Development of an Industrie 4.0 Software Platform for SMEs
ICIMP 2019

January 11th 2019, Vienna
Jörg Hoffmann, Hendrik Frölian, Antoine Morin, Martin Bleider
Agenda

1. Structure of our Research
2. Survey: The need for Industrie 4.0
3. Development Methodologies
4. Industrie 4.0 Software Architecture
5. Conclusion and Outlook
### Basic structure of our research

<table>
<thead>
<tr>
<th>Topic</th>
<th>Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>Survey</td>
<td>What challenges are companies actually facing?</td>
</tr>
<tr>
<td>Methodology development</td>
<td>Guidelines to develop Industrie 4.0 solutions</td>
</tr>
<tr>
<td>Industrie 4.0 software architecture</td>
<td>Modular, scalable and flexible software architecture</td>
</tr>
<tr>
<td>Use Cases</td>
<td>Application and validation of methodologies</td>
</tr>
</tbody>
</table>

**Focus of today’s presentation**
### Agenda

<table>
<thead>
<tr>
<th></th>
<th>Title</th>
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<tbody>
<tr>
<td>1</td>
<td>Structure of our Research</td>
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<tr>
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<td>Survey: The need for Industrie 4.0</td>
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<td>Industrie 4.0 Software Architecture</td>
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<td>5</td>
<td>Conclusion and Outlook</td>
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Survey: The need for Industrie 4.0

An online questionnaire was distributed to companies in the Greater Montreal area.

- Distribution of 125 online questionnaires
- 16% response rate (20 valid answer sheets)
- English and French version
- Company size from 11 to 500 employees
- Focus on manufacturing companies
- Mainly B2B sector

Most of the companies struggle to locate assets on the shop floor.
- Machines: 50% older than 10 years; tools: 50% older than 6 years
- Production interruptions: insufficient stock and breakdowns
- Mostly manual collection of data from shopfloor
- The impact of Industrie 4.0 is expected to be greatest in customer relations and production monitoring

Is time wasted searching for….

<table>
<thead>
<tr>
<th>Tools</th>
<th>Parts, Components</th>
</tr>
</thead>
<tbody>
<tr>
<td>30% Yes</td>
<td>40% Yes</td>
</tr>
<tr>
<td>70% No</td>
<td>60% No</td>
</tr>
</tbody>
</table>
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Methodologies to develop Industrie 4.0 solutions

Based on the survey results and using the VDI 2221 standard three fields have been identified:

- Resource tracking on the shop floor
- Monitoring and analysis of shop floor data
- Reduction of production interruptions: machine break downs
- Reduction of production interruptions: Insufficient stock levels
- Improved decision making, efficiency increase, increased process quality
- Maintenance activities are reactive in many cases
- Optimized stock management
- Detailed information on order status
- Predictive Maintenance

Asset Tracking

Production Monitoring
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# Industrie 4.0 software architecture: Overview

An overview of the four different layers of the software architecture

## User layer
- Device independence
- Automatic software updates

## Cloud layer
- Scalable data processing
- Storage of data

## IT-infrastructure layer
- Extraction of data from existing systems
- Insertion of data into existing systems

## Physical layer
- Quasi real-time production surveillance
- Fast handling of critical data
Use case: Dashboard example
A comprehensive overview of important performance indicator
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Conclusion and Outlook
To improve the feasibility and reduce the complexity standardization is needed

Based on a survey the actual needs of companies have been assessed

Methodologies to develop *asset tracking*, *production monitoring* and *predictive maintenance* solutions were created

A modular, flexible and scalable software solution is provided

In two use cases the solution has been applied and validated

Standardization on physical layer and IT-infrastructure layer is needed
Thank you very much for your attention!

Dipl.-Wi.-Ing. Jörg Hoffmann
Deputy Head of Information Management

Phone: +49 241 47705-521
Fax: +49 241 47705-199
Mobil: +49 178 9164937
E-Mail: Joerg.Hoffmann@fir.rwth-aachen.de

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BACKUP
VDI 2221

To properly derive methodologies to develop Industry 4.0 solutions the VDI standard is used

<table>
<thead>
<tr>
<th>Task</th>
<th>Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Clarify and define the task</td>
<td>Requirements</td>
</tr>
<tr>
<td>2 Determine functions and their structure</td>
<td>Function structure</td>
</tr>
<tr>
<td>3 Search for solution principles and their structure</td>
<td>Principle solution</td>
</tr>
<tr>
<td>4 Division into realizable modules</td>
<td>Module structure</td>
</tr>
<tr>
<td>5 Design of key modules</td>
<td>Preliminary draft</td>
</tr>
<tr>
<td>6 Design of the whole product</td>
<td>Overall design</td>
</tr>
<tr>
<td>7 Preparation of production and operations instructions</td>
<td>Product documentation</td>
</tr>
</tbody>
</table>

Structured top down approach

Phase I: Plan
Phase II: Concept
Phase III: Design
Phase IV: Finalize