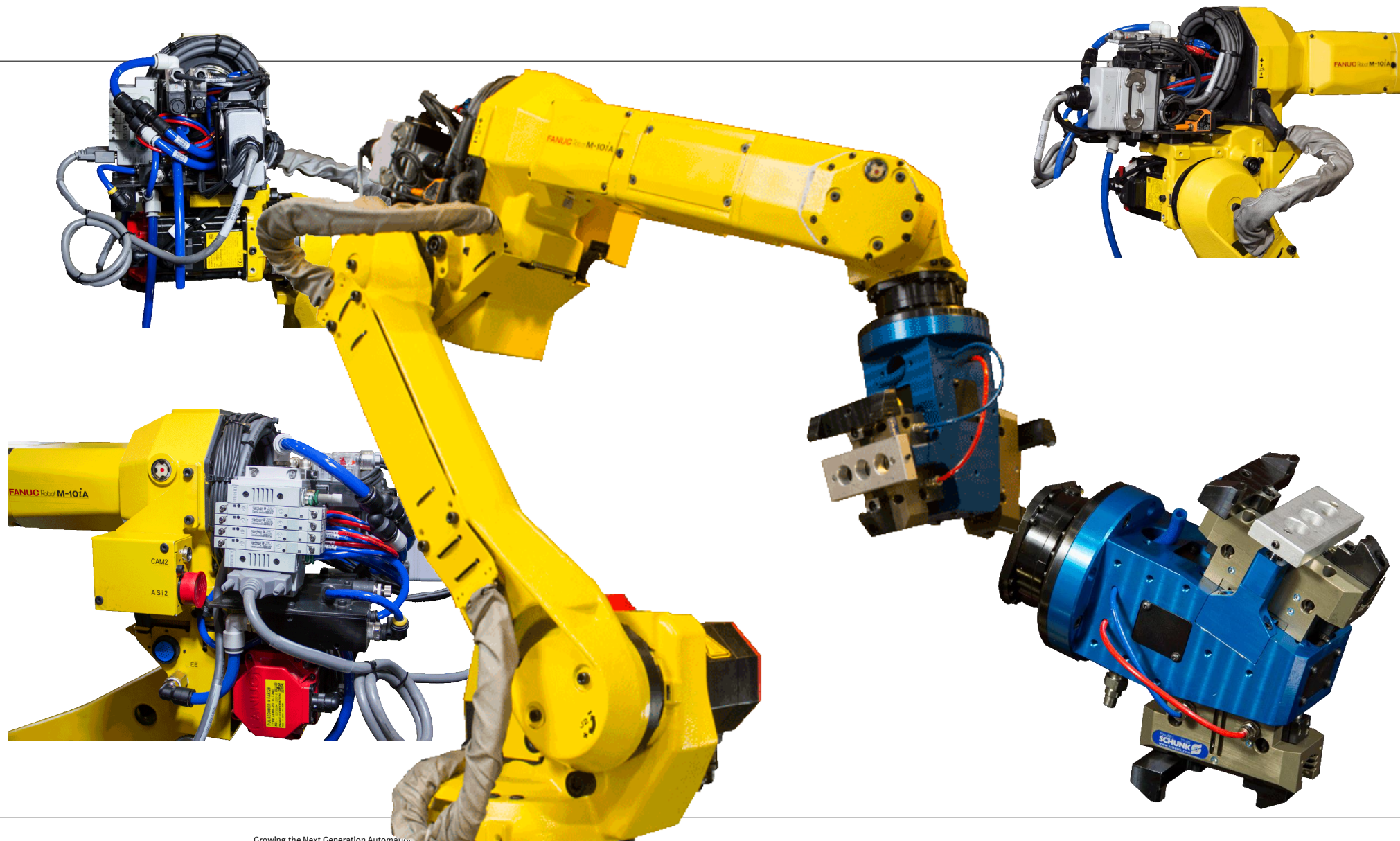
Does the Skill Gap really exist?

1. 84% of executives agree there is a talent shortage in U.S. mfg
2. Inability to recruit/hire the personnel with the **right skill sets** to match hiring needs
3. Chronic condition: **300,000** open positions in manufacturing

Technical Education & Qualification - The Foundation Stone for Development

Inability to recruit/hire the personnel with the **right skill sets** to match hiring needs




FANUC Robot M-10iA
CAM2
ASI2
EE
SCHUNK

Deloitte : Skill Gap Report

Over the next 10 years:

- 3.4 million new jobs
- 1.4 million qualified workers

Skills Gap:

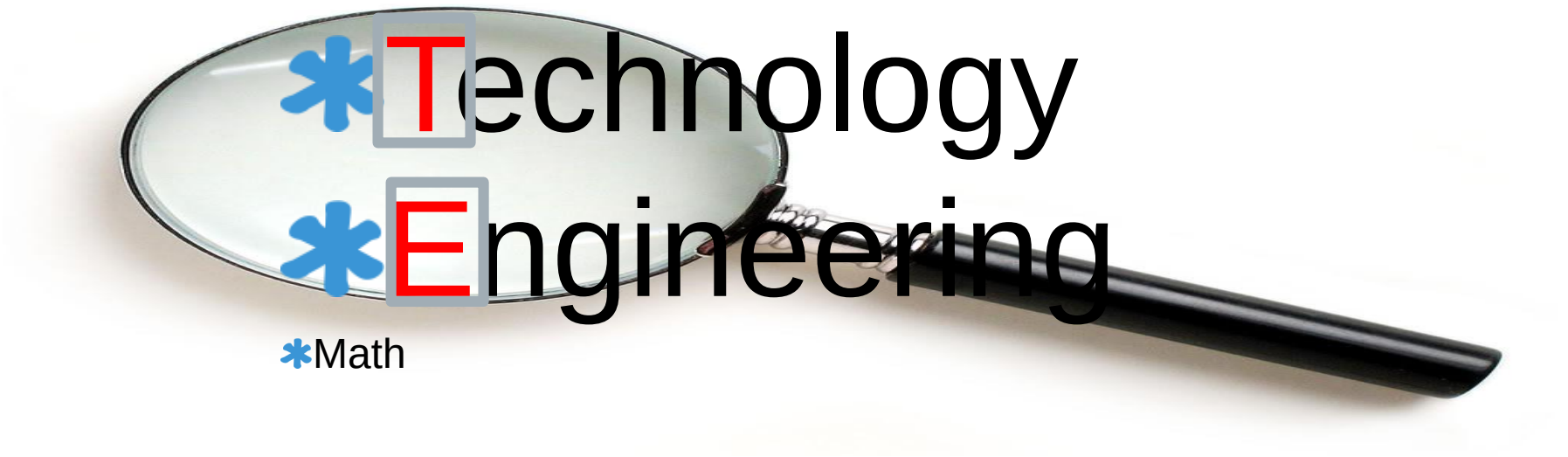
2 million qualified workers

Disciplines that lead to strong Manufacturing Careers

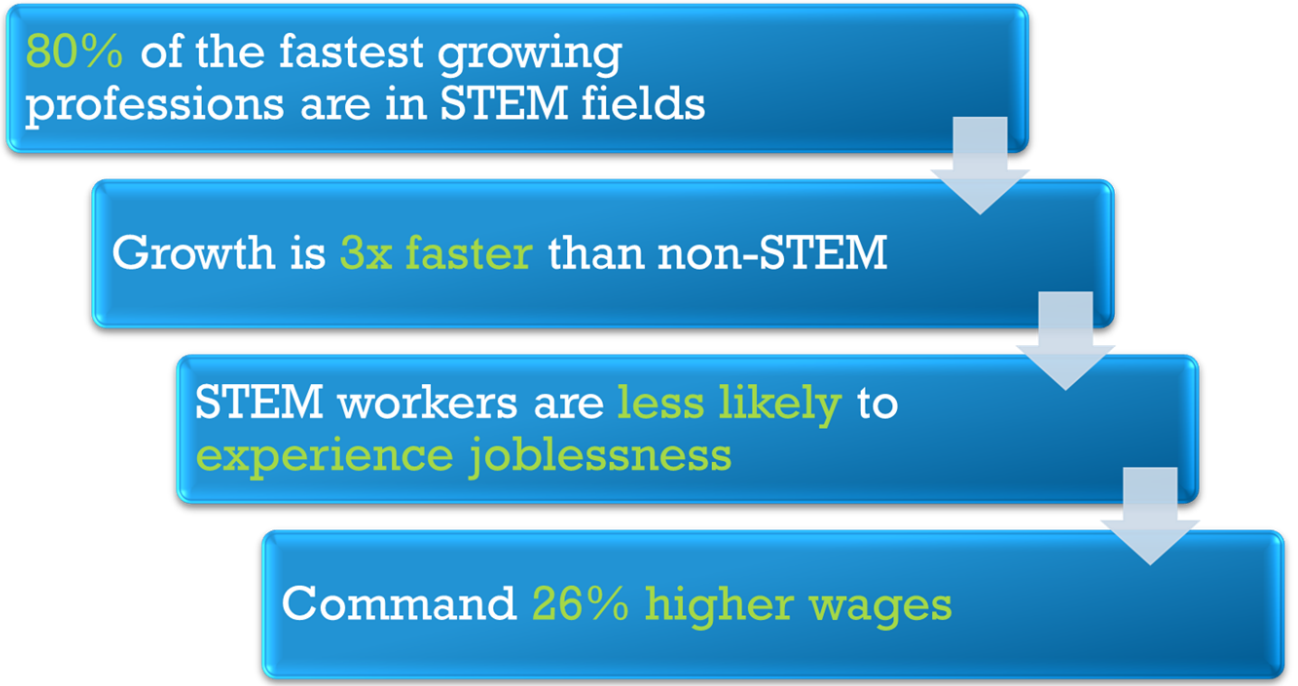
1) Computer Engineering
2) Mechanical Engineering
3) Electrical Engineering
4) Service Technicians

STEM stands for a cluster of careers in the fields of:

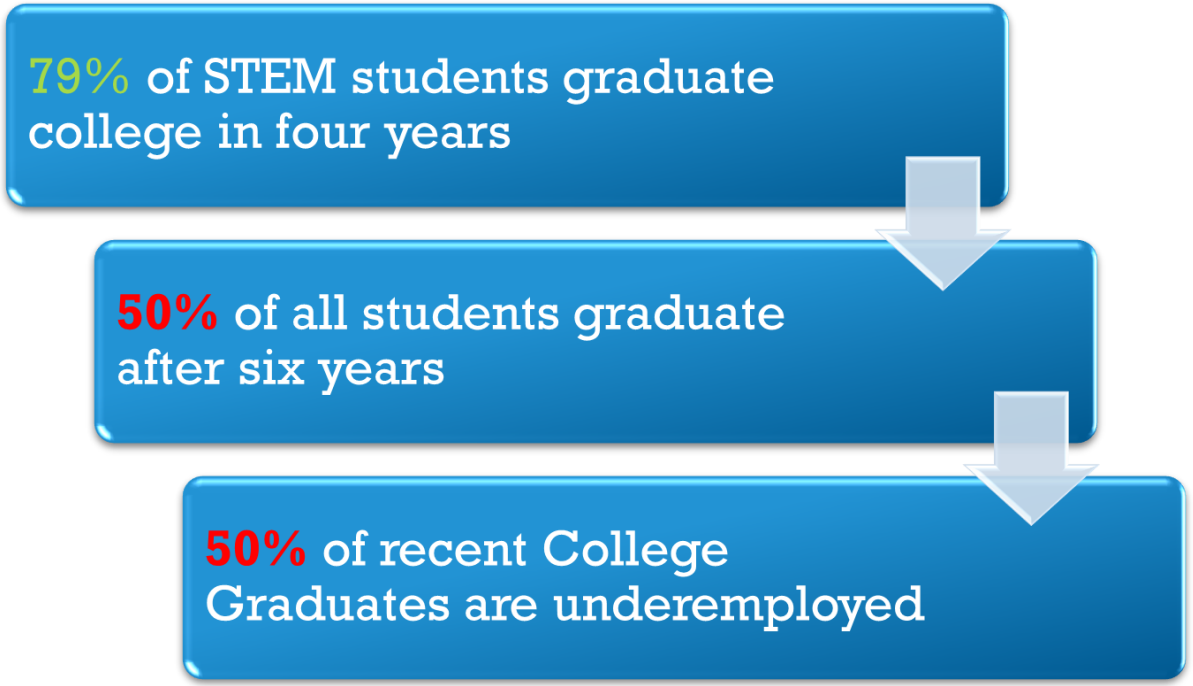
- Science
- Technology
- Engineering
- Math



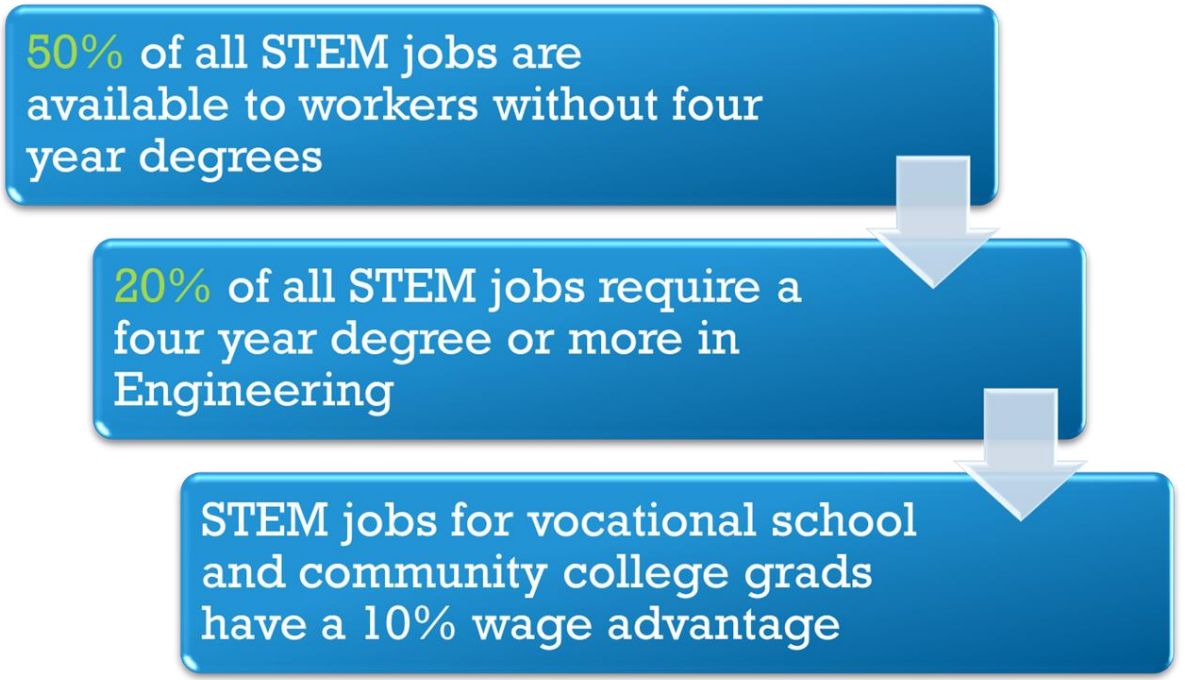
STEM: by the numbers



STEM improves graduation and employability rates



STEM in Manufacturing



What is the Buzz around the field of Mechatronics ?

"Were ever there is Automation and Manufacturing you will always have job security with Mechatronics talent!"



Mechatronics :

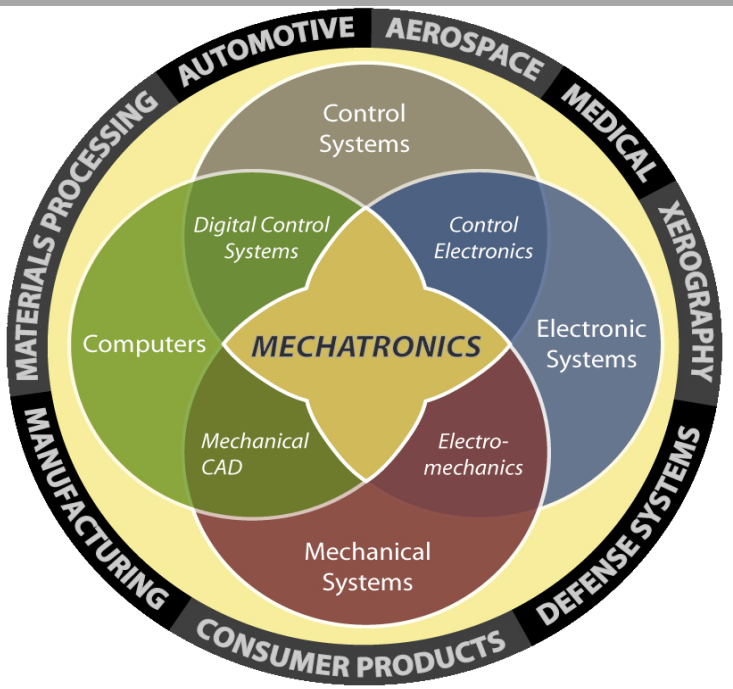
- Mechanics
- Electronics
- Computer Science
- All In ONE

A combination of knowledge from 3 disciplines.

What is Mechatronics ?

Mechatronics combines

- **Electronic**
- **Mechanical**
- **Computer and control skills in to ONE**

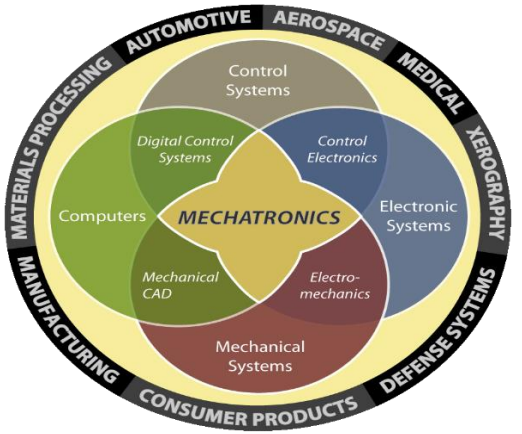


These Jobs include Installation ,Programming and Maintaining:

- Robot
- PLC
- CNC
- Factory Communication
- .....

What is Mechatronics ?

Mechatronics is one of the 10 emerging technologies slated to transform the world. The US Department of Labor lists mechatronics as an emerging "**green jobs**" growth area. And, according to the Bureau of Labor Statistics, the job outlook for mechatronics is bright over the next 10 years.



Mechatronics :

- Mechanics
- Electronics
- Computer Science
- All In ONE

A combination of knowledge from 3 disciplines.

Different training scenarios with Festo



Festo Didactic - Five Main Focus Areas for Education and Research

- Mobile Robots
- Highly flexible Transport
- Intelligent Products
- Wireless Communication
- Mobile Devices



What is Industry 4.0/ Smart Factory?

- **1782**
  1. **Steam Engines**
- **1913**
  2. **Production Lines and Conveyor Belts**
- **1954**
  3. **PLC, CNC**
- **4. Smart Automation Cyber physical Systems**

What do we mean by Industry 4.0?

1st

steam engine



1782

Power generation Mechanical automation

2nd

conveyor belt



1913

Industrialization

3rd

Computer, NC,PLC



1954

Electronic Automation

4th

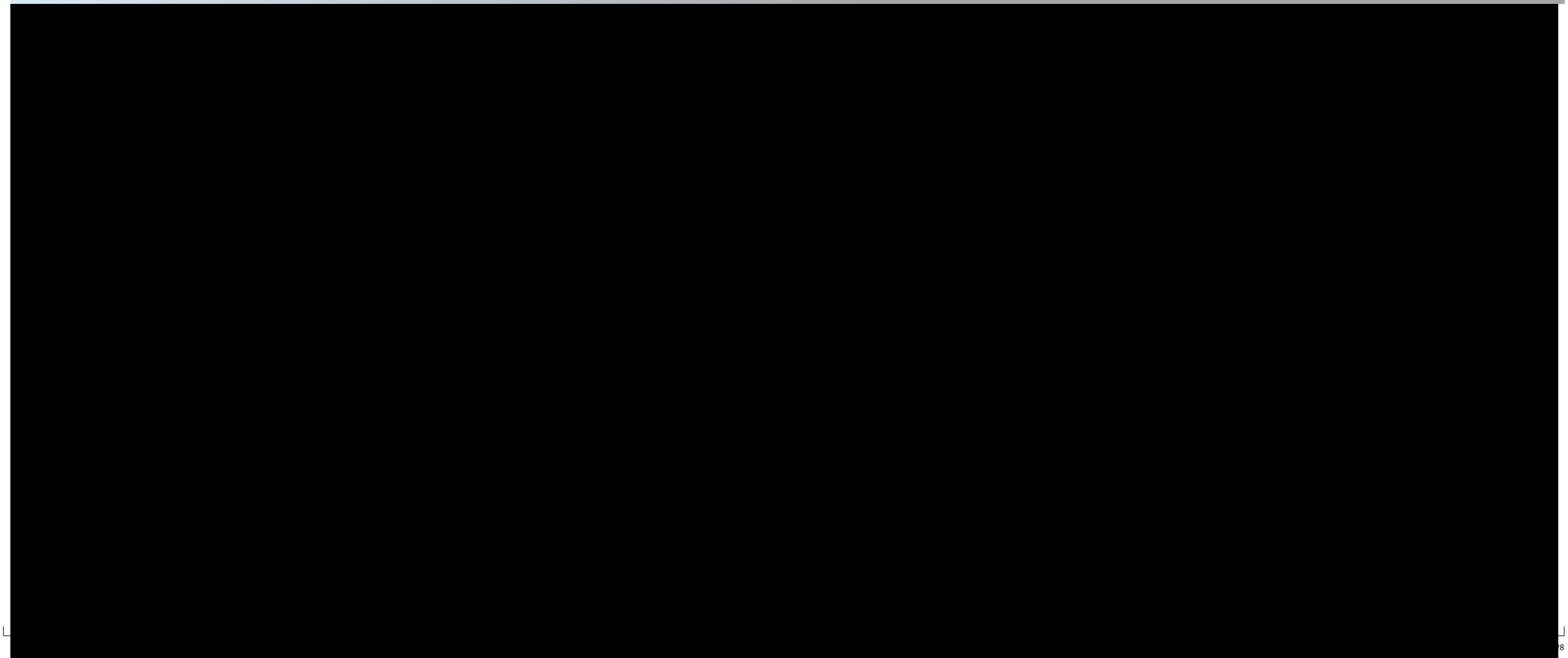


2015

Smart Automation, Cyber Physical Systems, Big Data.

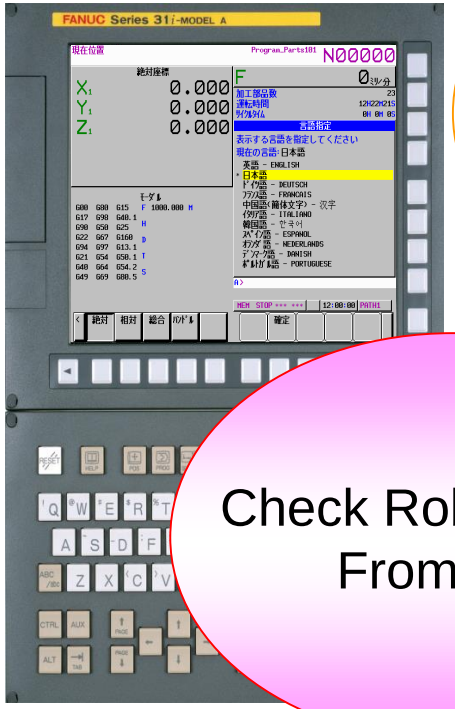
Source: Prof. Zühlke, DFKI

Whats going on currently within manufacturing plants?

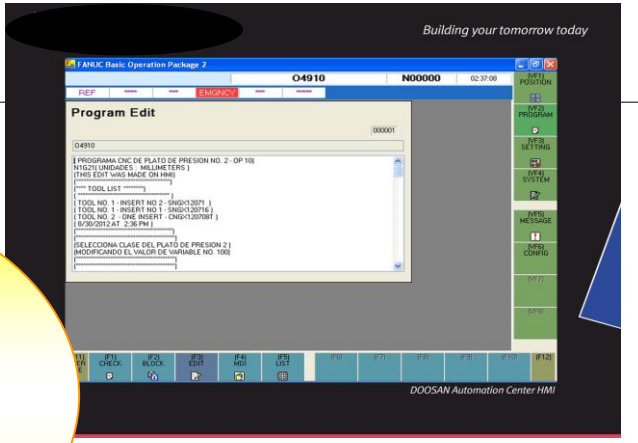


BRINGING AUTOMATION TO YOUR FINGER TIPS

FANUC CNC



HMI



Check Robot Status From HMI

Check Machine Status From HMI

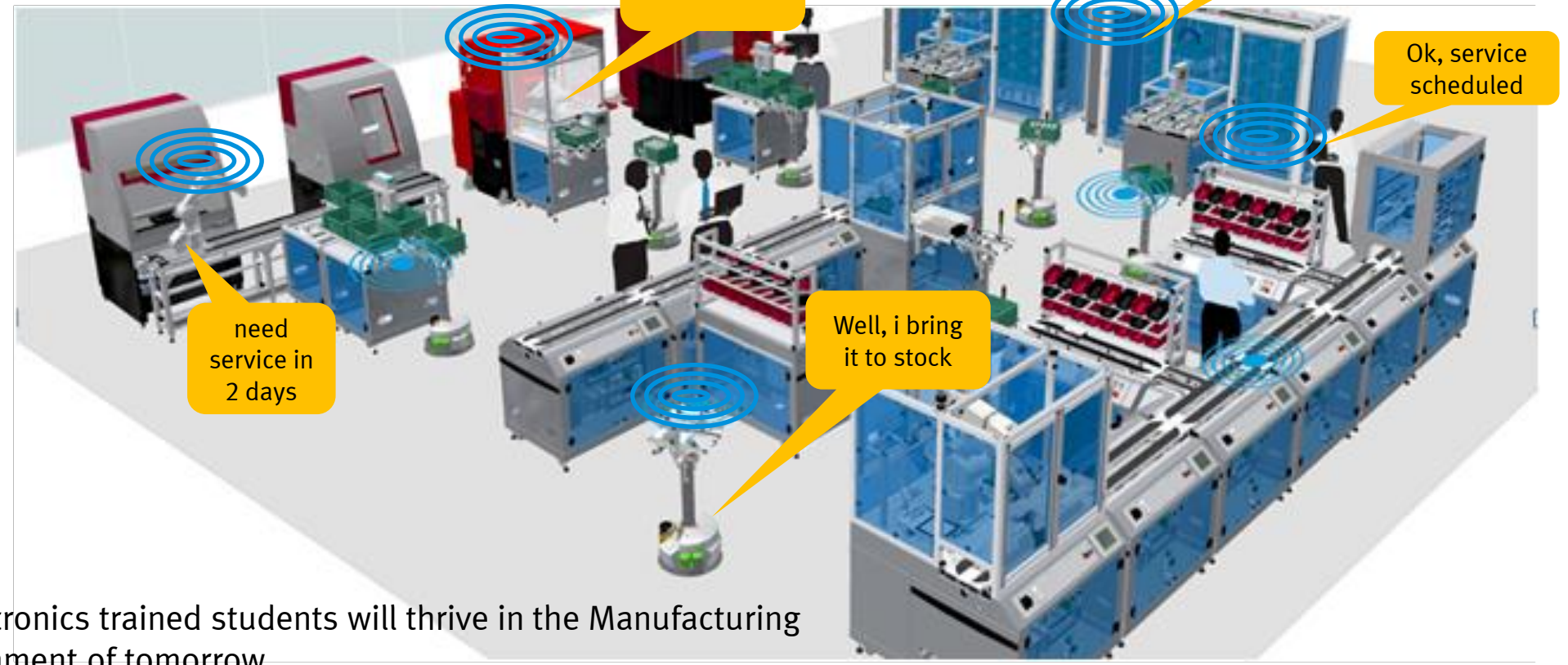


What does Industry 4.0 Mean ? Industry Experts Opinion



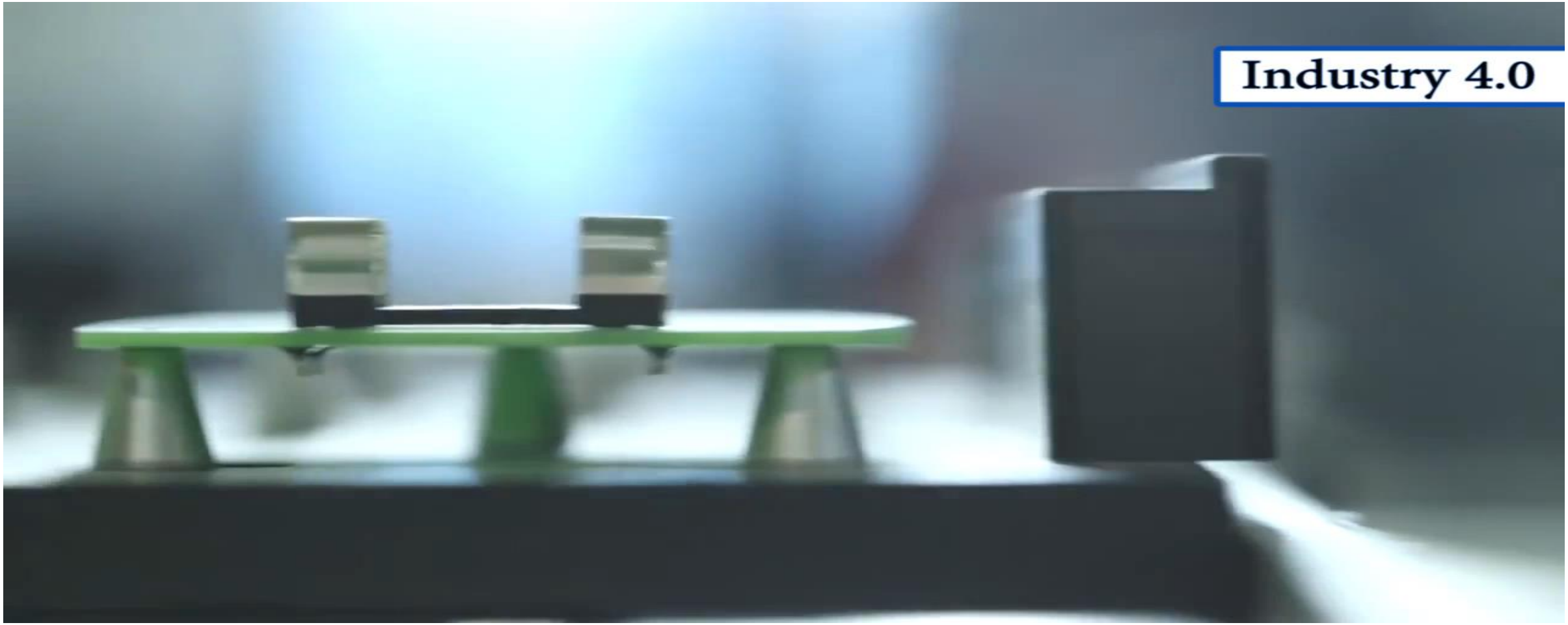
Festo Didactic - RESEARCH AND TRAINING FOR INDUSTRY 4.0

- **Mobile Robots**
- **Highly flexible Transport**
- **Intelligent Products**
- **Wireless Communication**



Mechatronics trained students will thrive in the Manufacturing Environment of tomorrow

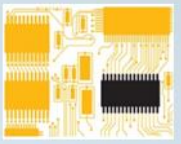
What does Industry 4.0 Mean ? Industry Experts Opinion



Festo Didactic - Five Main Focus Areas for Education and Research
Key Enablers for Industry 4.0 Cyber Physical Systems

- Mobile Networking
- Social Media
- Internet of Things Via 1 protocol
- Machine 2 Machine Self regulation
- Big Data & Predictive Analytics

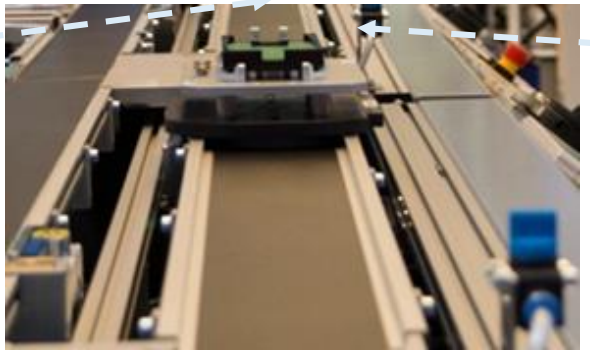



Sensor Technology of Tommorow

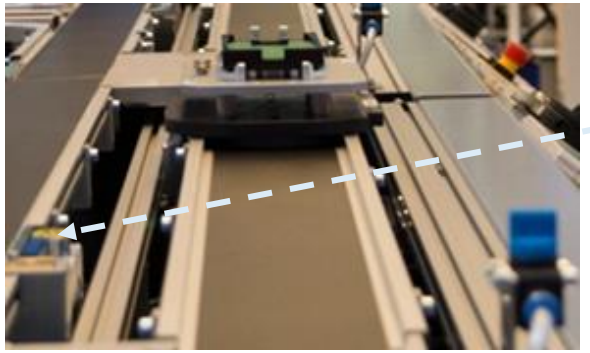
When production starts, each finished product that have to be produced, will be uniquely identified with the number (SFC = Shop Floor Control number) against this number all the production history for this product will be collected and stored in SAP ME system.

SFC number
for product



RFID chip
on carrier

The finished product will be placed onto the carrier to be moved from one workstation to the next. The carrier contains RFID chip where the production information will be written, thus helping other systems or machines to understand what product is now being processed. Each work station on a conveyer is also equipped with the RFID chip to identify the moment when the product arrives and request or pass necessary information.



RFID reader
at
workstation

Challenge	How Can Industrie 4.0 Help?
Cost	Industrie 4.0 offers manufacturers a possibility to reduce the lot sizes and still keeping the price low by using: ▪ Fully-automated end-to-end process with make-to-order approach ▪ Highly configurable equipment and variable products ▪ Flexible order management (MES4) ▪ Elimination of line controllers Distinguish between site-specific and global optimization..
Sustainability	Industrie 4.0 allows to reduce energy and water consumption and emissions through intelligent control of machines and equipment. This can be achieved by: ▪ Introducing Energy database where the energy data will be analyzed (cloud) for global decision making on energy saving measure ▪ Making constructive modifications/changes in order to save energy (standby mode, etc.) ▪ Making energy consumption details available for planning in MES ▪ Dynamically decide on production optimization and timing (when to produce) **Economic sustainability** of manufacturing: Combining high performance and quality with cost-effective productivity, realising **reconfigurable, adaptive and evolving factories** capable of small-scale production in an economically viable way. • **Social sustainability** of manufacturing: Integrating human skills with technology • **Environmental sustainability** of manufacturing: Reducing resource consumption and waste generation.
Data Availability and Visibility	Industrie 4.0 allows to increase of decision quality and react faster due to the availability of information: ▪ All production data is available anytime (Big Data, Web-Server, APPS, ...) ▪ Easier access to necessary data, quick data entry, QR-Codes, RFID, sensors... ▪ Ability to predict and forecast problems before they actually happen to avoid incidents and disturbances

Challenge	How Can Industrie 4.0 Help?
Product Complexity and Product Handling at a Workstation	Industrie 4.0 allows to increase the load of highly configurable (variant) products through automated control and production, by: ▪ Using dynamic order management according to the planned load ▪ Implementing configurable equipment (one machine has different magazines, fork changes, …) to increase the throughput of various product variants for one machine ▪ Previously this was supported but by specificslly designdd systems. Inflexible ▪ Built in flexibility of both ERP and ME system will be the standard to supportr the (linkage to VE, smart routing change, WI etc highlight extra component ordered by customer)
Individualization	Industrie 4.0 moves from mass production to producing individualized (one-off items) with lot size of 1. This allows customer-specific criteria to be included in the design, configuration, ordering and manufacturing phases and enables last-minute changes to be incorporated. Individualized WI, automatic setup of the software related controllers/assest. I4.0 will also help to enable software to handle embedded software of he product (current.y software version is a part of BOM. The question is how we can enable better communitation and error profing handling of the embedded software From the production POV, I4.0 would allow to lower the minimum lot size – from the technical POV, having no SPS changes and/or adjustment efforts even to lot size 1.0????? Double ckeck
Resource Efficiency	Industrie 4.0 allows to increase of availability of machines and equipment through better control and maintenance: ▪ Equipment is smart enough to monitor itself ▪ Equipment data and its changes are made available in real-time (set-up time cylinder …) ▪ Highly configurable equipment ▪ Global optimization of resources (cross facility optimization) ▪ Resources can be redistributed immediately in case of disturbances ▪ Analysis via process history (MES4 ▪ Predictive analytics and diagnostics; identify issues before they happen and have overall maximum OEE (availability, performance, quality)

Develop a thirst for learning!



Festo Didactic - Training and Research Platform for Hybrid Automation

Reference Guilford Technical Community College USA, AFB Factory

- Hybrid training factory AFB
- Including:
  - Process automation
  - MaterialHandling Automation,
  - Robotics,
  - RFID technology, Camera inspection

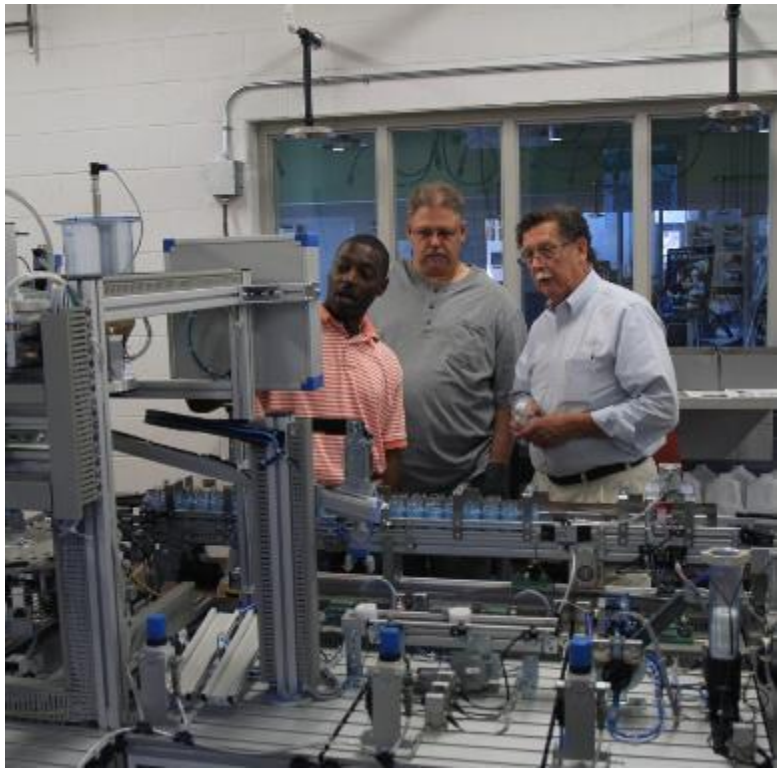


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Reference Guilford Technical Community College USA, AFB Factory

- Hybrid training factory AFB

More infos:



http://www.gtcc.edu/



Festo Didactic - Training and Research Platform for Flexible Manufacturing

Reference Anhui University of Science and Technology, China

- MultiFMS
- including:
  EMCO Mill250,
  EMCO Turn 250
  Complete MPS500 system
- Training content:
  CNC Technology,
  Robotics,
  Mechatronics,
  PLC Technology

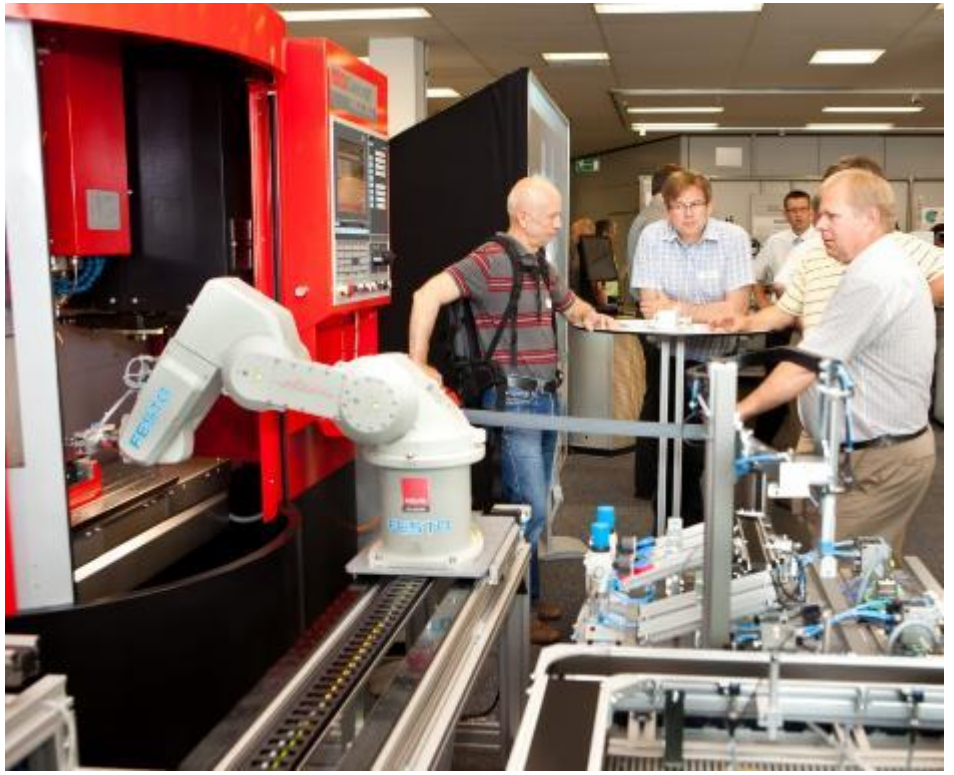


Festo Didactic - Training and Research Platform for Flexible Manufacturing

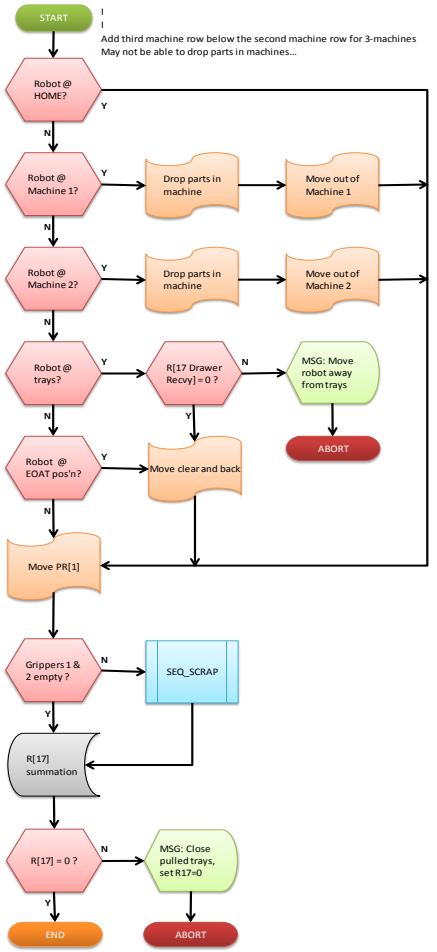
Reference Anhui University of Science and Technology, China

- MultiFMS
- including:
  EMCO Mill250,
  EMCO Turn 250
  Complete MPS500
  system
- Training content:
  CNC Technology,
  Robotics,
  Mechatronics,
  PLC Technology



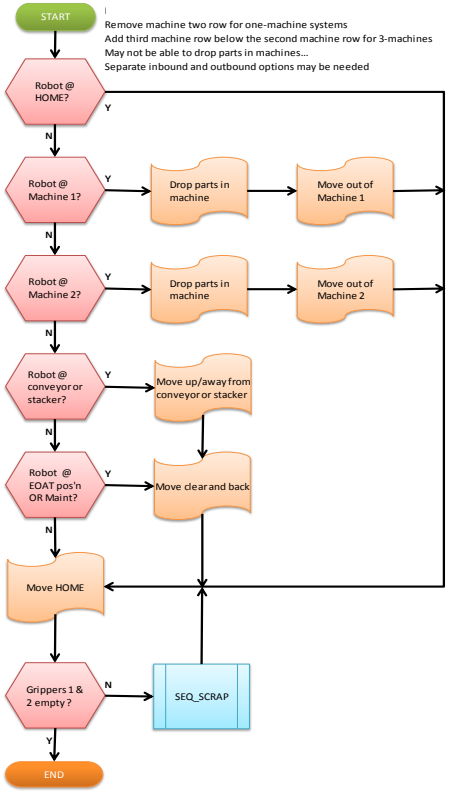


Best Programming Practices



Example 1: Two Machines with Drawers

- Looks for Reference Positions and moves the robot accordingly.
- May drop parts in machines if permissible and moves out. Third machine can be added, or the second machine removed.
- Has limited recovery from drawer systems.
- Robot moves to the HOME position after moving out of machines/ drawers.
- Will remove any parts on the robot grippers and return to HOME.
- Displays message on teach pendant if drawers are open, so operator can close them.



Example 2: Two Machines with Conveyors

- Similar to Example 1, but without instructions or displays for the drawers.
- Instead there are additional instructions to back away from conveyors or stocker systems. Many times conveyors do not need special recovery motions.
- Recovery from conveyors or stocker systems tends to be easier, requiring less operator involvement.
- Recovery programs are typically independent of machine models. They are dependent on layout and peripheral equipment options.

Key Points to remember

How do we go about training the next generation Automation capable Workforce?

1.Employers need to continuously strive to provide Advanced training for there Internal Staff to keep the workforce competitive

2.Educators need to keep their training programs up-to-date to help next-generation automation professionals.

Develop a thirst for learning

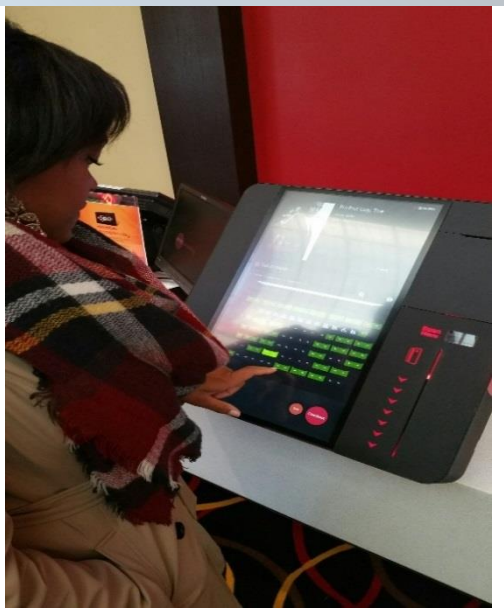
Develop gold collar workers do to the added value of knowledge Mechatronics trained students bring.

Visual Learners

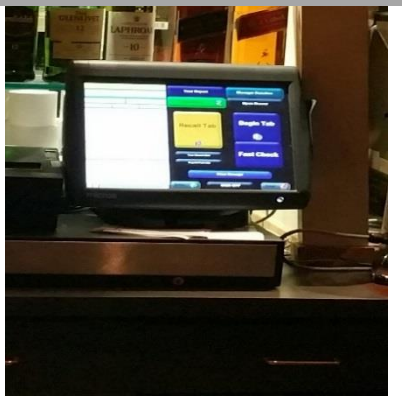
Humans are **visual learners**. According to a study done by neuroscientist Gordon M. Shepherd, "**Vision utilizes nearly half the human brain and approximately 70% of its sensory capacity is dedicated to processing visual information.**"



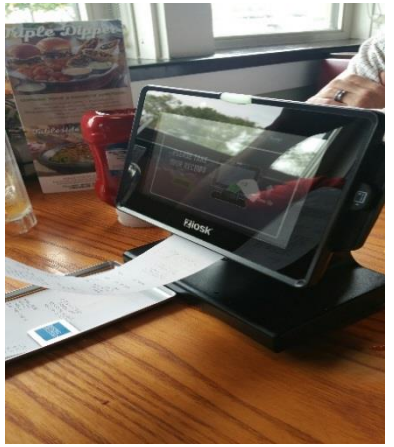
VISUAL AWARNESS











What does Industry 4.0 Mean (CHALLENGE)



What does Industry 4.0 Mean (CHALLENGE)



Festo Didactic – YOUR GLOBAL PARTNER FOR TRAINING AND RESEARCH

- Our mission is to be your partner in innovative research and training
- Thank you for your attention!





THANK YOU!

Question/Comment/ Contact Information

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Engineering Development Manager