Training environments for Digital Manufacturing

Ruediger Walther
Content

- Know-How levels & Education
- Training & Training-Equipment @ BoschRexroth
Know how levels at the shop flor

- Bachelor of Engineering
  - Mechatronic
  - Electronics for automation technology
- Master of Engineering
- Further education

Know How Level

less or even none education
Training environments for Digital Manufacturing

Jobs requiring less or even no education

Some professions, formerly requiring a Mechatronic education, can now be fulfilled with less or even none education.

Industry 4.0 can create jobs for less educated people !!!

Wearables
Vocational- & Further- education
Mechatronic / Electronics for automation technology

Actual situation:
- Education is according to the standards
- Beside the education in vocational schools, the trainees are trained in the company
- They are additionally trained on the job and in training centers
- The education in the company already includes useful parts according i4.0

Further education (life long learning)
- After the vocational education comes the further education
- Training on the job & special training sessions

Profession examples:
- Service Technician
- Commissioning Specialist
- System Maintenance
- Machine / System Operator
Vocational- & Further- education
Mechatronic / Electronics for automation technology

New skills for i4.0:

- Understand the complete manufacturing process
  - Value chain, ERP, MES, eKANBAN, MILKRUN ...

- Understand the technical design of a production line
  - Com. networks, distributed intelligence, security, safety
  - Plc, cnc, robotics, high-level languages
  - Data bases, clouds, cloud computing

- Diagnosis skills
  - Interpretation of data analyses results
  - Usage of smart devices in industrial environments
  - Usage of Native- or Web-based-Apps, Augmented- or Virtual reality

- Skills to detect i4.0 potential

- Language skills (minimum English)

- …
Bachelor of Engineering

Actual situation:
- Completely at Universities or Dual course of study
- 3 years (6 semester)
- Different variants possible
  - e.g.: Mechatronic, Electrical engineering, Mechanical engineering
- Training on the job and in training centers after education (life long learning)

Profession examples:
- R & D
- Application
- Service technician
- Sales
Bachelor of Engineering

New skills for i4.0:

- Understand the complete manufacturing process
  - value chain, ERP, MES, eKANBAN, MILKRUN …

- Design and Engineering of a production line according to i4.0 approaches
  - com. networks, distributed intelligence, security, safety
  - plc, cnc, robotics, high-level languages
  - data bases, clouds, cloud computing

- Design and Engineering of user oriented diagnosis concepts
  - which information how often to whom
  - escalation strategy in case of problems
  - programming of Native- or Web-based-Apps, Augmented- or Virtual reality

- Detection of i4.0 potential and development of implementation ideas

- Understand Data-Mining

- …
Master of Engineering

Actual situation:
- Postgraduate study after the Bachelor
- 2 years (4 semester)
- Different orientations
- **NEW: Orientation i4.0**
- Development of interdisciplinary skills
  - e.g.: Electrical-, Mechanical-, Business-, Production-engineering, Informatics ...
- Training on the job and in training centers after education (life long learning)

Profession examples:
- R & D
- Facility design
- i4.0 consultant
- Sales
Master of Engineering

New skills for i4.0:

- i4.0 consulting
- Design and Engineering of complete manufacturing process
  - value chain, ERP, MES, eKANBAN, MILKRUN …
- Design of global network concepts
  - fast and secure communication
  - cloud- and cloud computing concepts
- Development of platform software
  - production performance detection
  - process quality management
  - standardized interface to databases
- Development of Data-Mining “rules”
- …
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Markets & Products

i4.0 Training & i4.0 Education Equipment

End User
- End User Training for
  - Maintenance
  - Engineering (TEF)

OEM
- OEM Training for
  - Application
  - Service

End User with own
- vocational education
  (e.g. dual education, TGA)
- skill development

Educational Institutes:
- Vocational ... University
- Training Centers

End User with own
- vocational education
  (e.g. dual education, TGA)
- skill development
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Training methods

- eLearning
- eBooks
- eTraining
- Animations
- Hands on
- TtT\(^1\)
- Theory

\(^1\)TtT: Train the Trainer
Wide range of Face2Face-possibilities

From 1h up to 4½ days

From non technicians to application engineers

In Germany and abroad
Face2Face-training-possibilities

<table>
<thead>
<tr>
<th>Level</th>
<th>Target group</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overview</td>
<td>non technicians</td>
<td>1h - 3h</td>
</tr>
<tr>
<td>Sales</td>
<td>technical sales</td>
<td>1½ days</td>
</tr>
<tr>
<td>Application</td>
<td>application engineers</td>
<td>4½ days</td>
</tr>
</tbody>
</table>

non technicians are e.g. Management, Executives, Production, …
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i4.0 Education Equipment

Several equipment for basics & specific topics

mMS4.0 for many i4.0 topics

Always new extensions from Industry for Education

Extension Kits

Consulting, develop new things together with us

Documents, Exercises

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Training environments for Digital Manufacturing

The mMS4.0

- Robotics & CNC
- Augmented Reality
- High-level-languages
- HMI
- RFID
- Sensors
- Smart devices & Apps
- Smart Glasses
- MES & Office tools
- Interactive Cockpit
- Web-based visualization
- Data analysis
- PLC & Motion Control
- High-level-languages
- Network
- Communication
- Safety & Security
- Cloud Services

Manufacturing process / Technical design

And more!
Thank You for Your attention