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“Experimental Learning in Industrial Management”
Jochen Deuse, Marlies Steffen, Jens Riis, John Johansen
# Experimental Learning in Industrial Management

## Discussion Points

1. What are the future challenges to industry?
2. What role do experiments play in that game?
3. What is the desired competence profile of our graduates?
4. What is the background at our universities?
5. How should an experimental learning-based framework look like?
   - Learning styles
   - Examples for Experimental Learning

6. What then for AIM?
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Future Challenges to Industry

- From resource-based to knowledge-based production
- From linearity to complexity
- From individual competition to systematic competition
- From mono-disciplinarity to trans-disciplinarity
- From top-down to bottom-up production
  
  [Manufuture - A Vision for 2020]

- From stable to dynamic and unpredictable environment
- From foreseeable cyclical fluctuations with effects on single industries to more powerful fluctuations effecting sensitive global networks
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Conclusion 1

- From resource-based to knowledge-based production
- From linearity to complexity
- From individual competition to systematic competition
- From mono-disciplinarity to trans-disciplinarity
- From top-down to bottom-up production
- From stable to dynamic and unpredictable environment
- From foreseeable cyclical fluctuations with effects on single industries to more powerful fluctuations effecting sensitive global networks

“Experimenting is the best way for industrial organisations to enhance quick innovation and adaptability in our unpredictable world!”

[Manufuture - A Vision for 2020]
### Experimental Learning in Industrial Management

#### The Desired Competence Profile of our Graduates

<table>
<thead>
<tr>
<th>Professional / methodological competence</th>
<th>Activity / implementation competence</th>
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<tbody>
<tr>
<td></td>
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<td>Methodological competence</td>
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<tr>
<td>System competence</td>
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<tr>
<td>Problem-solving competence</td>
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<td>Being a “hands-on doer”</td>
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<th>Personal Competence</th>
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<td>Being a team player, able to motivate employees and to lead change processes</td>
<td>Ability to reflect, act self-directed and develop own competences</td>
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[according to J. Erpenbeck, V. Heyse]
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Conclusion 2

Professional / methodological competence

- Methodological competence
- System competence
- Problem-solving competence

Activity / implementation competence

- Being a “hands-on doer”

Social / communication competence

- Being a team player, able to motivate employees and to lead change processes

- Ability to reflect, act self-directed and develop own competences

“We are currently teaching important professional knowledge but do not empower the development of holistic competence profiles!”

[according to J. Erpenbeck V. Heyse]
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The Background at our Universities

Professors
- Academic vs. industrial career path depending on European region
- Changes in the appointment procedure of professors at European Universities

PhD Candidates
- Development of different competence profiles based on different models, e.g. research fellows vs. graduate school

Students
- Missing link from theory to practice
- Students are not used to student-centred, experimental learning and have to learn to participate actively

Bologna Process
- Strives for outcome-oriented teaching but leads to:
  - “School-like regimentation” of curricula
  - “Paternalism” and less self-responsibility
  - Less time for practical experiences, internships etc.
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Conclusion 3

Professors
- Scientific career vs. industrial experiences depending on European region
- Changes in the appointment process of professors at European Universities

PhDs
- Development of different PhD competence profiles based on different frameworks of engineering doctorates

“Transfer of knowledge and talents between academia and industry must not be a one way street!”

Students:
- Missing relation of theory and practice in teaching
- Students are not used to student-centered, experimental learning and have to learn to participate actively

Exceptions:
- Strives for outcome-oriented teaching but leads to:
  - “school-like regimentation“ of curricula
  - “paternalism” and less self-responsibility
  - Less time for practical experiences, internships etc.
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Theories of Learning

„Information Assimilation“

- Receiving information through a medium
- Acting according to understanding
- Organizing information, generalization
- Inferring a particular application

- Less time consuming
- Easy to give knowledge a structure
- Low taxonomy level
- Low learning retention

„Experiential Learning“

- Concrete experience
- Active experimentation
- Reflective observation
- Abstract Conceptualization

- High taxonomy level
- High learning retention
- Time consuming
- Knowledge needs a structure

[Kolb]

[Coleman]
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Learning Styles of Experiential Learning

Grasping experience
Transforming experience
Reflective observation
Concrete experience

Active experimentation
"doers"
Diverging
"watchers"
Assimilating
Converging

[Kolb]
Experimental Learning in Industrial Management
Learning Styles of Experiential Learning

Grasping experience
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“doers”

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Abstract conceptualisation

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Assimilating

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Active experimentation

Grasping experience

Transforming experience

[Kolb]
“Compared to the competence profile we have to focus on western learning styles, i.e. Experimental Learning!”
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EL based Educational Program - The Olin Experiment

Hands-on starting on day 1

Professors and students

Classroom work

Lab time

[http://spectrum.ieee.org/at-work/education/the-olin-experiment]
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Examples for Experimental Learning

SimLab, Aalto University
[http://simlab.aalto.fi]

Gaming, Steel Industry
[DEW]

Solution Lab, Aalborg University

IE Training Centre, TU Dortmund

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Accomodating Learning – Cuddling in an Ass’y Line
“We have some excellent examples of Experimental Learning within AIM that we should promote and develop further!”
# Experimental Learning in Industrial Management

What then for AIM?

## Step 1: Get overview at first glance

### Ongoing Activities on Experimental Learning (EL) in Europe

(Literature, Conferences*, Research**, Networks/Communities***, Working Groups, Surveys****, Industry*****)

**Target:**

- Get an overview to define a starting point and specify open questions

**To do:**

- Collect and sort information ...

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## Step 2: Analysis – Best practice for EL in IM

**Target:**

- Identify and share best practice
- Analyse EL in theory and practice

**To do:**

- Attend conferences
- Set up further surveys
- Organise benchmark trips ...

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### Potential starting point to apply for possible EU Funding

- *e.g.:* 2nd conference on learning factories; IEEE EDUCON; Dortmunder IE-Fachtagung
- **e.g.:** Project TeachINNG.LearnINNG EU; Project Elli
- *** e.g.: SAGE: Simulation and Advanced Gaming Environments for Learning
- **** e.g.: Survey on Learning factories by Prof. ElMaraghy, survey on Curriculum of Master of Advanced Industrial Management by Prof. Dombrowski
- ***** e.g.: Simulation Work Environment by GM
Experimental Learning in Industrial Management
What then for AIM?

Step 3: Common understanding and Benefit of EL

Target:
- Create a common understanding of EL
- Prove why EL is an appropriate concept for IM higher education

To do:
- Define IM tasks, necessary asset of competences, learning targets
- Develop a way how to evaluate competence development respectively benefit of EL
- Set up surveys, expert interviews ...

Step 4: Define Framework for Educational Program based on EL

Target:
- create a framework with recommendations how to integrate EL

To do:
- Define an core work group/ an advisory board, organise workshops (e.g. in combination w/ benchmark trips)
- Analyse different cultural, organisational and social background at European universities ...

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Step 5: Evaluation (“Summerschool”) (mid-term vision)

Target:
- Evaluate framework and benefit of EL by a prototype (e.g. summerschool)
- Enable exchange of students,
- Support development of holistic competence profile, including intercultural competence
- Maybe integrate Industry by forming mixed groups w/ employees and students

To do:
- Develop and organise summerschool according to the EL framework …

Step 6: Consolidation (long-term vision)

Target:
- Establish „IM Summerschool“ as a yearly event (rotating locations within Europe)
- Create European curriculum of IM based on EL framework
- Sustainable discussion about EL within AIM, support AIM fellows w/ EL

To do:
- Create structure to organise, finance, schedule summerschool,
- Integrate EL at each AIM conference
- Further development of AIM homepage to exchange information …
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Conclusion 6

Step 5: Evaluation ex. Summerschool

- Organise „IM Summerschool“
- Targets: improve quality of IE Education and thus students employability. Encourage European exchange and international experience of students, support development of intercultural competence. Maybe integrate industry by forming groups w/ engineers/workers and students
- To do: choose participants, organise summerschool, develop or adapt existing EL course to defined requirements

Step 6: Consolidation/ Sustainability

- Establish „IM Summerschool“ as a yearly event (rotating locations within Europe)
- sustainable discussion about EL
- Targets: support further improvements of IM higher Education. Encourage exchange on EL at least within AIM, support AIM fellows implementing EL
- To do: define sustainable structure to organize, finance, schedule summcamp integrate topic EL on AIM conference, further development of AIM homepage to exchange information

“Now it’s time to act and AIM is in charge!”