



## Lean Learning Academies

Final Report

Public Part

## Project information

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# Executive Summary

## 1. Target Audience:

An important way for companies to stay competitive is to focus on production efficiency and cost reduction (see e.g. Tinham, 2005). That is what lean manufacturing is aiming at (see e.g. Wood, 2004). The maximum benefit from lean manufacturing is gained by considering all its elements (i.e. principles, tools, and mindset) together as a system, and by practicing them every day in a consistent manner. As such, companies should be able to train their managers and employees continuously in lean manufacturing principles, tools, and mindset.

At the same time, higher education institutions are trying to prepare their students to function successfully in professional life. They are looking for ways to better develop their students' competencies. More specifically, lecturers are looking for learning methods that raise students' interests, motivate them, make them better understand complex matters and allow them to study anytime and anywhere using course materials published on the web (see e.g. Yazici, 2006; Dobson and Shumsky, 2007).

## 2. Project objectives:

To satisfy the need for training lean manufacturing principles in companies on the one hand and to improve engineering students' employability in professional life on the other hand, an innovative training programme about lean manufacturing has been developed in the framework of this Erasmus–Lifelong Learning Programme (LLP) project. The training programme consists of a lean production simulation game of which rounds are alternated with course modules on different lean topics. Apart from teaching lean principles and tools, the training programme also aims at developing a lean mindset.

## 3. Partners and their expertise:

In this project, a collaboration has been established between lean experts from five EU-universities, each supported by a company with a lot of expertise in lean management. EURASHE was added as the ideal partner to disseminate our project results among other European HEI's. Each academic partner created a resonance group of people from other HEI's and companies. These resonance groups provided their academic partner with valuable feedback during at least 3 meetings. All academic partners, however, met more frequently with their resonance group. Last but not least, groups of master students in engineering were involved especially for testing the developed training materials.

#### **4. Approaches:**

The goal of this cooperation was to develop a state-of-the-art training programme consisting of a lean production simulation game of which rounds are alternated with course modules about different lean topics. In order to enhance the output quality, a Deming circle approach (plan, do, check, act) has been used. To guarantee the authenticity of incorporated cases and the relevance of all material included, many external experts were involved in each academic partner's resonance group. Since a lot of development had to be performed in only two years time, monitoring the project progress was important from the very beginning. As such, measures (on-line to-do list and external evaluator) were taken to keep all partners on track.

To disseminate our project results, we regularly informed each of our target groups. On top of these actions, we also informed the broad public about our project through e.g. websites, publications and a radio broadcast.

#### **5. Major results achieved:**

At the end of the project, 17 course modules about lean topics and a lean production game have been developed in English, reviewed and translated in Dutch, Swedish, Polish, Portuguese and Romanian. All these project deliverables together with a lot of articles are published in the public part of the project website [www.leanlearningacademies.eu](http://www.leanlearningacademies.eu). We now have a lot of experience about creating a lean production game and installing it in a dedicated room. The project resulted in an innovative training program about lean management, integrated in engineering curricula. An important aspect of this training program is the strong and sustainable involvement of lean experts from industry. During this project we set up a network of lean experts. We expect that through the exploitation activities of our Lean Learning Academies, this network will keep growing.

#### **6. Plans for the future:**

In the near future, the lean learning academy's training program will further integrate into our engineering curricula and will be open for subscriptions from employees and managers. The training program will be subject to further improvements to keep pace with recent evolutions in industry. We will update the website accordingly and use this website to further exchange materials with our current project partners. What's more, all partners agreed to try to work together in a next project about lean. Meanwhile, all partners will continue to disseminate the project results at any occasion.

## **7. Project website:**

The project website is online since the first month of this project and can be visited at <http://www.leanlearningacademy.eu> . It consists of a public part and a 'Partners Only' part. The public part informs the world about the project and shows the project deliverables while the 'Partners Only' part is password protected because it contains documents for internal use only. Only partners, resonance group members, the external evaluator and representatives from the Executive Agency have access to the 'Partners Only' section.

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# 1. Project Objectives

## 1.1. Project objectives

The establishment of a Lean Learning Academy has 3 major objectives:

- to enhance employability of employees and students  
In times of economic recession, companies try to dismiss some employees and they only recruit people for crucial vacant functions. If students want to find a job and employees want to keep their job, both groups need to have up-to-date knowledge and trained skills. Knowledge and skills about lean management are especially useful to improve the operational efficiency of all kind of organisations.
- to improve the competitiveness of companies  
Today, companies are faced with decreasing profit margins due to economic crisis and global competition. To bend this declining trend upwards, the implementation of lean management can contribute significantly improving product quality, reducing costs and minimising delivery times while showing a lot of respect for the human capital.
- to create more attractive engineering curricula.  
Too often, students attend rather unattractive courses by sitting and listening to lecturers teaching ex-cathedra. Although ex-cathedra teaching can be very efficient to transfer a lot of knowledge in a short period of time, it isn't suitable to train skills and attitudes. Universities are looking for better ways to develop their students' competencies. More specifically, lecturers are looking for learning methods that raise students' interests, motivate them, involve them, make them better understand complex matters and allow them to study anytime and anywhere using course materials published on the web.

## 1.2. How the project benefits a specific community of users and how they are involved in the project

This project benefits mainly 3 specific communities of users: companies, students and higher educational institutions. All of them have been involved in this project at several stages.

Companies:

- The Lean Learning Academies will be used as training centres for employees and managers from different companies. Employees and managers, well trained in lean management principles, have better understanding of their production system and as a consequence they take better decisions to make their companies more competitive.

Those companies will end up with lower production costs, shorter delivery lead times, better output quality, more balanced workload for the employees, more flexible production,... to name just a few advantages.

- In this project, a modular lean manufacturing course programme has been developed, using contributions of all company partners. Furthermore, a lean production game has been developed using the best ideas from existing lean production games provided by the company partners. The company partners reviewed the developed course modules and formulated their feedback during international meetings or well before. Feedback on the developed course modules and the lean production game is also provided by company representatives which were members of a resonance group. Most resonance groups participated in testing the lean production game of their academic partner. Furthermore, the external evaluator, who has a lot of experience in industry, evaluated the project output and project progress and formulated constructive feedback. He pushed the academic partners to produce deliverables that meet high industry standards.

During the project, all partners grabbed opportunities to inform company representatives about this project. Partners participated in networking events, conferences, company visits,... At each occasion they talked about the project and distributed the project flyer which has been published on the project website in an early stage of the project. In addition, companies were invited to the special events academic partners organised to disseminate project results.

Students:

- The LLA's provide up-to-date courses, divided into modules (one module per lean topic), with relevant content, authentic cases from industry and reviewed by a lot of lean professionals and students. This state-of-the-art training programme improves the employability of our students. The innovative working method motivates students to learn more about lean. Playing the lean production game helps them to better understand complex matters and also stimulates their interest. The fact that all course modules are available on the project website, creates e-learning opportunities also for other target groups than regular students, although these modules have not been developed as self-study courses.
- Students have been involved in reviewing the course modules and in testing the lean production game. All academic partners informed their students about this project, orally during lectures and/or through their digital learning platform. Students have been invited to the final dissemination event. Project flyers were offered to students at several locations on our campuses.

Higher educational institutions:

- Higher educational institutions are searching for both more attractive and more efficient didactical working methods. The Lean Learning Academies (LLA's) at each of the academic partners are sustainable examples of a successful alternative for the traditional way of teaching. They use an innovative, effective and attractive methodology to get insight in lean topics by doing. More specifically, they provide a better way to develop competencies like e.g. entrepreneurship, creativity, problem solving and team work. The project results inspire colleagues to question the didactical working method they use.
- Universities of the academic partners in this project reserved a dedicated room for the lean production game set-up, provided meeting rooms for project meetings and of course they co-financed this project. The coordinating university, KAHO Sint-Lieven University College, also hosts the LLA project website. Some other higher educational institutions were represented in the resonance groups where they gave feedback on the project deliverables. Some more higher educational institutions attended the final dissemination event. At the end of this project, EURASHE informed her European wide network of HEI's about our project results through the distribution of 500 printed flyers and the publication of an article in her electronic newsletter.

### **1.3. Potential impact and benefits to target user groups**

The Lean Learning Academies focus on three target user groups: employees/managers, students/alumni and LLA trainers.

Employees/managers:

After a training in a Lean Learning Academy (LLA), managers and employees will hopefully be convinced that also their company can benefit from the implementation of lean principles, tools and mindset. Back in their company, they should be able to start a process cycle of continuous step-by-step innovation involving people on all company levels. The training will also bring their lean management competences up-to-date and so it will improve their employability.

Students/alumni:

This training programme has an important impact on students/alumni. The innovative training method allows students to enjoy their study even more and alumni might be triggered to come back for further training. The lean production game provides young bachelors and masters in applied sciences with a maybe first experience as entrepreneur under safe conditions. The course modules on the other hand, allow them to go through lean topics

whenever they have access to the internet. Both project deliverables help them to better understand lean management. As with the group of employees/managers, for students/alumni this training will also bring their lean management competences up-to-date and so it will improve their employability.

LLA trainers:

Since LLA's also act as lean manufacturing training centres for employees and managers, trainers are extra motivated to keep their training materials up-to-date. This pushes all trainers to keep in touch with lean manufacturing companies and to get involved in lean projects. This guarantees that they will become even better lean experts. Some of the trainers are professor at the academic partners' university and so they will experience the above benefits themselves. In the end, the academic partners' university will have more competent professors and a more attractive curriculum.

## 2. Project Approach

### 2.1. Development concept

In the development phases of this project, mainly two groups of partners were involved: academic partners each with their company partner. In order to transfer industry practices to higher education, company partners brought in all information they could find (in their company) concerning existing courses about lean management and concerning lean games. The academic partners developed and translated 17 course modules and a lean production game. Together with an independent external evaluator, company partners provided the academic partners with constructive feedback on all developed materials. As a result, all deliverables meet high industry quality standards.

### 2.2. Project monitoring

In order to end up with a training programme that meets the high standards for training employees of well-known companies, project progress and output quality were continuously monitored. This monitoring is performed in several ways:

- **Resonance groups:** All five academic partners composed their own resonance group consisting of at least ten people from higher educational institutions and companies. To enhance the relevance and the quality of the project output, at least three times in the project lifetime, these resonance groups gave feedback on materials developed by their academic project partner.
- **External evaluator:** An independent external evaluator (from Amelior management consultants, Belgium) monitored project output quality and project progress. He gave feedback on the published project deliverables, contacted partners who were far behind schedule and coached them to keep pace with the project milestones. His reports have been published on the project website.
- **To-do list published on the website:** In the 'Partners Only' section of the project website, a to-do list has been updated continuously in which is mentioned for every milestone what should have been done by each partner. As soon as the task was done, the web master changed the red X in a green OK button. When an arrow is drawn on the green button, clicking on it activates a link to an output document related to the task. This is represented in Fig. 1.

Home ▶ Meetings / To Do ▶ To Do by international meeting in Rzeszow Poland - June 2010

**Main Menu**

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**Partners Only**

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- ▶ Logout

To Do by international meeting in Rzeszow Poland - June 2010

**Academic Partners**

To Do	BE KaHo SL	PT ISEP	PO RUT	RO UTBv	SE USK
Submit presentation showed during meeting in Skövde	OK	OK	OK	OK	X
Submit interesting materials useful for the development of one or more course modules	OK	↓	OK	OK	OK
Write & publish an article	↓	↓	↓	↓	↓
Put a link on your website	↓	OK	↓	↓	OK
Give feedback on all published course modules	OK	OK	OK	OK	OK
Create a resonance group	↓	↓	↓	X	↓
Organise first national meeting	↓	OK	↓	↓	↓
Organise second national meeting	↓	↓	↓	↓	↓
Submit first course module (01/01/2010)	↓	↓	↓	↓	↓
Submit second course module (01/03/2010)	↓	↓	↓	↓	↓
Submit third course module (01/05/2010)	↓	↓	↓	↓	↓
Give feedback on lean production game	OK	OK	OK	OK	OK


  
 Lifelong Learning Programme

Fig. 1. To-do list in the 'Partners Only' section of the project website

Apart from the above mentioned ways, eight national and four international **project meetings** were scheduled to discuss project progress and output quality among partners.

### 2.3. Innovative didactical concept of the Lean Learning Academies

The training programme can be seen as an innovative didactical concept. Rounds of the lean production game are alternated with short courses on lean topics. The learning cycle starts with the bottom rectangle as represented in Fig. 2:

1. The lean learning programme starts with a first round of the lean production game.
2. After that round, team members compute and measure lean key performance indicators (KPI's).
3. Looking at the indicators, team members formulate what situations, according to them, are problematic.
4. To assist the team in fully understanding the problem and to provide the team with an appropriate improvement tool, the coach teaches the related course module.
5. Afterwards, the team members use this knowledge to find the most appropriate improvement actions.
6. As soon as the whole team agrees on the actions to be taken, they implement them in the lean production game by changing the game setup. Then, the team is ready to play a next round and a next learning cycle can start.

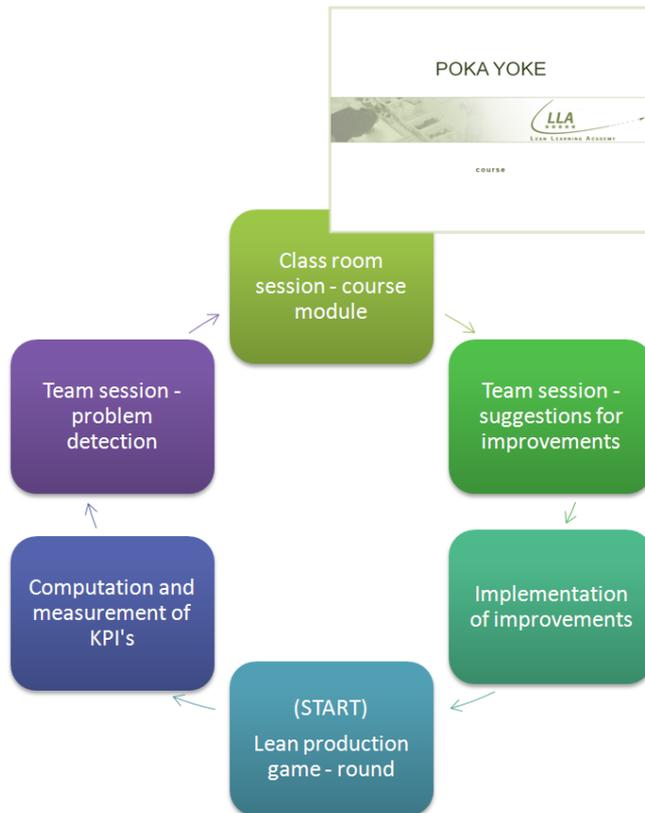


Fig 2. The innovative learning cycle

### 2.3. Deming circle principle:

The work plan is inspired by the Deming circle principle:

**PLAN:** At our first international meeting, the development of 16 course modules about lean management was assigned to the five academic partners. (Later on, one of the modules has been split, resulting in 17 course modules.)

**DO:** By the second international meeting temporary versions of almost all course modules were ready.

**CHECK:** During the second international meeting, the external evaluator and the other partners gave constructive feedback on all temporary versions.

**ACT:** Academic partners updated and finished their course modules in the following two months taking into account the feedback from the external evaluator, from other partners and from their resonance group.

**PLAN:** As soon as courses met the criteria determined by the external evaluator, he labelled them 'approved for translation'.

DO: By the third international meeting, all academic partners should have translated all 16 course modules.

CHECK: The course modules have been reviewed by students and by resonance group members in order to improve translation.

ACT: Courses have been finalised taking into account all feedback from students and resonance group members.

A similar approach has been used for the lean production game.

## **2.4. Dissemination and exploitation strategy**

Although no detailed dissemination and exploitation plan was described in the submitted application form, it was the intention of the whole partnership to broadly disseminate our project results to all target groups. The message we communicated evolved. In the first half of the project we explained to our target user groups “What is this project about and how do we try to assure high quality deliverables?”. To support this message, we developed a project flyer, we printed and distributed the flyer and we published it on the project website. Every partner had access to an editable version just to be able to put the logo of their own university and to add their own contact info. During the second half of the project a new flyer has been developed telling “What are the deliverables of this project and what are potential benefits for the different target groups?”. This flyer will also be distributed among our target groups beyond the project end. Project information has been communicated with all target groups:

- Students have been informed about this project during their lessons, through their university’s digital learning platform and as background information accompanying the invitation to evaluate a course module and the invitation to participate at a try-out session of the lean production game. It is important that they know about the choices they can make in their study program.
- Alumni have been informed using e-mail. We hope they will come back to their university for further training.
- Colleagues and university management board have been informed during formal meetings, informal contacts and through a newsletter. It is important to have their support, today and in the future, for this initiative.
- Other HEI’s have been informed during the project lifetime through an article in EURASHE’s newsletter and will be informed in the near future at several events

organised or supported by EURASHE. For this purpose, 500 new project flyers have been delivered to EURASHE in September 2011.

- Employees and managers have been informed during multiple company visits, fairs, lessons, presentations, networking events, personal contacts,...
- Besides initiatives to contact a specific target user group, a high number of actions have been taken by all partners to tell 'the world' about this project. To name just a few: our project website, a radio broadcast, a number of publications, many presentations at conferences, articles in university newsletters,...

During the project, all academic partners prepared the sustainable integration of their Lean Learning Academy training programme into an engineering curriculum at their university. A lean production game has been set up in a room, assigned to the Lean Learning Academy. For the exploitation of the Lean Learning Academy some partners made a business plan, drew a business process chart, developed a new website and a training program flyer, searched for trainers and engaged them to teach and/or coach parts of the training program. These activities ensure that the start-up of a Lean Learning Academy is well-thought making it a sustainable business. They also allow to organise different training activities about lean management starting in 2012, both for students and for employees/managers/alumni.

## 3. Project Outcomes & Results

At the end of September 2011, all project deliverables were finished, reviewed and approved by the external evaluator. They are published in the public part of the project website:

[www.leanlearningacademy.eu](http://www.leanlearningacademy.eu). Temporary documents and project management documents are put in the 'Partners Only' section.

Following project outcomes and results can be considered:

### 3.1. Course modules: (deliverable)

These are MS PowerPoint presentations illustrated with pictures, diagrams and graphs and mainly intended to support the trainer during classroom sessions about a lean management topic. Many slides include explanations in the textbox below the slide as a help for the trainer and as a study aid for the trainee. We promised to develop at least 15 such modules. At our first international project meeting, the project partners grouped all lean topics into 16 groups and decided to develop 16 corresponding course modules. One of those course modules has been split (into a module Value Stream Mapping and a module FMEA). So now there are 17 course modules. At the end of September 2011, all English versions of course modules were finished, reviewed and approved by the external evaluator and also the translated versions were ready and reviewed.

These final versions of the course modules are published in the public part of the project website:

[Home](#) ▶ [Project Deliverables](#) ▶ [Course modules](#)

### 3.2. Lean Production Game: (deliverable)

During the project, tools and techniques have been developed enabling the application of the lean concepts into a lean production game. The didactical concept is to alternate theoretical sessions with the application of learning into the simulated production. By running different production rounds, the process improvements are leading towards a best-in-class lean production process. After each round, productivity and efficiency metrics are visualized on the team board. These standard metrics and the PC-programme to register and visualise the evolution have been developed in the project.

At the end of August 2010, the lean production game concept had to be elaborated. But, better yet, at our international project meeting at Rzeszow University of Technology (3<sup>rd</sup> & 4<sup>th</sup>

of June 2010), our Polish academic partner already showed a mature version of the lean production game they developed during the months before the meeting. In that game ballpoint pens are assembled. At that meeting, we decided to take that game as the project's lean production game. However, since each academic partner continued to further develop the game to meet a game according to the culture and preferences of his target groups, we ended up with 5 (slightly) different ballpoint pen games, although we promised to develop one game together. This is enriching even more the content of our project, because each partner can learn from the others and apply different games according to the industry needs. The last two meetings turned out to be very interesting for all of us since we all shared our developments and experiences and learned a lot from each other. The accompanying game documents had to be developed by January 2011 but some of them were already on the website before:

[Home](#) ▶ [Partners Only](#) ▶ [Project Deliverables](#) ▶ [Lean Production Game](#)

Now all game documents are translated (and adapted to the own game). A PC-programme to monitor and visualise game progress and results has been added at the end of the project.

These games play an essential role in our Lean Learning Academies: they make it an attractive 'Learning by doing'-training program and they make up a sustainable competitive advantage compared to other lean training programs.

### **3.3. Website:**

From the very beginning of the project, a project website has been developed, as was announced in the project proposal. It contains a public part and a 'Partners Only' part. The public part is aimed at the dissemination of the project info and deliverables to a broad public. The 'Partners Only' section serves as a platform to share project documents with project partners and to remind them what they are expected to do by next meeting. At this moment, the public part of the project website shows all deliverables in 6 languages: English, Dutch, Swedish, Polish, Portuguese and Romanian. At our last international meeting, all partners agreed to further use this website in the future to share exploitation experiences and publish updated versions of documents.

### **3.4. Flyer:**

A first project flyer has been designed and published on the home page of the project website. This flyer presented the Lean Learning Academies project to a wide public. It

contained the aims of this project and indicated how we intended to reach them. It was written in English and allowed all partners to print it and distribute it among interested people. At the end of the project, a new flyer has been developed, explaining the results of this project and indicating the possible benefits for different target groups. At the home page of the website, the first flyer has been replaced by the new one.

### **3.5. Articles:**

During the project's planning horizon, every partner should have written an article and got it published. The project coordinator wrote a conference paper for the IHEPI 2010 conference in Budapest from 6<sup>th</sup> till 8<sup>th</sup> of September 2010 and the Swedish partners published another article where this project is explained briefly, for the ICERI 2011 conference in Madrid 14-16<sup>th</sup> November. Both articles have been published in the conference book and are also published on the homepage of the project website. All other articles from partners are put on the website as well. These articles inform a wide audience about our project.

### **3.6. Network:**

The project created a strong link and multiplied the number of contacts between the local academic partners and the industrial partners in each of the participating countries. The resulting network is an indirect but very valuable outcome of this project. It will be useful to facilitate future co-operation and to further develop the Lean Learning Academy beyond the project end. Indirectly, the incorporation of expertise from the work field into higher education will attract more students because they will learn more relevant and up-to-date content and have more opportunities for placements and employability.

### **3.7. Renewed engineering curriculum:**

The goal of this project is to develop the didactical concepts to educate lean in the engineering curriculum of the academic partners with modular course materials and to develop the tools and techniques enabling the application of the lean concepts in a simulated production environment. At this moment, a number of partners already used some of the developed course modules and already integrated their lean production game into an engineering curriculum. Since curriculum changes, especially changes of the name and the number of study points of course units, have to be approved by university program directors,

it may take another year to further integrate the course modules and the lean production game into the engineering curricula.

### **3.8. Game setup in dedicated rooms:**

To establish the Lean Learning Academies at the academic partners' universities, all academic partners already reserved one or two rooms (depending on the size of the rooms). The rooms provide enough space for the lean production game setup, the classroom sessions and the team corners with visualisations, performance measurements, team management tools, follow-up instruments and communications. This set-up creates a factory floor experience in a HEI and augments the realism and relevance of the training course content. At some academic partners, the rooms will not exclusively be used by their Lean Learning Academy. For efficiency reasons, they will also be used for other lectures. All partners already installed their lean production game in a dedicated room. The Polish, Belgian and Portuguese partner already installed their lean production game in an assigned room. The Swedish and Romanian partner developed a portable game that can be played in any room with tables and chairs so the room is not going to be an obstacle to play the game, with the aim of giving more flexibility in case of the industry needs to have the education within their companies.

### **3.9. Method of creating a lean production game**

Before starting with this project, we had no or very little expertise in developing a lean production game. We didn't know where to start and we had to learn from existing serious games. For our game, it was important to find a cheap product (we needed about 300 pieces), easy to assemble and disassemble (to save working hours), with many parts (to allow assembly line balancing), with opportunities for error-proofing, etc. Since most partners would like to extend the activities of their Lean Learning Academy to other sectors than manufacturing industry, they will benefit from this experience in the near future. When we give presentations about our Lean Learning Academy, we also focus on the efforts we put to create such a game.

## 4. Partnerships

To develop an innovative training programme, a collaboration has been established between lean experts from five EU-universities, each supported by a company with a lot of expertise in lean management as represented in Fig. 3. This partnership assures a didactically well thought training programme with relevant and authentic content. Indeed, the company partners contribute to the project by providing the academic partners with their expertise (at the start and now, during the exploitation phase) and e.g. with authentic cases; the academic partners use this expertise to develop the training programme. EURASHE (European Association of Institutions in Higher Education) is added as additional partner to help disseminate the project results to its wide member network of HEI's.

	<i>Academic partners</i>	<i>Company partners</i>
Belgium 	Katholieke Hogeschool Sint-Lieven 	Volvo Cars Gent 
Poland 	Rzeszow University of Technology 	PRZEMOT H.T.P. Chmiel s.j. 
Portugal 	isep Instituto Superior de Engenharia do Porto 	Associação Comunidade Lean Thinking 
Romania 	Transilvania University of Brasov 	Siemens PSE 
Sweden 	HÖGSKOLAN SKÖVDE 	Volvo Powertrain AB 
European Association of Institutions in Higher Education 		

Fig. 3. Logo's of universities and companies involved in the project

All academic partners have professors involved in this project which are lean experts. At KaHo Sint-Lieven university college a lean production game (production of polystyrene trucks) is already in use in the engineering curriculum. Högskolan Skövde developed a lean production game in which real go-carts are assembled. Volvo and Siemens both are very

experienced in lean management while Przemot is just starting to implement lean management. Associação Comunidade Lean Thinking has been involved in many high level training and consulting activities in public and private organisations and they developed new lean solutions for the service sector.

#### **4.1. Added value:**

The added value of this multi-country partnership lies in several aspects:

- All partners have specific expertise. When they are brought together, this opens opportunities to learn from each other but also to develop course modules with rich course content and with an international dimension (authentic cases from different countries). Some partners focused on e-learning capabilities (ISEP, Porto), others on computer simulations (USK, Skövde), others on attractive PowerPoint presentations. We also visited interesting lean factories in different countries.
- Thanks to the European partnership, our project output is available in 6 European languages: English, Dutch, Swedish, Polish, Portuguese and Romanian. This makes it easier for many other European companies and HEI's to learn from our work.
- Thanks to the European partnership, the results of this project will quickly become geographically spread all over Europe. As a result, more companies can benefit from our project deliverables.
- To boost the dissemination of our project results, EURASHE is added as extra partner. Through their widespread network of higher educational institutions, it is convenient to distribute project results. As a consequence, more HEI's all over Europe will consider adopting our innovative working method of game rounds alternated with short courses.
- The European collaboration gives more power to the project and his results when we talk about it. It makes our results and our communication stronger. Indeed, all outcomes of this project have been checked by lean experts from 5 European countries.

#### **4.2. Our experiences:**

During the two years of intense collaboration to develop course modules and a lean production game, we felt no competition between partners. On the contrary, partners spontaneously exchanged materials they carefully developed just to help each other.

We also felt that all partners were enthusiastic about the project aims and definitely wanted to attain high quality project output because they each wanted to introduce the Lean Learning Academy into their engineering curriculum. We all felt responsible for the project and we pushed each other to achieve good results.

#### **4.3. Benefits of indirect partnerships:**

Besides the 5 academic partners, the 5 company partners and EURASHE, in this project two partnerships with groups outside of the direct project/consortium have been established: partnerships with students and with resonance groups.

Students:

As soon as the course modules and the lean production game documents have been translated, students were asked to review the course modules and to test the lean production game and the concept of alternating rounds of the lean production game with lectures on a lean topic. Their feedback has been used in the last phase of this project to finalise the project deliverables.

Resonance group:

At least 3 times in this project's life time, each partner organised a meeting with his resonance group. In each resonance group, at least 10 experts formulated feedback on the project deliverables in order to improve the content, the working methods and the didactical value. The experts were lean experts from companies, professors (from other universities) teaching lean management topics and experts from the educational world.

The involvement of both groups, students and resonance group members, also guaranteed that the project deliverables satisfy at least the expectations of the local target groups.

## 5. Plans for the Future

Now that the project has ended, each academic partner has started to sustainably integrate the Lean Learning Academy into his engineering curriculum. Since curriculum changes, especially changes of the name and the number of study points of course units, have to be approved by university program directors, it may take another year to further integrate the course modules and the lean production game.

From now on, the training programme becomes also open for employees/managers from companies and the Lean Learning Academies will start a life of providing training, getting feedback, adding new lean topics, improving course modules,... and the website will continuously be updated accordingly. This process will push the trainers to keep up with the latest evolutions and implementations of lean concepts. This guarantees that the lean course modules will continuously be updated making it a high quality course in the curriculum.

This project is the start of a new cooperation between enterprises and academic institutions. At the meeting in Rzeszow and at all meetings afterwards, the partnership expressed the will to further cooperate in a sequel to this project (e.g. Lean management in higher education, lean in the service sector, expanding the Lean Learning Academies with Six Sigma tools, human error,...). In any case, the current project website will allow to make further developed and updated modules available to the world.

Already now that our exploitation has started, the academic partners get a lot of opportunities to further disseminate the project results and present their Lean Learning Academy. For the Belgian partner alone, there will be following activities:

- 3<sup>rd</sup> of December 2011: during half a day, a shortened version of our lean production game will be played with 15 people participating at JCI Soft Skills Training Day at KAHO Sint-Lieven. All (probably more than 100) participants will receive our flyer. JCI is a chamber of young entrepreneurs (less than 40 years old).
- 8<sup>th</sup> of December 2011: a one-hour presentation in English of our project and the resulting Lean Learning Academy for 25 to 30 members of the international CCMLL-Tempus project with Bosnia-Herzegovina.

- 10<sup>th</sup> and 16<sup>th</sup> of December 2011: our Lean Learning Academy has agreed to give 2x 3 hours of courses about lean management at Brugge Business School.
- By December 2011: VOKA, chamber of commerce, asked us to write an article for their monthly magazine about our Lean Learning Academy and how lean can benefit all kind of organisations. That magazine will be distributed among their approximately 17000 members, all companies!

For the Swedish partner:

- 14-16<sup>th</sup> of November 2011, an article that explains briefly this project has been presented in the International Conference on Education, Research and Innovation (ICERI) held in Madrid. More than 600 participants from more than 75 countries attended the Conference.
- Different course modules developed during this project have been integrated into courses in Automation engineering curricula. The students are learning during this autumn 2011 semester concepts about lean that have been developed during this project.
- The Swedish partner is going to participate actively to continuously update the outcomes of this project. Nowadays, the course modules developed in the beginning of the project are being revised and are going to be improved in order to have a better material. These improved modules are going to be shared with all the partners of this project.

The presence of a LLA at the academic partner and the obtained expertise by the trainers might also be the start of a process of implementing lean concepts in the quality management of the academic partners. Therefore, all academic partners informed their quality manager about this project and gave him/her a project flyer.

## 6. Contribution to EU policies

- The Lean Learning Academy 's training program helps to create a strong European industrial base (i.e. **growth objective** of Lisbon strategy). The target groups for the training program are both students/alumni and employees/managers. After having followed this training they should be well prepared to manage improvement projects in industry, making their companies more competitive and resulting in more growth.
- The Lisbon strategy also aims at **more and better quality jobs**. Well, companies that let their employees and managers follow the Lean Learning Academy's training program invest in their human capital by improving the lean education level and lean mindset of their employees/managers. For students and alumni, this training program also enhances their employability.
- The deliverables of this Lean Learning Academies project, 17 course modules and a lean production game, are the result of an intense cooperation mainly between lean experts from 5 European universities and 5 European lean companies. In all 5 European universities, this training program will be part of an engineering curriculum. All documents include the project logo and the logo of the Executive Agency, **promoting the European dimension in higher education** (Bologna objective). Furthermore, the project website is an important show window for this project, visible and accessible from all over the world.
- This project especially contributes to the Prague declaration which added 3 key themes to the Bologna Process:
  - **Lifelong learning**: although the main deliverables of this project will be incorporated into an engineering curriculum, it also serves as a further training for employees/managers and in this way contributes to their lifelong learning. Moreover, all course modules are available in the public part of the project website, allowing all visitors to learn about lean production at any time and anywhere in the world.
  - **Involvement of students**: the Lean Learning training program requires active involvement of participants: In the lean production game they all together assemble ballpoint pens; after each round they measure key performance indicators, conclude what goes wrong and agree on what aspects need to improve. To better understand the issue, they follow an intensive course on one lean topic. Afterwards, they implement what they have learned by changing the set-up of the simulation game and preparing their team for a next round.
  - **Attractiveness and competitiveness of the European Higher Education Area to other parts of the world**: The lean management training program

meets high quality standards thanks to the incorporated feedback from students, from experts in the resonance groups, from a professional external evaluator and of course from the experienced partners themselves. The ongoing feedback leads to more relevant and frequently updated course content and didactically improved training sessions. It is a flexible course because it allows class room learning as well as e-learning and focused short running courses as well as broader long running training programs. All these aspects make it an attractive training program, not only for our own students but also for students coming from abroad e.g. with an Erasmus student exchange program.

- This Lean Learning Academies training program contributes to the development of curricula and to fostering of methods that **promote the learning of competencies and skills that are needed in tomorrow's economy** (Bologna Beyond 2010).
- This ideal mix of educational and professional partners in this project aims at **upgrading skills and promoting employability** and at matching skills of higher education to labour market needs (cfr. Communication from the Commission, SEC-2008-3058).

## 7. References

- Dobson, G., Shumsky, R. 2007. Web-based simulations for teaching queuing, Little's law, and inventory management. *INFORMS Transactions on Education* 7 (1): 106-124. Available online at <http://ite.pubs.informs.org/>.
- Tinham, B., 2005. How to make your supply chain lean. *Manufacturing Computer Solutions* 11 (3): 4-7
- Wood, N. 2004. Lean thinking: what it is and what it isn't, *Management Services* Volume 48 (2): 8-10
- Yazici, H.J., 2006. Simulation modelling of a facility layout in operations management classes, *Simulation and Gaming* 37 (1): 73 - 87

