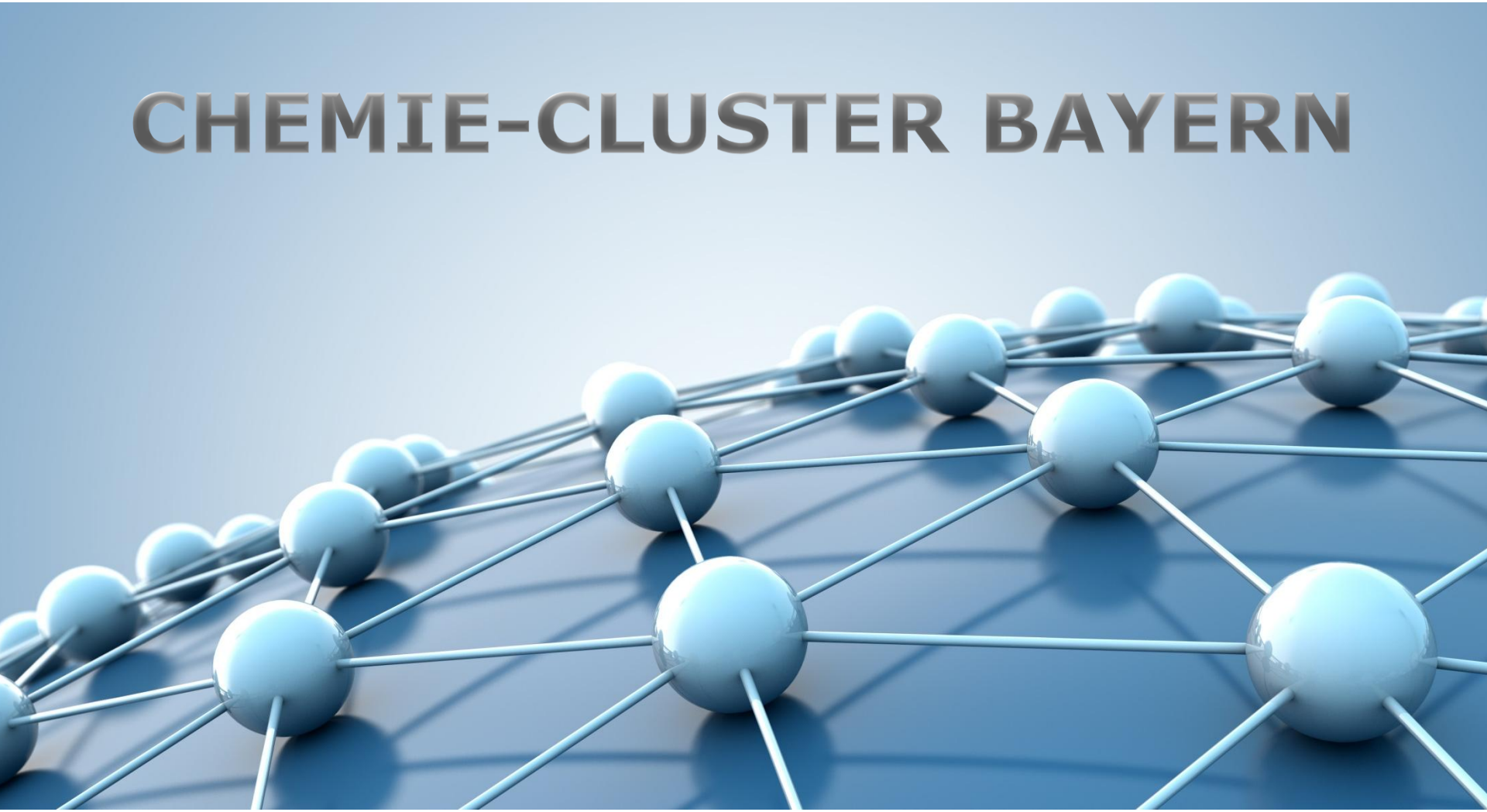

CHEMIE-CLUSTER BAYERN

Our Missions

Public

- Enhance value creation of chemical industry
- Support for enterprises, universities

Industry

VCI
Verband der Chemischen Industrie e.V. - Landesverband Bayern

- Accelerate market success of research results
- Optimize synergistic effects in cooperation projects

Academic

Universität Bayern e.V.

- Strengthen industrial participation at academic research projects

The Cluster Network 2017

- Fine chemicals
- Pharmaceutical industry
- Agricultural Industry
- Petrochemistry
- Plant Engineering
- Soaps and detergents
- Software
- Surface Chemistry
- Organic Chemistry
- New Materials
- Polymers
- Energy and Environmental Consulting
- Analytics

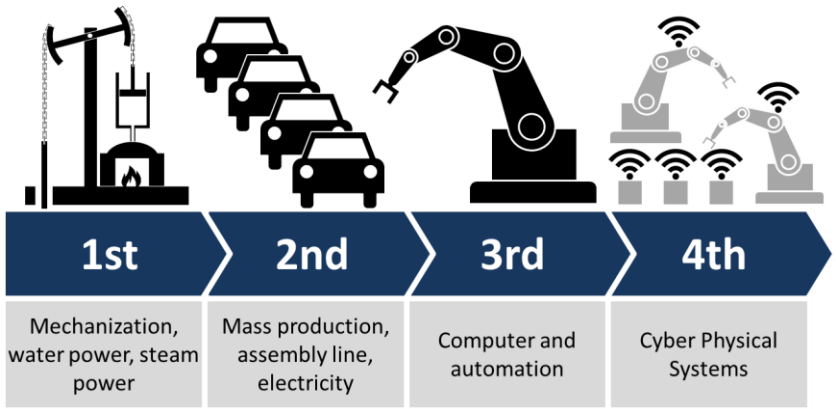
ca. 130 members

Condensed assumptions of impacts of Industry 4.0:

- Will **change the business environment**
- Offers **immense potential for** our industrial cluster members and research institutions
- Offers **chances and potential** for every participant in the value chain
- Cannot be stopped - **only shaped**
- Needs highest **security standards**
- Changes **qualification needs for employees**
- Can be an **immense chance** for the region
- Cannot work with **national separation**
- Needs **proper frame conditions** on a national, European and worldwide level
- Needs **open and honest dialogue** with all stakeholders

„Definition“ of Industry 4.0

- „Disruptive Technologies“, „Transformation of working processes“, „Big Data“, „Internet of Things“ (IoT), „Augmented Reality“, etc.
- “Digitalization is […] the process of moving to a digital business.”
- „Combination with tradtional production, development and sales processes“
- -> Very broad field for our members!



Impact of Industry 4.0

VCI President Dr. Kurt Bock

„The chemical industry is again in its history at a position of points or a turning point:

Namely, for the chemical industry, **Chemistry 4.0** is the combination of digitalisation **with innovative business models** and sustainability in all fields“

Effects expected by ‚Chemistry 4.0' -

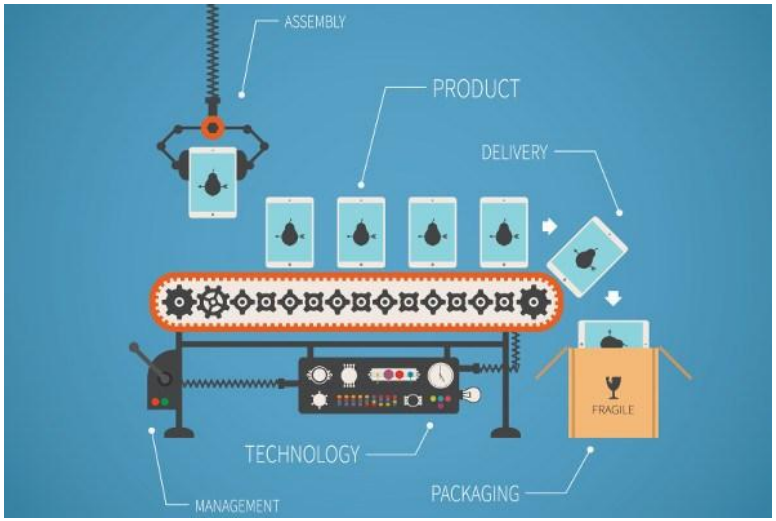
Chemical industry has among the highest growth potential

Sector	Gross Value Added [2013-25]
Chemical Industry	+30 %
Automotive	+20 %
Machinery	+30 %
Eletrical equipment	+30 %
Food	+15 %
IT systems	+15 %

(source: Fraunhofer/Bitkom)

Examples: Potential of new technologies in the chemical sector

- **Reduction of machine failures** and optimization of production processes, e.g. by Predictive Maintenance, Big Data Analysis
- **Innovative products** and **services** by **digital connection** to other companies and service providers (digital business models, e.g. precision farming)
- **Horizontal integration of customer and supplier** (production and storage are interactive optimized) in shared data platforms



The Internet revolutionizes the business world and creates major challenges and opportunities for manufacturing companies

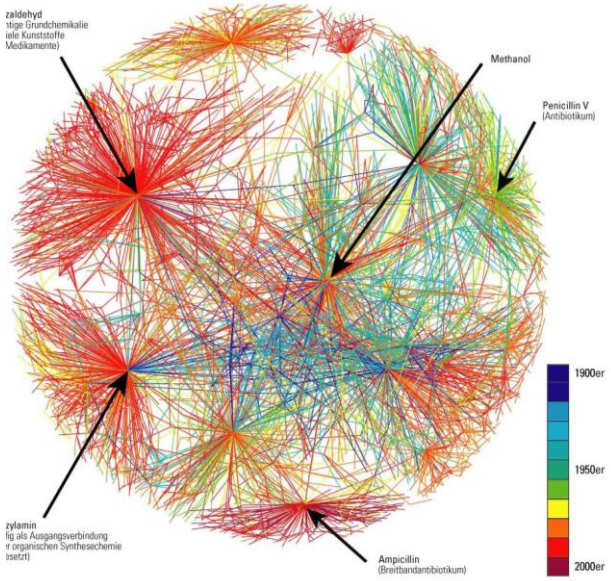
- Customers are increasingly able to tell their manufacturers directly via the net, what exactly they want and when
- Formerly isolated processes are getting connected through internet based services influencing B2C and B2B

Internet Security - Industrial systems and office world have different management & operational characteristics

	Industrial Systems 	Office IT 
Protection target for security	Production resources, incl. logistics	IT- Infrastructure
Component Lifetime	Up to 20 years	3-5 years
Availability requirement	Very high	Medium, delays accepted
Real time requirement	Can be critical	Delays accepted
Physical Security	Very much varying	High (for IT Service Centers)
Application of patches	Slow / restricted by regulation	Regular / scheduled
Anti-virus	Uncommon, hard to deploy, white listing	Common / widely used
Security testing / audit	Increasing	Scheduled and mandated

Big data – Computer aided solutions for chemical synthesis (Chematica)

- Chemical synthesis often more ‚art' than ‚science'
- The idea of an "information machine for chemistry" first envisioned by V.K. Finn in 1957
- New approach in 2012: Big Data approach using databases of 250 years of scientific literature to predict synthesis ways
- Next step: Include synthesis failures
- Aim: Prediction of synthesis ways with high accuracy



http://chematica.net/

Industry 4.0 - The people factor

During our events and discussions it apeared that the influence of digitalisation on the workorce is of highest interest

Concerns among the labour force/employees:

- Job losses (automization ↓ digitalisation ?)
- Old jobs have to be revised and adopted -> Are qualifications sufficient?

Fraunhofer IAIS

Chances expected:

- New job profiles (e.g. data scientist)
- Heavy/Dangerous work can be automized
- New jobs by new business opportunities?

Specific aspects of Industry 4.0 from our cluster perspective

- **New business models**
- **IT security** to protect data, constructions and equipment from cyber attacks
- **Regulatory frameworks** protecting intellectual property but also security of the plants
- Uncertainties in **chances and risks**
- All stakeholders are looking for **information**

Many thanks for your attention!