SHAREBOX - How to acquire symbiotic synergies successfully on the web
Chemical Cluster of Bavaria - Mission

**Public**
- Increase economic value in Bavaria
- Economic promotion of cluster members

**Industry**
- Accelerate market success of research results
- Optimizing synergies in cooperation projects

**Academic**
- Strengthen cooperation between industry and research institutions
Key challenges for the competitiveness of the process and clean-tech industries in the EU:

- **Improve cost structures by increased resource efficiency:**
  - Personnel and energy costs are not competitive in the global context
  - Raw materials and energy costs
    - make up more than half of the average industrial expenditures
    - grow twice as fast as personnel costs

- **Get along with tightening environmental regulation:**
  - Strict decarbonization goals demand for a fundamental restructuring of industrial processes (e.g. Carbon Capture & Utilization, Power to X)
  - Limited natural resources will lead to more restricting regulations on environmental pollution and waste disposal

- **Create symbiotic inter-corporate structures for sharing resources:**
  - Create awareness for cross-corporate, cross-sectoral opportunities
  - Identify the right topics and partners for creating new value chains
  - Define operational and legal procedures for industrial symbiosis

- **Meet the fast-growing global demand for clean and efficient technologies:**
  - Benefit from the rapid growth of process industries, e.g. in Southeast Asia
  - Leadership in clean technologies as a unique selling proposition

The future of the European process industry is green, connected and digital!
Resource efficiency and flexibility:

- Maximising efficiency in the use of primary resources
- Full re-use, recycling or recovery of waste as alternative resources
- Optimising water treatment and symbiosis concepts
- Full traceability of value chains

Industrial symbiosis and digitalization as “transversal topics”
SHAREBOX Case Study

1. The EU/ SPIRE needs
“solutions for more efficient processing and energy systems for the process industry, including industrial symbiosis”

SPIRE goals: (i) 30% reduction in fossil energy intensity, (ii) 20% less non-renewable raw material usage, (iii) 40% reduction of CO2-equivalent

2. The Project Solution
A secure ICT platform that functions as byproduct inventory, supply chain management and decision support system, allowing companies to identify and manage win-win situations in trading byproducts and sharing resources.

3. Value to Customers
Cost Savings: Avoid costs related to waste handling and management
Boost Revenues: Create additional income by commercialising byproducts
Cut expenses: Benefit from the lower prices of resources considered byproducts
Lower risk: Through diversifying both supplier base and clientele

4. How will this happen?
1. Adoption by companies in existing industrial parks and clusters
2. Reaching critical mass of users for national and international symbiotic exchanges
3. Regulatory change for decharacterising outputs as “waste” once part of symbiotic exchanges
The project: SHAREBOX

Secure Management Platform for Sharing Process Resources

- Joint project funded by EU (Horizon 2020)
- 16 project partners from 8 countries
- EC funding (A): 5.416.544,75 €
- Private investment (B): 1.500.000 €
- Funding period: 2015-2019
Project video

https://www.youtube.com/watch?v=KMPawNSkF7c&t=106s
Backgrounds of participants

- Consultation and facilitation
- Software engineering
- Knowledge on industrial ecology
- Industrial production
Definition Industrial Symbiosis

Exchange of resources between industrial production sites; aiming at an increase of resource efficiency at the single exchange partners as well as in the whole exchange system

- All resources (materials, energy, and also knowledge)
- All industrial sectors
- Principle of profitability

1) within the boundaries of industrial parks

2) in networks without geographic boundaries
Why is the topic so important?

Save money
- > 300 Mrd. €/a for the EU’s process industry

Stay competitive

Create innovations
- New industrial processes and technologies

Protect the environment
- Less fossile resources
- Less emissions

Raw material costs rise twice as fast as personnel costs!
Existing web-based platforms

Regional:
- Raw material exchanges, e.g. by chambers of industry and commerce
- Stand-alone platforms, e.g.:
  - www.FreeCycle.org
  - www.recycling-europe.com
  - http://www.recycle.net/

Global:
- ebay
- Google
- Alibaba.com

Little coordination power up to now!
Challenges - Communication

- How do I formulate my cooperation interest?
- How do I identify my cooperation partner
- How do we get in contact with each other?
- Maybe we mean the same, even when saying different things?
Challenges - Negotiation

- How much should the other side know about me?
- How can we find a solution if the offers do not fit together precisely?
- Which price could I offer or accept in the negotiations?
- How can I be sure that the negotiation partner is reliable?
Approach 1: Manage complex issues by facilitated face-to-face communication

Pros:
- Very efficient matching through active and systematic facilitation
- Little learning effort for the participants

Cons:
- High effort regarding personnel and organisation
- Synergies can only be created within the limited space of a region
Approach 2: Manage complex issues by a web-based platform using artificial intelligence

**Pros:**
- Automatised interaction – little effort
- Available anytime and anywhere
- Large reach beyond regions
- High data processing capacity

**Cons:**
- Use of platform requires training
SHAREBOX Key Objectives

Facilitating the next generation industrial symbiosis delivery to process industries through ICT and data intelligence

- To provide plant operations and production managers with the robust, reliable and timely information they need to effectively and confidently identify resource reuse opportunities
- To identify and realise new cross-sectorial interactions (‘synergies’)  
- To develop intelligence tools such as input-output (IO) modelling, game theory (GT) and agent-based modelling (ABM)
SHAREBOX: Basic principles

Web-based:
- Universal access via Application Programming Interface (API)
- Can be integrated into different IT systems
- Available world-wide

Intelligent:
- Integration of diverse classification systems
- Software based classification tool
- Tools for technical and decision making support
- Learning system

Secure:
- User identification
- Anonymous handling of data until concrete start of negotiations on cooperation
Example: Product classification

Keywords
polypropylene
Polypropylene
Polypropylene film

EWC Entries

WASTES FROM AGRICULTURE; HORTICULTURE; AQUACULTURE; FORESTRY; HUNTING AND FISHING; FOOD PREPARATION

- wastes from agriculture; horticulture; aquaculture; forestry; hunting and fishing
  - 02 01 04 waste plastics (except packaging)

WASTES FROM ORGANIC CHEMICAL PROCESSES

- wastes from the MFSU of plastics; synthetic rubber and man-made fibres
  - 07 02 13 waste plastic

WASTES FROM SHAPING AND PHYSICAL AND MECHANICAL SURFACE TREATMENT OF METALS AND PLASTICS

- wastes from shaping and physical and mechanical surface treatment of metals and plastics
  - 12 01 05 plastics shavings and turnings

WASTE PACKAGING, ABSORBENTS, WIPING CLOTHS; FILTER MATERIALS AND PROTECTIVE CLOTHING NOT OTHERWISE SPECIFIED IN THE LIST

- packaging (including separately collected municipal packaging waste)
  - 15 01 02 plastic packaging

WASTES NOT OTHERWISE SPECIFIED IN THE LIST

- end-of-life vehicles from different means of transport (including off-road machinery) and wastes fro
Example: Creating a synergy

- Defined steps
- Discretion
- Documentation
SHAREBOX Expected Outcomes

- New approaches that perform **cost-saving optimisation** of energy and resources supply and demand
- **Data mining techniques** for further optimisation of industrial symbiosis based on historical big data collected from SHAREBOX
- **Flexible and secure** platform that allows secure sharing of information about resources and energy transactions among industries in a symbiotic network and for generating operative actions

Image source: SPIRE Vision 2050
What key sustainability impacts has SHAREBOX delivered?

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Impact at M30</th>
<th>Impact forecast at M48</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO2 emission reduction</td>
<td>682,000 tonnes</td>
<td>1,170,000 tonnes</td>
</tr>
<tr>
<td>Virgin resources saved</td>
<td>345,600 tonnes</td>
<td>617,900 tonnes</td>
</tr>
<tr>
<td>Waste avoided</td>
<td>273,000 tonnes</td>
<td>498,700 tonnes</td>
</tr>
<tr>
<td>Additional Sales</td>
<td>€14,000,000</td>
<td>€24,200,000</td>
</tr>
<tr>
<td>Cost savings</td>
<td>€6,300,000</td>
<td>€10,500,000</td>
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Benefits

Estimation for the European process industry:

Turnover of EU process industry: €1.6 bn p. a

Theoretical size of cost savings potential: 19%

It makes sense to get involved into Industrial Symbiosis!

Data sources: SPIRE, Ellen McArthur foundation with McKinsey
Industrial symbiosis network success criteria

- Good communications/real time information
- Promotes innovation
- Access to solution providers: Financial, technical, legislative
- Critical mass of participants
- Representation from a wide range of sectors
- Not be reliant on a single anchor tenant

Image source: SPIRE Vision 2050
Criteria for successful diffusion of innovation (Everett Rogers)

- **Relative advantage:** The greater the perceived relative advantage of an innovation, the more rapid its rate of adoption

- **Compatibility:** Consistent with the existing values, past experiences, and needs of potential adopters

- **Complexity:** Not too difficult to understand and use

- **Trialability:** Results in less uncertainty for adoption

- **Observability:** The easier it is for individuals to see the results of an innovation, the more likely they are to adopt.

Image source: SPIRE Vision 2050
System requirements - Standardisation

- **Taxonomy:**
  Finding a unified wording for basic elements of Industrial Symbiosis

- **Procedures:**
  Integration into existing standardised management systems and creation of responsibilities in public authorities

- **Legal framework:**
  Integration into European and national environmental law and technical norms
System requirements - Training

- Creating **awareness** for the importance and the benefits of industrial symbiosis
- Teaching the **competence** to handle the SHAREBOX web-based platform successfully and efficiently
How to get your business involved into Industrial Symbiosis

Inside perspective:

• Know about your potentials
  • Information
  • Value
• Bundle activities
  • Define responsibilities
  • Define procedures

Outside perspective:

• Get ready for cooperation beyond sectoral limits
• Get ready to start co-opetition relationships
• Get access to external competence
  • Technological advice
  • Facilitators
  • Clusters and networks
Integration into facilitated processes

Learn about an IS potential

Communication, negotiation, technical advice, legal advice, testing

Cooperation contract

SHAREBOX

Facilitator
Clusters and Industrial Symbiosis

Value chain creation

Challenge statement

Partner identification, negotiation, business development

Challenge solution

Chemie Cluster Bayern
### Potential cooperation partners

<table>
<thead>
<tr>
<th>Regional development agencies</th>
</tr>
</thead>
<tbody>
<tr>
<td>▪ Cross-sectoral</td>
</tr>
<tr>
<td>▪ &gt; 750 in Europe</td>
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<table>
<thead>
<tr>
<th>Multi-site/multinational companies:</th>
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</thead>
<tbody>
<tr>
<td>▪ Unified resource management</td>
</tr>
<tr>
<td>▪ Across different sites</td>
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<table>
<thead>
<tr>
<th>Industrial parks:</th>
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</thead>
<tbody>
<tr>
<td>▪ Unified resource management</td>
</tr>
<tr>
<td>▪ Across park boundaries</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cluster organisations:</th>
</tr>
</thead>
<tbody>
<tr>
<td>▪ Strengthening network cooperation</td>
</tr>
<tr>
<td>▪ Using value chain creation skills</td>
</tr>
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<table>
<thead>
<tr>
<th>Industrial zones:</th>
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</thead>
<tbody>
<tr>
<td>▪ Smartness of location</td>
</tr>
<tr>
<td>▪ Global option</td>
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<table>
<thead>
<tr>
<th>Industrial associations:</th>
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</thead>
<tbody>
<tr>
<td>▪ Strategic partners</td>
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<tr>
<td>▪ Teaching, standardisation</td>
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Business model

- SaaS-(Software as a Service) Software business model
- Supercomputer cloud – affordable, high performance computing to end-users for high processing power and speeds
- Individual user platform (computer & mobile devices), user community, social media (e.g. Twitter), Youtube, Tutorials & Webinars…
Wrap-up: Key selling proposition

- Easy and self-explaining handling of the system,
- Creating easily a common understanding of *what* is being dealt on the market,
- Helping to negotiate concrete transactions,
- Protecting sensitive internal knowledge of the participating institutions.

Reduction of transaction costs for the creation of industrial synergies
Learnings from the project

Well done:

- Interdisciplinary approach
- Consortium representing triple helix and value chain
- Integration of technical knowledge and project management skills
- Integration of potential users from the beginning
- Continuous testing and validation

Needs more work:

- User-friendliness of integrated tools
- Understanding of user adoption
- Integration into existing industrial ecosystems
See you at the WRF, booth 28!

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Project website:      sharebox-project.eu
Thank you for your attention!

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