Warehouse of the Future

Robotics in the Supply Chain

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Robots in Logistics: Why Now?

Needs and Enablers

- The Need
  - e-Commerce revolution
    - Fulfillment centers (Amazon, Walmart)
    - Parcel delivery (UPS, FedEx)
  - Labor shortages & rising wages
    - The e-commerce model requires more labor that the Brick and Mortar model.

GPU image processing

The Kinect effect
From Microsoft

- The Enablers
  - AI
  - GPU's
  - Perception
  - Grasping
  - Cobots
  - Funding

Smart Robots

Courtesy of Righthand Robotics

Courtesy of Soft Robotics

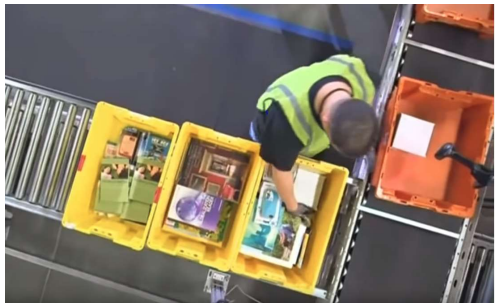
Here Come the Mobile Robots!

Thanks to Lidar, fast image processing and wireless bandwidth

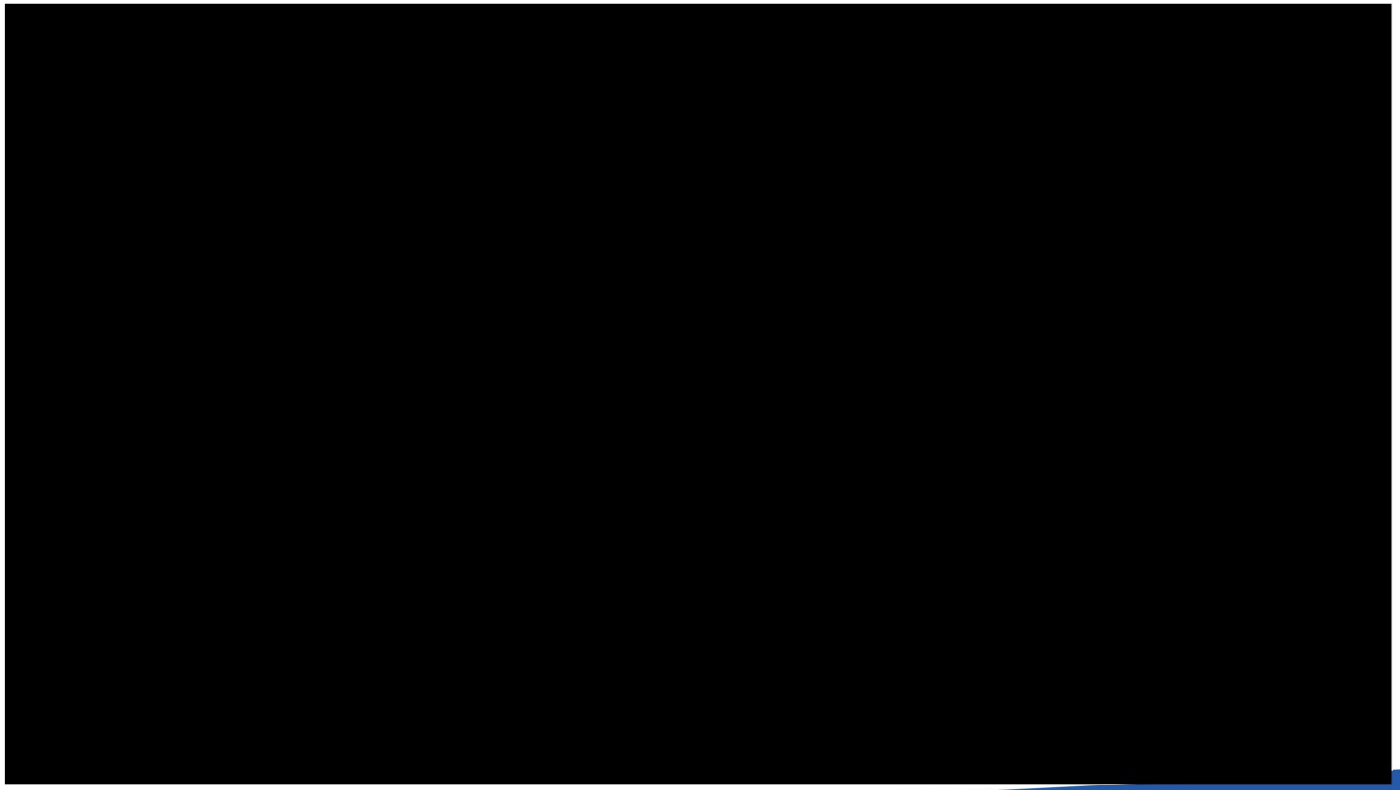
- Amazon started the mobile-”robot” revolution and changed the fulfillment model
  - Goods to people vs. people to goods
  - The next chapter is goods to robots

Examples: Goods to Person

Examples: Goods to Robot

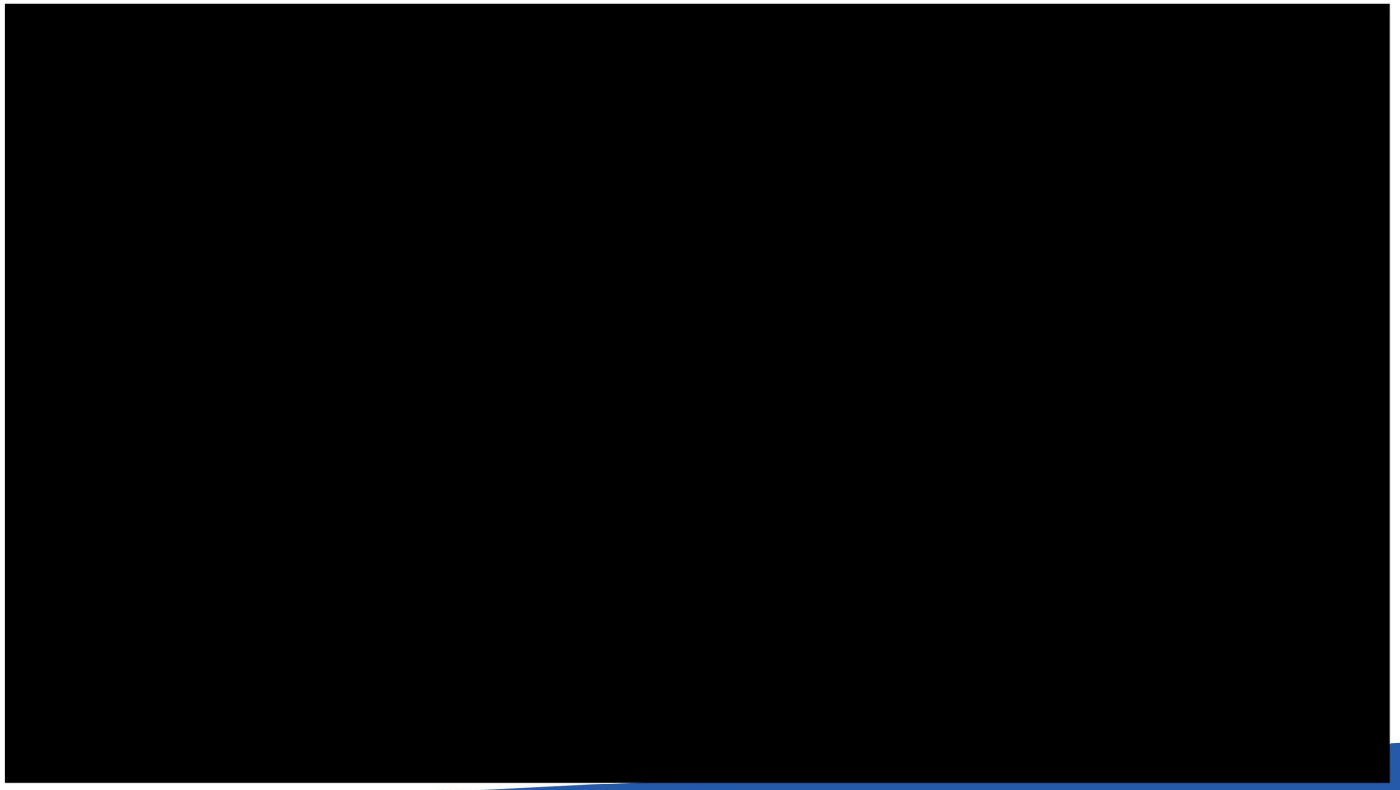


Examples: Driverless Tugs



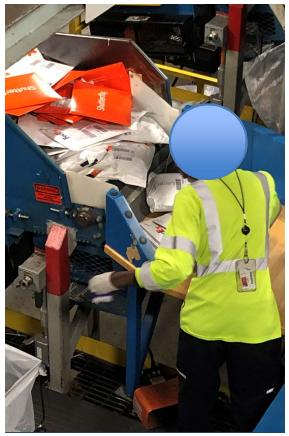
Examples: Truck Loading

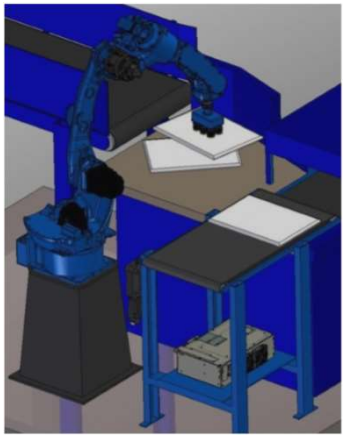
One of the hardest manual jobs.

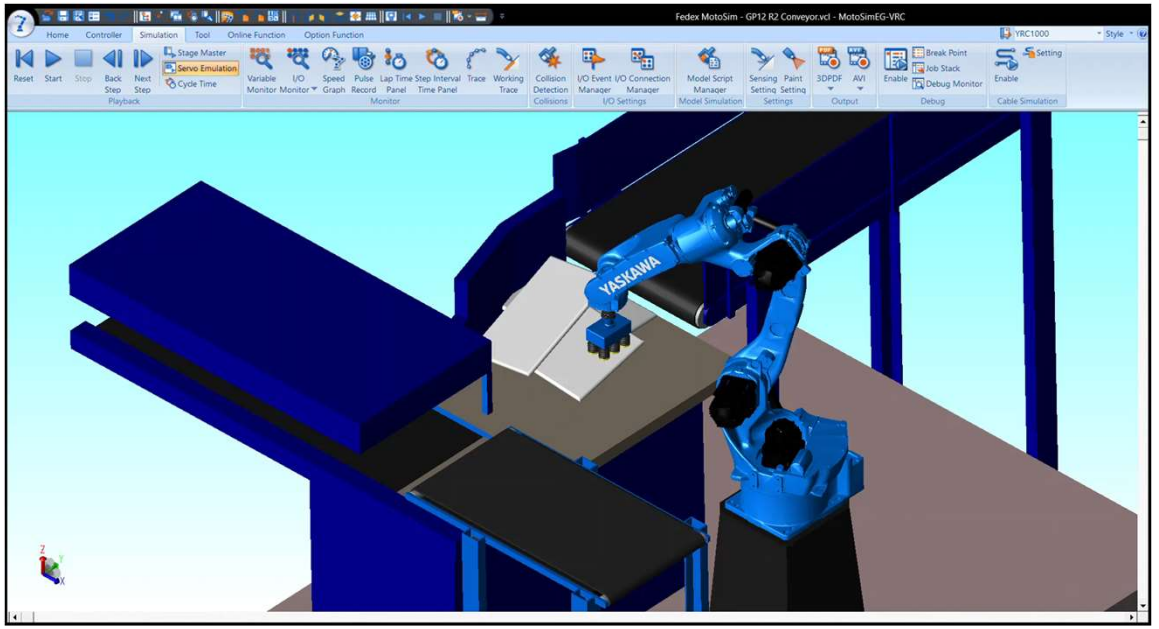


Examples: Parcel Sortation

From Manual to Robotic



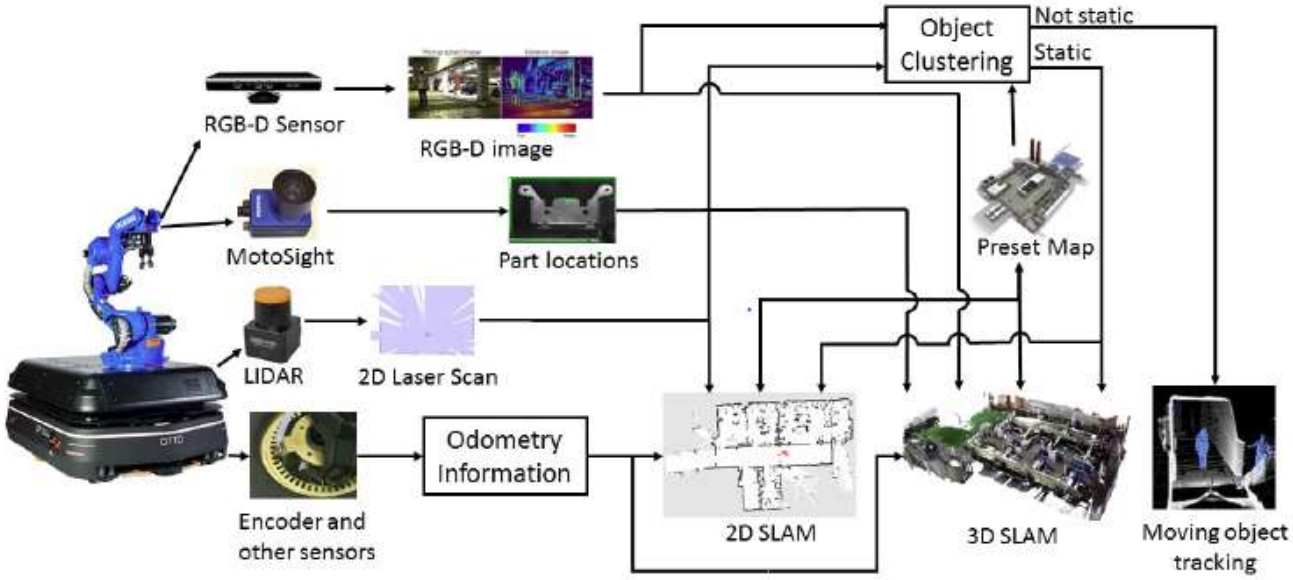




- Requires:
  - 3D vision
  - GPU image processing
  - Smart path planning
  - Purposeful EOAT
  - Pneumatics
  - Network Communication

Advanced Developments

Building Realtime Situational Awareness for Robotic Mobility

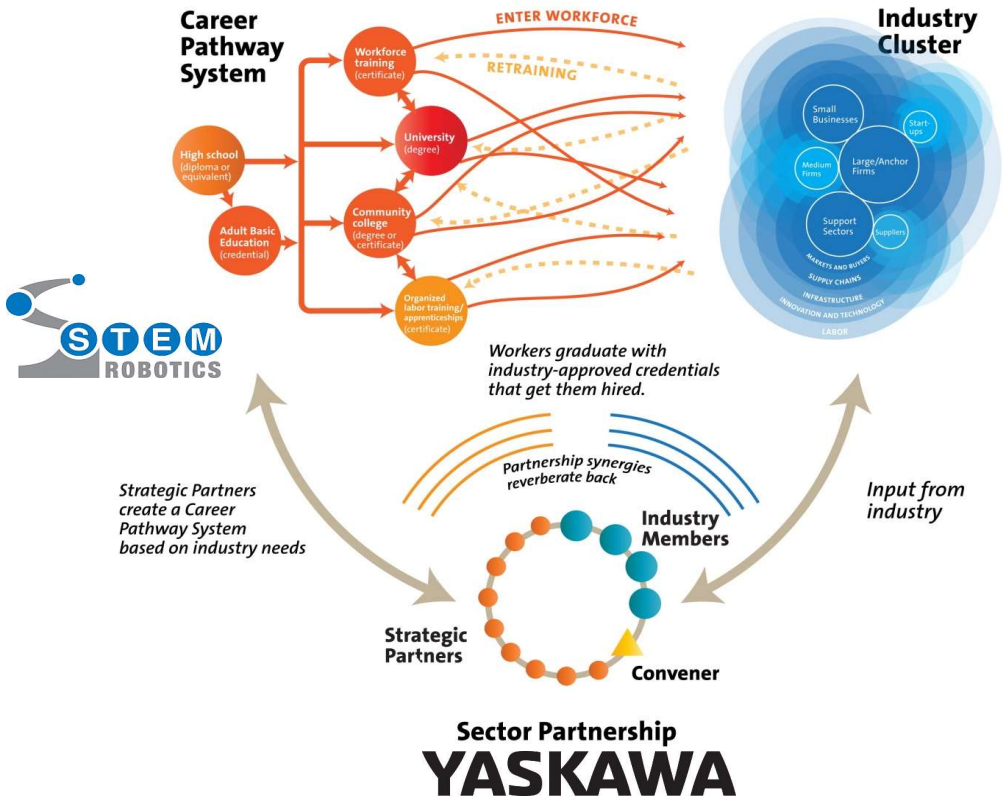


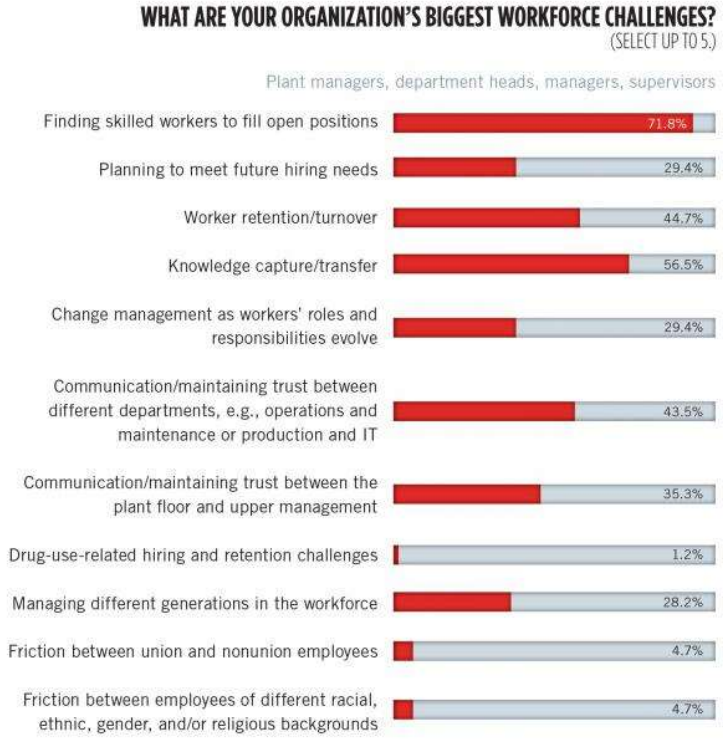
Technology flow chart from Clemson University for an ARM funded project called Smart Companion Robot (SCR)

Courtesy of Fetch Robotics

What’s happening in WFD

Understanding The Workforce Connection

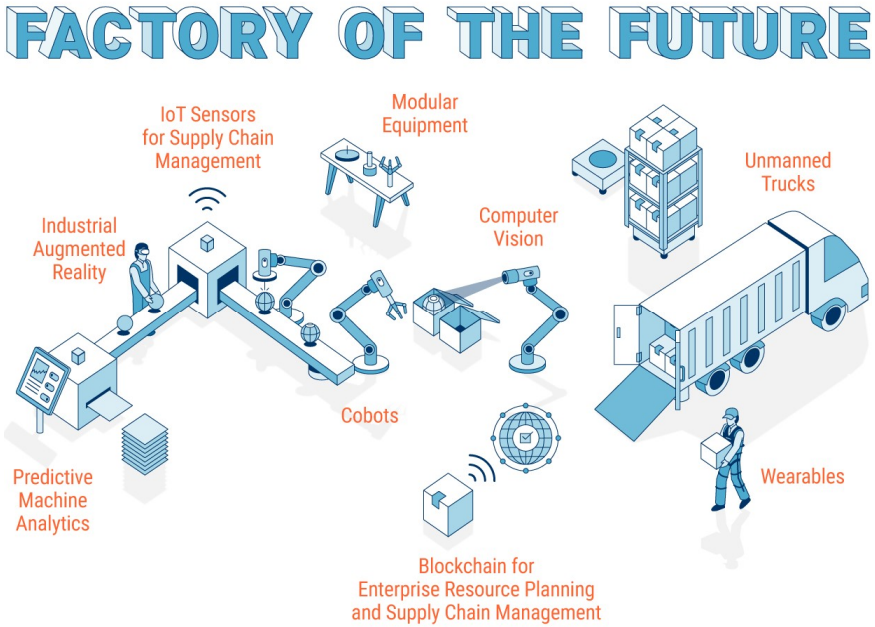




Understanding The Workforce Connection

INDUSTRY 4.0 SKILLS

Connecting Skills, Technology and Training



Understanding The Workforce Connection

INDUSTRY 4.0 – Impact to Manufacturing Jobs

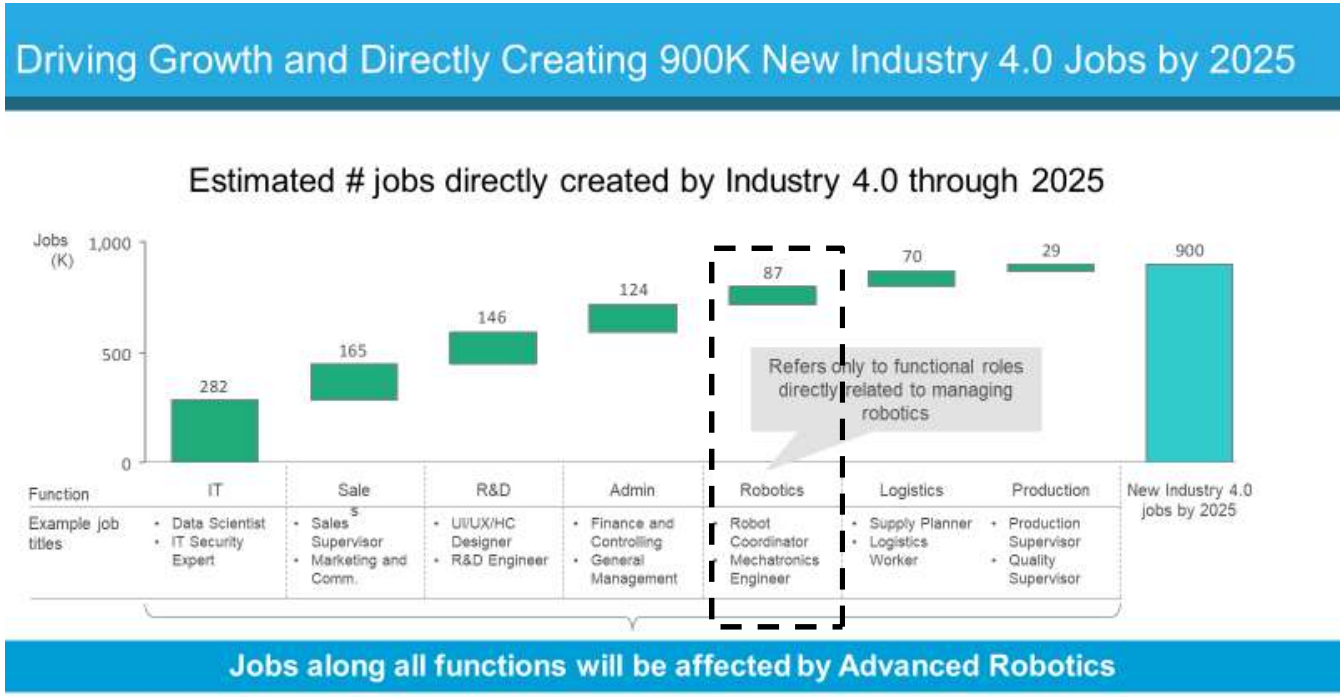
Connecting Skills, Technology and Training

Expect new jobs and skill sets that don't exist today

- IT solutions architects
- Robot coordinators
- Industrial data scientists
- Sales and marketing agents
- Digitally-assisted field service engineers

Industrial Workforce Marketplace

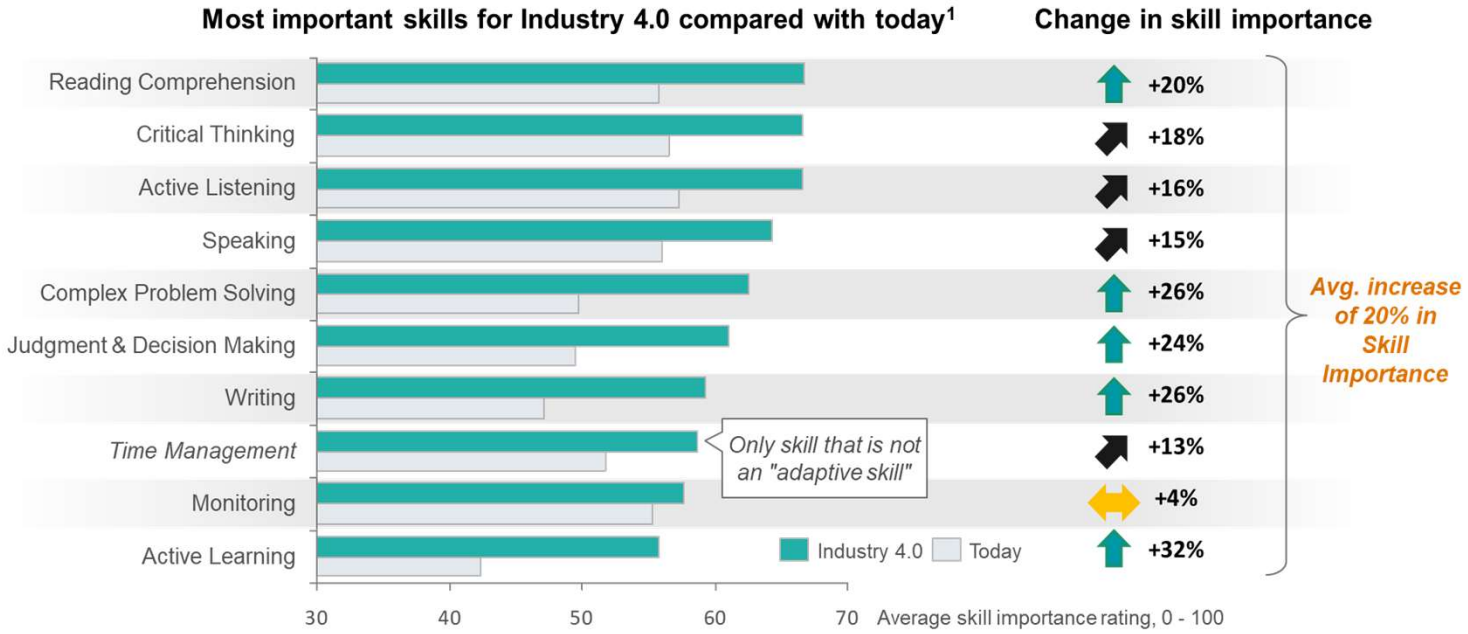
The Industry 4.0



Source: BLS; ONET skills data

Industrial Workforce Marketplace

Adaptive Skills Expected to be ~20% More Critical across Top Industry 4.0



1. Skills "today" based on avg. for top 10 fastest growing jobs
Note: Definition of "adaptive," "technical" and "general" skills taken from ONET classification of skill types; based on average (weighted by projected job growth) of skill importance for 28 Industry 4.0 jobs
Source: ONET Skills data

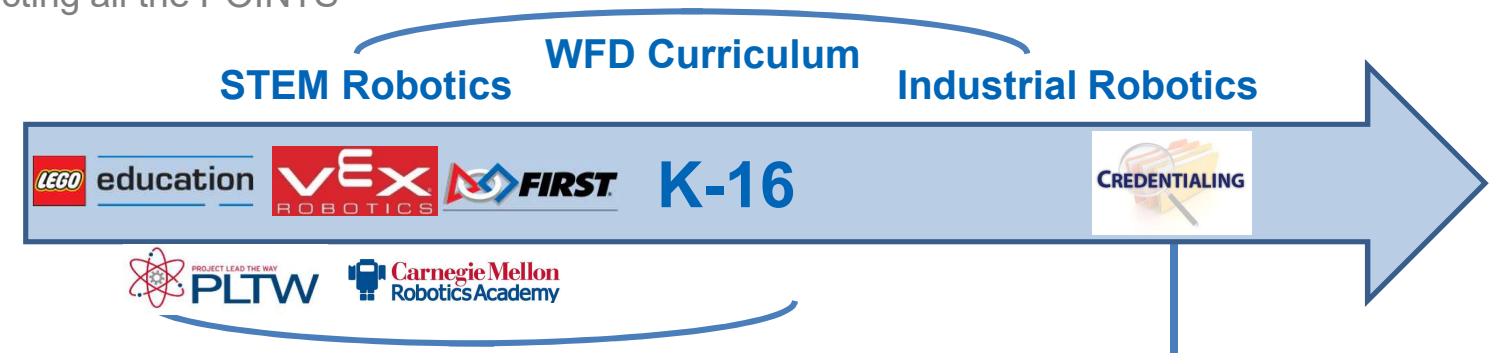
Training disciplines required

Robot systems need Inventors, Programmers and Maintenance experts to flourish

Skills requirements for robots in e-commerce, warehousing and parcel sortation					
	Inside the "four walls"				
	Inventing	**Concepting**	**Build & Deploy**	**Maintaining**	**Selling**
	Advanced degree	Industry experience	Hands-on experience, Tecnhcial College or WFD specific training		Listening and follow-up skills
ME Masters/PHD	**O**				
EE Masters/PHD	**O**				
CE Masters/PHD	**O**				
OTJ Applications Experience	**+**	**O**			**O**
Mechanical training	**O/+**	**+**	**O**	**O**	**+**
Electrical Training	**O/+**	**+**	**O**	**O**	**+**
Pneumatic training	**+**	**+**	**O**	**O**	**+**
Software expertise (C++, ROS)	**O**		**+**	**+**	**+**
Robot programming	**+**		**O**	**O**	**+**
Vision Programming	**+**		**+**	**+**	**+**
PLC Programming	**+**		**O**	**O**	**+**
IT/Big Data (networks)			**O**	**O**	**+**

The Industrial – Education Workforce Pathway

Connecting all the POINTS



Academic Goals

1) Provide a rigorous, standards based, instructional program beginning with high school level career technical education center (CTC) that aligns to post secondary programs;
2) Establish a personalized learning environment where students master workforce competencies using industry standard equipment;
3) Create numerous leadership and growth opportunities for students, staff, and industry professionals;
4) Engage industry partners in curriculum design aligned to industry standards; and
5) Embed cross system collaboration among K-12, industry and Higher Education

Industry 4.0 SKILLS

Programming/Simulation
Applications
Robotic Welding
ROS / PLC Ladder
Robotics 101 / Safety
Robotic Maintenance
Collaborative Robotics
Vision Systems/Perception
Mobile and Autonomous
Additive
AI / Augmented Reality

Industrial – Education CERTIFICATIONS

Connecting all the POINTS-Industry Certification

Train the Trainer

YASKAWA
ACADEMY

TRAINING CREDIT

Issued to
ABC University – Train the Trainer Program
Redeemable for one seat in any
Phase III – Workshop Assessment

Expires (18) months from June 23, 2016

Steve Holland
Sr. Manager, Technical Training

Doug R. Burnside
Vice President Customer Satisfaction

Serial No. EDU000126
Serial Number required for registration.

Non-Transferable

MERIT

YASKAWA
ACADEMY

TRAINING CREDIT

Issued to
ABC University – Modified MERIT Program
Redeemable for one seat in any
Phase III – Skills Assessment (1-on-1)

Expires (18) months from June 23, 2016

Steve Holland
Sr. Manager, Technical Training

Doug R. Burnside
Vice President Customer Satisfaction

Serial No. EDU000129
Serial Number required for registration.

Non-Transferable

ACCREDITED
IACET
PROVIDER

The Industrial – Education Workforce Playbook

Industry 4.0 Career Pathway Model - Steps to Building a Model

Leadership / Sector Partnership Capacity Building: Through technical assistance and best practices sharing, increase industry champions' and partnerships' abilities to drive systems change

- **Policy Development:** Amplify the voice of manufacturers with lawmakers and public officials
- **Marketing and Communication:** Leverage brand to elevate awareness and interest in manufacturing careers
- **Education Innovation:** Increase public/private collaborations that train and educate the manufacturing workforce of tomorrow
- **Training, Curriculum and Certification Roadmap:** Leverage, partner and build a roadmap with manufacturers, academia, content developers and subject matter experts to develop, Industry 4.0 aligned curriculum for credit and non- credit, apprenticeships and co-ops.

Industry-Recognized Credentials (and Industry- Recognized Apprenticeship): Expand awareness and attainment of industry-recognized credentials by educating manufacturers, intermediaries, and education providers on the value of credentials; advocate for policies that award credit for credentials; and align earn-and-learn programs with credentials

- **Career Pathways:** Adopt statewide pathways to ensure that programs and initiatives are aligned with industry demand and offer predictable transitions for students
- **Partner Engagement:** Support industry champions and emerging sector partnerships as they ensure workforce, economic development, and education systems are fully engaged in sector partnership strategy
- **Fund Development and Sustainability:** Expand outreach to sponsors and philanthropic funders; build regional sector partnerships' ability to secure their own funding

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