IT and Work 4.0: Job Killer and Job Creator

Green Forest Jobs, June, 25th, 2019
Dr.-Ing. Arno Buecken

The Institute for Man-Machine Interaction

- Institute for Man-Machine Interaction
  - Faculty for Electrical Engineering, RWTH Aachen University

- founded 2006
  - by Prof. Dr.-Ing. Jürgen Roßmann

- Currently about 50 employees
  - including 20 scientific employees

- Our Goal
  - Building the scientific foundation for eRobotics
eRobotics-Applications in the fields of environment, industry and space

Digitization
Digital Technologies change the world – fast

2005: Visitors of the Vatican after the death of pope Johannes Paul II

2013: Visitors of the Vatican after the retirement of pope Benedikt XVI

Digitization changes the World – fast!

Sources: www.spiegel.de, Christian Klettner / BASF

Perfect?

Cars are now perfect. They do not need further improvement.

“If I had asked people what they wanted, they would have said faster horses.”
Henry Ford
Innovation by stepwise advancement?

**Disruptive Developments are not new:**

- Refrigerator vs. “Block of Ice in the Basement”
- Pflough vs. Spade
- Cellphone vs. Phonebox
- CAD vs. Drawing Board
  etc.

The Invention of Electrical Power was a disruptive Development!

Everythings is fine!

**Comfort Zone-Dilemma:**
Actually, everything is fine.
How do major companies handle disruptive changes?

**Forestry 4.0**
Everything is 4.0, but what does that mean?

The four step of the industrial revolution

Image: Metaltech.com
The digital twin of a forestry unit

A comprehensive DIGITAL TWIN of a forestry unit for example could:

- **STORE** the inventory data of the last years.
- **SIMULATE** the development within the next years for several harvesting strategies.
- **SENSE** the local growth conditions permanently.
- **COUNSEL** workers, machines, … for the optimal planning of harvests in consideration of required measures of nature conservation, safety measures, …
- **EXPLAIN** tourists, where to find unique trees or bird species
- **INITIATE** required harvests and strategies under consideration of its current state and the market situation
Digital Twins are Basis for the Digitization and Result of the Digitization – at the same Time!
Communication in the Forest

Communication

4G
Communication

4G
5G

Communication

4G
5G
LoRaWAN
LoRaWAN

Advantages and Disadvantages of LoRaWAN

+ Long Range
+ Energy Efficient

- Low Data Rate

Possible Architecture
**Edge Computing**

Data is processed at the edge of the cloud – on the local device.

Only the results are transmitted.

A lower bandwidth is required.

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**Smart Communication – only required information**
Examples

Safety

Statistics for Germany, 2014

<table>
<thead>
<tr>
<th></th>
<th>Total</th>
<th>Forestry</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Jobs</td>
<td>42.6 Million³</td>
<td>33,000⁴</td>
<td>0.0008%</td>
</tr>
<tr>
<td>Number of Accidents</td>
<td>880,326¹</td>
<td>5,700²</td>
<td>0.65%</td>
</tr>
<tr>
<td>Number of fatal Accidents</td>
<td>473¹</td>
<td>31²</td>
<td>6.6%</td>
</tr>
</tbody>
</table>

Sources: ¹arbeitsschutz-portal.de, ²Sozialversicherung für Landwirtschaft, Forsten und Gartenbau, ³spiegel.de, ⁴statista.com

Statistics for Germany, 2014
Rescue Chain

Man-Machine Interaction ➔ Applications Business Processes

Informationbroker ➔ Control Information

DT-Platform ➔ Forest-worker

Sensor-/Actornetwork ➔ Informationbroker ➔ Man-Machine Interaction ➔ DT-Platform

Rescue Chain

Proximity Alert

Man-Machine Interaction ➔ MobileApps Business Processes ➔ Informationbroker ➔ DT-Platform ➔ Sensor-/Actornetwork ➔ Proximity Alert ➔ Forest Information ➔ Proximity Alert

Level
Areas
Usage
Services
Digital Twins
Physical Assets

Level
Areas
Usage
Services
Digital Twins
Physical Assets
Remote Sensing in the Virtual Forest Project

Remote Sensing based Forest Inventory

- Mixture
- Density
- Height
- Age
- Quality
Intelligent Sensors for the Forestry Sector

2008

2012

2014

Localization in the Forestry Sector
Job Killer or Job Creator

Conclusions

• change towards a network of humans and digital assets
• change in the requirements for personnel
• change in the workload and the tasks
Conclusions

Where are the decent jobs?

Jobs in Forestry

requirements
skills
education

Conclusions

Changes
Better Qualification
Chances

- higher level of qualification (educated jobs) => less exchangeability
- a huge supply chain relies on forestry => sustainable jobs
Conclusions

Safety Educated Jobs
Sustainable Jobs
Modern and demanding Environment
Interesting Jobs

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Thank you!