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LeanPPD: Lean Product and Process Development
7th Framework EU project (2009-2013)
www.leanppd.eu

Points of Interest:

- Introduce the LeanPPD project
- Introduce the LeanPPD working model
- Present initial results of the LeanPPD project
- Introduce LeanPPD learning and serious game models
- LeanPPD 2011 Calendar
- LeanPPD 2011 academic publications

Inside this issue:

What is the LeanPPD project?

The LeanPPD project is a 7.8 ML€ EU funded programme, involving twelve European academic and industrial partners. It addresses the need of European manufacturing companies for a new, agile, competitive, innovative and sustainable business model. In the global competition, European companies might be able to serve their customers better than ever by providing value-added, knowledge-intensive and highly customized product and service solutions in a shorter time span.

Lean manufacturing has already spread out its benefits, and the competitive advantages that can be gained through its implementation is descending. Now it is time to ensure the transformation of the whole enterprise into a lean environment, in order to respond to customers and market demands for value creation, incorporating sustainability, culture and customization. LeanPPD urges that a significant change in enterprise performance can come from the adoption of lean thinking throughout the entire product lifecycle.

Lean thinking supports companies in the elimination of wastes that exist in the product lifecycle, starting from the development phase (e.g. inefficient communication between team members), as well as wastes in the end product (e.g. scrap due to poor design).

The LeanPPD consortium is working to go beyond the identification and reduction of wastes in product development. It supports value creation of new, affordable and sustainable products, that can foster quality, innovation and customization. This is what the Lean Product and Process Development (LeanPPD) project strives to achieve.

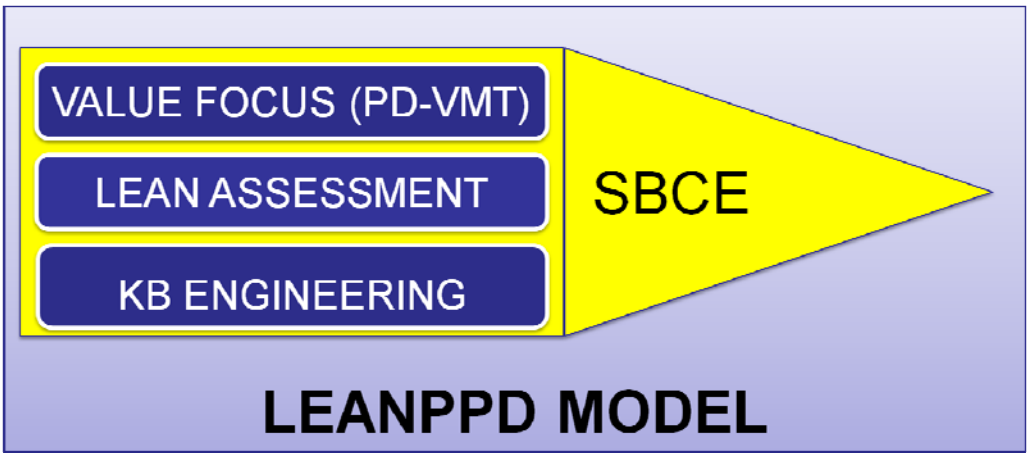
The LeanPPD Community

The LeanPPD working model

To achieve the objectives of the project the consortium agreed on several main enablers of a LeanPPD model. The working model centralizes on the concept of Set Based Concurrent Engineering (SBCE). This product development process model can revolutionize the traditional point based engineering model many European companies are using to develop new products. SBCE enables maximum value and eliminates design rework starting from early in a design process. To support SBCE the LeanPPD model incorporates three other tools: (1) A Product Development Value Mapping Tool (PD-VMT), with particular focuses on value creation and waste elimination in product development; (2) Knowledge Based Engineering (KBE); and (3) a Set Based Lean Design Tool (SBLDT). Furthermore, a Product Development Process lean assessment tool, called SMART Lean-T² readiness tool has been developed and validated within the project.

This issue of the LeanPPD Newsletter presents a selection of the initial results of the project.

"Lean Product and Process Development: A waste minimization, a value creation design process in a learning and continuous improvement fashion. The new paradigm for European competitive frontier"



The LeanPPD Set Based Concurrent Engineering (SBCE)

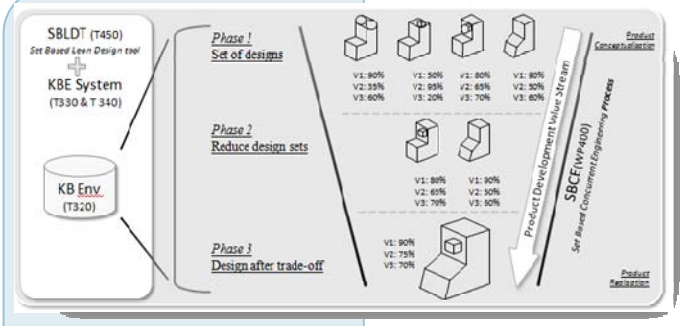
In order to establish Lean product and process development, the Toyota way of product development (PD) will be used as the foundation. Toyota PD focuses on three central elements: value, knowledge (or learning) and improvement.

The LeanPPD community believes that such focus has enabled Toyota to please customers through optimal designs and minimal design rework. In order to achieve this they developed a process that is referred to as Set Based Concurrent Engineering (SBCE). However, there is no formal published methodology of this process or how to execute it in practice.

In this project the SBCE model has been taken as a fundamental model to be explored in detail with practical implementation within the industrial partners. The research activities involved in this model are:

- Customer value research
- Mapping design space
- Concept sets development
- Pre-production planning
- Design concept convergence
- Detail design and production launching

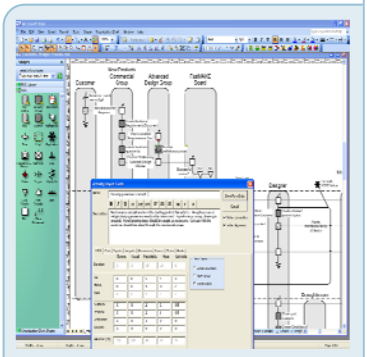
In each phase of the research practical methods, tools and guidelines will be developed to support the execution of SBCE. These tools will be developed with the application of industrial partners' business cases. The SBCE model will also contain a Set Based Lean Design Tool (SBLDT) developed to help designers to translate and product customer values within their designs.



SBCE model
From design concepts generation to convergence to an optimal design

The SBCE model can be used by other European companies to excel in PD by creating value in their products in a short period of time, and at the same time compete in the global market. Through dissemination activities the LeanPPD SBCE model is planned to be spanned to SMEs across Europe.

The LeanPPD Product Development Value Mapping Tool (PD-VMT)



PD-VMT application tool

There are many phases within product development, most of which generate vast amounts of data. This can result in data disconnect points causing delays, added cost and general frustration to the team. The use of an integrated tool to support all of these phases e.g. CAD/CAM or KBE removes this disconnect and thus levels the flow of information. The same level of disconnect between process improvement tools, such as Business Process Management, Value Network Diagrams, etc., also exists. However, there is no single tool to encompass all of these elements of process improvement. Thus, the objectives of the PD-VMT are to develop tools and approaches for value creation, waste elimination and product life-cycle based cost optimization within product design and development.

The model consists of three layers of information: (1) a data model (ontology) containing known entities of waste and value; (2) standard data in order to minimize data re-entry; and (3) Adapted data based on company data gathering. From these three levels of data companies will be able to generate a personalized process analysis improvement plan.

Since the methodology will be validated within Business Cases it will benefit other industrial sectors outside the LeanPPD consortium. In particular, for European SMEs this method will be easy to adopt.

The LeanPPD Knowledge Based Engineering (KBE)

Design is a knowledge intensive process where new materials, technologies and design features are constantly evolving and being created to meet the ever changing customer requirements. Such knowledge that has been created should be identified, captured, and reused for future design projects in the LeanPPD model.

The LeanPPD KBE model primarily aims to perform the structuring, sharing and reusing of design knowledge created within engineering function, across engineering functions and between difference departments (e.g. between design and manufacturing function). The KBE model provides the following as outputs:

1)LeanKLC (lean knowledge lifecycle): a methodology to systematically capture, re-use and create Knowledge in PD along with its software demo (called KBE demo).

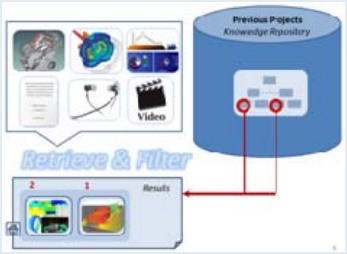
2) A3 methodological approach: that helps to represent the provision of created knowledge and aid the generation of future lean product design. This can be done through identifying problems, measuring, and generating potential solutions in a continuous learning process mode using the so called A3 problem solving approach.

In general, the KBE model of LeanPPD has five requirements to fulfill:

1. Bring together relevant previous projects in order for the designers to initiate a new set of designs.
2. Enable a search function in order to locate and retrieve the most relevant project information.
3. Provide a function to visualize knowledge required to support engineering decision taking.
4. Provide a mechanism to dynamically capture the knowledge created by engineers throughout the product development process.
5. Provide a function to recall the key lessons learnt at the various stages of the product development process .

Companies that can effectively utilize the previous knowledge can radically reduce the time to market and improve the innovation level, and KBE supports this leverage.

The model will be tested in industrial case studies and can be disseminated to European SMEs.



KBE model for retrieving and filtering previous projects' knowledge to be reused for generating set of design options to support SBCE

LeanPPD Transformation Toolkit (lean t²)

Lean thinking and its applications have always been a continuous improvement effort. Lean product and development needs a continuous tracking of PD performances to enable companies to lead their journey to LeanPPD.

The LeanPPD Self Assessment and Transformation Tool provides a ready made platform to assess the maturity level of companies in the application of product design and development lean thinking. Lean t² incorporates qualitative and quantitative metrics of lean practices, and companies can use it to measure their leanness and can map where they stand in the lean journey.

The tool uses a five step change process to help partner companies identify their "AS-IS" state and define "TO-BE" state.

Quantitative and qualitative key performance indicators (KPIs) have been developed to create the proposed 5 levels of the LeanPPD Self-Assessment Tool, with acronym SMART (Start, Motivate, Apply, Review, Transform). This tool is based on the balanced scorecard model. Further, the tool proposes anonymous benchmarking method that companies can use to compare their performances with other similar industries.

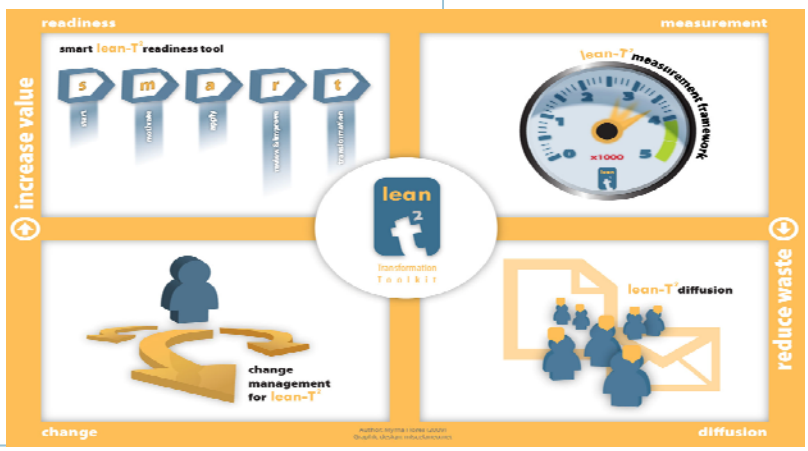
The five levels of the LeanPPD journey are:1) level 1(**S**tart) "No Lean Thinking with some awareness"; 2) level 2 (**M**otivate) "Getting Started"; 3) level 3 (**A**pply) "Basic LeanPPD implementation"; 4) level 4 (**R**eview) "LeanPPD Continuously Measured & Improved" 5) level 5 (**T**ransformed) "LeanPPD Best Practices Identified and Shared (internally/externally)". In the first step of the assessment some qualitative lean practices are used to ask and map partners companies across the different levels.

The lean practices have been clustered in four major perspectives: cost and time, new product development process, tools and multi-skilled people.

The second part of the assessment consists quantitative KPI's to measure the four perspectives. Companies can select any measures that make more sense to their application from the list of measures given in a library. Therefore, using both qualitative and quantitative assessment it will be possible to map the current and future states of the leanness of a new product development process.

The tool is already available in web-based form for easy usage by the Industrial partners.

Self Assessment and Transformation Tool main elements



Inside the LeanPPD Transformation Toolkit (lean t²)

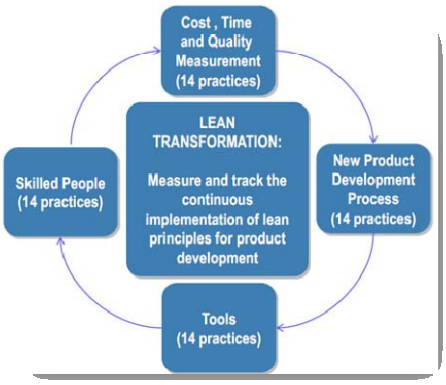
Web-based version of the LeanPPD self-assessment tool. Measure your leanness in product development and compare with other industries.

"Continuous improvement is not about the things you do well - that's work. Continuous improvement is about removing the things that get in the way of your work. The headaches, the things that slow you down, that's what continuous improvement is all about"
Bruce Hamilton

The LeanPPD self-assessment tool has four perspectives to measure. Inside these perspectives there are 14 best practices that a company needs to become lean in new product development. However, the measurement is done at five levels of maturity that enable to map the as-is status of a company.

Each perspectives contains 14 practices in terms of guided questions to be answered.

The questions can be asked at three team levels: individual level, group level, and organizational level. By carrying out the assessment at different levels it is possible to identify agreements and differences of opinion in the answers given to the practices.



The four perspectives of the self-assessment tool.

The tool has been tested in most industrial partners of LeanPPD Project: Indesit, a household appliance manufacturer in Italy; Visteon, an automotive supplier based in UK; Rolls-Royce, an aerospace industry in UK; and Volkswagen (VW), a German automotive company. The feedback gained from the validation makes the tool more robust and applicable to other European manufacturers to assess their product development leanness and can find out improvement potentials to excel in new product development performances. The LeanPPD community believes that such a tool can easily be transferred to SMEs, so that best practices from larger companies can be applied outside the LeanPPD consortium. And, the consortium is also carrying out dissemination activities of the tool by working with regional communities that can validate the tool in their local industries.

Assessment using the Transformation Toolkit (lean t²)

S =**S**tart
M=**M**otivate
A=**A**pply
R=**R**eview
T=**T**ransformed

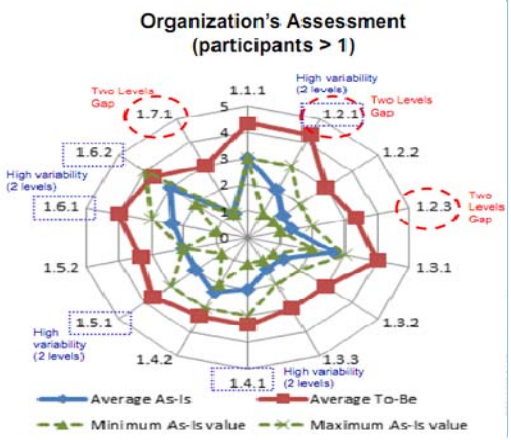
The SMART self assessment tool gives a simple numerical value that aggregates the performance of different perspectives and places it into a spider chart.

By using a web-based platform (connected with a database), companies can easily use the tool to assess their PD performance in a given period and also track their improvement. The tool provides a report of the maturity level given to each practice, highlighting the practices in which the company should focus its improvement efforts.

Furthermore, the validation of the tool in different companies will enable the continuous improvement of the tool's content and the report that it generates.

Group Self-Assessment Panel

Lean Practice Number	Practice Description
1.1.1	The Product Development Department aligns effectively its metrics to the company's strategic objectives and measures them periodically to implement improvement actions.
1.2.1	Metrics are defined to measure cost reduction in New Product Development (NPD) projects.
1.2.2	The company measures the cost reductions achieved in New Product Development (NPD) projects.
1.2.3	The company communicates cost reductions achieved in product development projects using automated and standard reports.
1.3.1	Metrics are defined to measure lead time reduction in New Product Development (NPD) projects.
1.3.2	The company measures the lead time reductions achieved in the New Product Development (NPD) projects.
1.3.3	The company communicates lead time reductions achieved in product development projects using automated and standard reports.
1.4.1	Continuous improvement initiatives are defined and carried out to reduce cost in the new product development projects.
1.4.2	Necessary resources are available to enable continuous improvement in the product development process to reduce cost.
1.5.1	Continuous improvement initiatives are defined and carried out to reduce lead times in new product development projects.
1.5.2	Necessary resources are available to enable continuous improvement in the product development process to reduce lead time.
1.6.1	Product quality measures are used to track NPD projects' performance and define improvement initiatives.
1.6.2	Product prototypes conform to design specifications.
1.7.1	The company has an effective portfolio management system based on a funneling approach that results in high value projects and high productivity.



A Learning Kit for LeanPPD implementation

The concept of lean in production is now evident in industries. The eight production waste as defined by Taiichi Ohno are something any manager can tangibly see.

However, wastes in product design and development process are not as easy to identify or to ascribe as waste. Neither it is easy to maximize customer value in product development. At the initial fuzzy front end of NPD considering alternatives, as predicated in a set based approach, could be considered waste. However, considering such alternatives may well enhance customer value. It is necessary at some point to constrain the engineers, who being knowledge workers think that whatever they do is for the better of the new product they are developing and for the better of the company. Studies show that 80% of engineers time is wasted on non-value adding activities. Wrong understanding of customer value, unnecessary meetings, waiting for information, receiving and giving wrong information, and unutilized knowledge are some of the many wastes in PD.

Wastes in PD are specific in different industries and generalizing might not work to create a panacea method to eliminate these types of wastes. In the project, some learning methods and games are under development to help designers and project managers to reflect to themselves and find out wasteful design activities that affect performances. At the same time, using the learning kit participants will be able to introduce with the LeanPPD tools and methodologies.

The LeanPPD learning kit has four modules:

1. Learning MyWaste
2. NPD (new product development) simulations
3. SBCE game
4. Value and waste game.

Apart from the above four learning games, other means will be used for LeanPPD training purpose such as: software demos, documents, slides, CDs, case studies, and so on.

A Learning Kit for LeanPPD Implementation

Elements of the LeanPPD Learning Kit

1.Learning MyWaste

The first learning module under development is MyWaste. This is a simple method that offers designers and project managers an opportunity to reflect on the possible non-value adding wastes in their day to day design works. Moreover, the method offers the possibility to find improvement potentials to eliminate waste.

2. NPD Simulations

The second part of the learning module is NPD simulations. This system dynamics based learning game allows players to understand casual relationships between process variables characterizing the NPD process and performances. Participants can play with process variables and understand the impact of different decisions on time to market and cost.

3. SBCE Game

This game will allow players to understand the basics of the LeanPPD model. This game enables players to understand how keeping alternative design solutions can help designers to tackle future technical and market uncertainties.

4. Value & Waste Game

This game is divided into two scenarios. In the first scenario players will do traditional product design of a simple airplane. Then in the second scenario, players will be guided to incorporate lean techniques to improve the PD performances they gained in the first scenario. So that, they can appreciate the application of LeanPPD tools to improve product development performances.

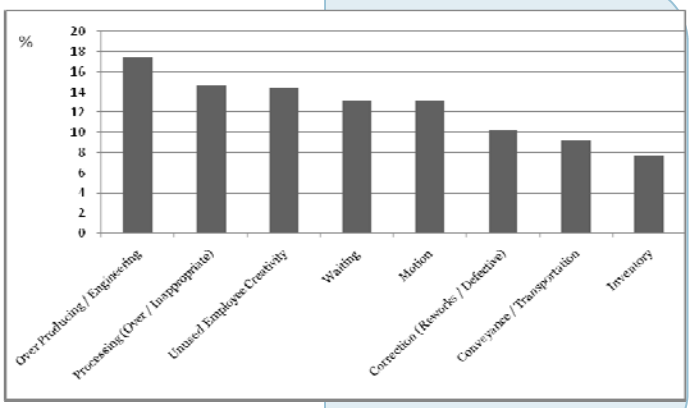
The definition of wastes in PD depend on company specific interpretation , and MyWaste is a tool that allows designers and managers to brainstorm critical wastes in PD and search for process improvements.

MyWaste: A self learning method to identify PD wastes and accelerate improvements

Learning MyWaste is part of the learning games that are under development. It has already been played by eight manufacturing companies in Italy. The game was developed based on the prevalent method of FMEA (Failure Mode and Effects Analysis). It lists a significant number of wastes that exist in the design process. Designers can add their own specific waste if they think it is not listed. Then, individual designers and managers fill the probability, severity, detection, and avoidability of each waste. For each waste, a priority index of intervention (PII) can be calculated. This allows participants to brainstorm the main wastes affecting their performances and search for improvements.

The waste library found in literature is included, nevertheless companies are constantly adding their own interpretation and definition according to their experiences.

A full report of the methodology and the industrial practices is presented at ICE2011 conference in Aachen, Germany. It is also presented at the GaLA (IFIP) serious game workshop in Espoo, Finland.



PD wastes and PII for a specific company

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LeanPPD 2011 Calendar

- 5-7th April 2011: LeanPPD 5th General Assembly Meeting, Bremen, Germany.
- 22nd September 2011: The1st Industrial LeanPPD workshop organized at Cranfield University, UK (http://www.cranfield.ac.uk/sas/aboutus/events page52747.html).
- 29-29th September 2011: LeanPPD 6th General Assembly Meeting, Fabriano, Italy.
- January 2011: LeanPPD 5th Community Workshop, Dell'Orto, Italy.
- March 2011: LeanPPD 6th Community Workshop, Milan, Italy.
- SMAU workshop has been held in Bari, Rome, Padova, and Bologna (Italy) in 2011 under the title - Laboratorio di Miglioramento ed Innovazione della Progettazione, and LeanPPD concepts has been introduced by Polimi teams.
- Please visit the LeanPPD website to see more upcoming events.

LeanPPD 2011 Publications

- Kerga E., Taisch M, Terzi S. "Lean Decisions Making for Sustainable Product Lifecycle Management", PALM2011 doctoral workshop (May 9-11), Ardèche, France.
- Rossi M., Kerga E. Tasich M. Terzi S. "Lean product development: fact finding research in Italy", IESM 2011 conference (May 25-27), Metz, France.
- Rossi M., Kerga E. Tasich M. Terzi S. "Lean Product and Process Development: a Learning Kit" at GaLA + IFIP : Co-Designing Serious Games Workshop 2011 (June 5-7), Espoo, Finland.
- Rossi M., Kerga E. Tasich M. Terzi S. "Proposal of a method to systematically identify wastes in new product development process", ICE2011 conference (20-22 June), Aachen, Germany.
- M. Flores, A. Cabello, L. Torredemer, M. Agrawal, J. Keast, S. Terzi and A.Sopelana. "Do enterprises implement a Process Architecture towards Lean in Product Development? A comparative study among large and small firms", ICE2011 conference (20-22 June), Aachen, Germany.
- Khan M., Al-Ashaab A., Doultsinou A., Shehab E., Ewers P., Sulowski R. "Set-Based Concurrent Engineering process within the LeanPPD environment", CE2011 conference (4-8 July 2011), MIT Boston, USA.
- Kerga E., Taisch M, Terzi S. "Integration of sustainability in NPD process: Italian Experiences " PLM2011 conference (July 11-13) Eindhoven, Netherland.
- Khan M., Al-Ashaab A., Shehab E., Sorli M., Sopelana A., and Ewers P. (2011) "Towards Lean Product and Process Development", International Journal of Computer Integrated Manufacturing, Accepted.
- Furian R., Grote K.-H. „Anforderungen an eine wissensbasierte Softwareumgebung im Konstruktionsprozess", Tagungsband zum 9. Gemeinsamen Kolloquium Konstruktionstechnik (6-7 October 2011), Rostock, Germany.

LeanPPD

SEVENTH FRAMEWORK PROGRAMME

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