Since a few years back there is a new buzz word for R&D managers: “Lean R&D”. Managers in the forefront may already have read the books, and done their assessment of the methodologies. For the majority remaining, however, this newsletter will give you a quick glance at what it is, the potential gains, and a path towards adopting Lean R&D. We also have an exclusive interview with one of the most experienced consultants in the area, Triathlon Senior Associate Håkan Swan.

We can however give you the aim of Lean R&D right away, and in true Japanese fashion it’s as evident as it is hard to reach: “Knowledge driven R&D operations to create true sustainable competitive advantage”.

Benchmark cases show the vast improvement potential of Lean R&D, such as reduced quality problems and substantial decrease of time-to-market. Lean R&D focuses on building capability to bridge knowledge gaps in early phases to achieve predictable projects that deliver quality with outstanding time-to-market. Leading experts foresee that Lean R&D will transform Product Development as profoundly as Lean Manufacturing has changed production during the last 20 years. As with Lean Manufacturing, early and successful adopters will gain a long-term competitive advantage.

Most companies struggle with repeated difficulties to meet planned time-to-market for new products. Once products eventually are launched, the quality problems often hurt sales and risks undermining the brand value.

The cause of this is often to be found in unplanned late loop-backs in R&D projects. There are two types of loop-backs. First there are the planned iterations every product development project goes through. The product “evolves” with each new iteration. These iterations are necessary.

However, there are also unplanned loop-backs. An example of this is when the concept you have chosen, and worked on for some time, does not turn out to be a viable solution. You need to go back and redo your work. These late loop-backs cost money, development time, and resources. The later you realize a problem, the more expensive the loop-backs will be.

To meet critical lead-time targets products are in this situation most often pushed to market launch despite not being finalized. This is the main source of quality and warranty problems for customers.

Symptoms of poor performance
Organizations experiencing quality, lead-time or cost problems often share common symptoms:

- Poor re-usability between projects
- Incentive structures and culture not focused on knowledge growth
- Specifications and concepts frozen early
- High technical risk levels late in projects
- Unpredictability in project portfolio
- Command and control cultures

These symptoms are often recognized, but attacked with point initiatives failing to address the fundamental flaws in conventional product development.

Lean R&D practitioners have accepted this problem, understood its source and set up a systematic way to avoid unplanned loop-backs. This leads to reductions in development lead-time and cost, increasing product quality and performance, which will free up time and money to be innovative.

![Figure 1. Increasing cost of product changes](image_url)
Product Value Stream – delivery of new products
The Product Value Stream results in new products and/or services. The Lean R&D organization starts with broad targets. It does not specify one solution at the beginning of the project, but investigates different concepts, eliminating one at a time through set-based engineering. Decisions are taken as late as possible to avoid continuing with non-tested solutions. However, without the Knowledge Value Stream the learning’s in the projects will be wasted.

Knowledge Value Stream – capturing and re-use of knowledge
The purpose of building knowledge is to continuously drive the organization’s ability to push the technical boundaries and understand customer needs without excessive risk in projects. The Lean R&D organization puts a strong emphasis on creating and re-using knowledge. The Knowledge Value Stream captures, generalizes, standardizes and re-uses knowledge about customers, products, technologies and processes. Continuous improvement systems, and tools like A3 reports and PDCA-cycles are commonly used tools.

The two phases of development
1. Concept phase – the fuzzy front end made less fuzzy
During the concept phase of development there are a lot of uncertainties regarding what the final product will look like. The main focus is to identify and bridge all knowledge gaps and test all concepts to reduce the technical risks to a minimum in the execution phase. This establishes a functioning final solution even before detailed design starts. Where traditional development usually push testing to the final phases of the project, making the technical risks substantial and expensive loop-backs unavoidable, the Lean R&D organization involves a lot of early testing to concurrently explore different concepts and solutions.

First when the major knowledge gaps are known and solutions proven, the project is allowed to continue into the execution phase and detailed design. This assures that unplanned loop-backs are minimized by validating the final solution early. This phase has unique characteristics for R&D compared to Manufacturing.

2. Execution phase – development factory made predictable
The execution phase of the project share characteristics with Lean manufacturing. If the focus during the concept phase is on the product and technology, the focus for the execution phase is more on standardized process and proven ways of working. Therefore, efficient execution is achieved through standardized best practice processes, visual planning and management. The knowledge flow is still important in this phase as problems are not only solved but also eliminated from occurring again by transferring solutions to best practice and the technology knowledge base.

Lean manufacturing vs. R&D environment

<table>
<thead>
<tr>
<th>Manufacturing</th>
<th>R&amp;D</th>
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<tbody>
<tr>
<td>Repetitive</td>
<td>Non-repetitive</td>
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<tr>
<td>Environment is fixed</td>
<td>Changing environment</td>
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<tr>
<td>Producing physical objects</td>
<td>Producing information and knowledge</td>
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<tr>
<td>Risk-taking is always bad</td>
<td>Dependent on rational risk-taking to be innovative</td>
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<tr>
<td>Valuable even though performed millions times</td>
<td>Not valuable if performed twice</td>
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<td>Need to constantly redefine what is good enough</td>
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Lean Leadership – MEANS, NOT RESULTS

Lean consists of a set of philosophies, principles and methods, that are included in the company’s system and processes. The implementation of Lean does NOT mean a set of methods, rather aims at creating a sustainable system where principles and methods yield results over time. This puts different and higher demands on Leadership. So what characterizes Lean Leadership?

The Lean Leader acts as a coach
Her role is to support and develop her team members, not to control them. Coaching, with focus on learning as individuals and as an organization is done through providing the questions to address problems, rather than solutions.

It is a more humble approach that comes from the recognition that the organization is best supported by growing knowledge and capabilities. It demands that leaders show an interest in and understand products, processes and customers. How else can the leader support problem solving, improve processes and encourage co-workers to become more skilled and knowledgeable?

Lean Leadership is characterized by focusing on means and not results
Management by Means focuses on the way of working. The underlying belief is that desired result will come when the right methods are applied. Managers ask for, and develop, ways of working rather than focus solely on results. The organization is steered through the consistent application of agreed ways of working. Results are tracked continuously to make sure that the chosen methods bring the desired results. Achieved results will therefore be sustainable. The opposite, management by results is characterized by focusing on measurable results. It can be condensed to “Do it however you want to as long as the right result is achieved!”. The problem with the approach is that results seldom can be sustained if new knowledge and way of working is not established and standardized.

A consequence of Lean leadership will be a shift in how the organization functions, from management giving answers to management helping engineers to learn.

Learning based on common principles and values drives organizational alignment without command and control. It allows increased flexibility with maximum control. Flexibility through the responsibility of each individual to think and take initiatives, control through responsibility and understanding.

Triathlon’s Lean R&D expert Häkan Swan has worked with lean initiatives since 1994. He has a long track-record of successful lean transformations, and has been educating managers in lean principles through the CHAMPS programs at Chalmers University of Technology.

What are the current trends within Lean R&D in the Nordic Region?
The interest in Lean within R&D has grown tremendously during the last years in the Nordic region. In fact, participants from Nordic countries have been heavily overrepresented at international conferences held within this area lately. In short, Lean R&D is hot.

Why has the interest for Lean R&D increased during the last years?
The reason may differ depending on the company. Some contributing factors can be identified. Companies have gained positive results from lean programs in production, and want to extend into R&D. The notion of Lean R&D is more known and accepted now than before. An increasing number of good results are emerging from different case companies.

What are the major benefits for companies that have adopted Lean R&D thinking?
In the end it is the increased long-term competitiveness and profitability. It is achieved through the improved capability of a) learning between projects, b) incorporating new technologies and concepts while reducing the project risk, and c) increasing the productivity of the organization.

Where does Nordic companies stand compared to other regions, for example?
While Lean R&D originates from companies in Japan, the current wave of implementations are headed by companies in the US. However, several Nordic companies, especially in Sweden and Norway, have come as far as US counterparts. One important reason for this is that the Nordic company culture and leadership style is more suitable for Lean thinking.

What do you think makes Lean R&D attractive for companies and employees?
Lean R&D is attractive because of the results that can be obtained. It also makes sense to the employees as a natural way of working with R&D.

Where do you think development organizations will stand in 5-10 years?
The trend is clear. More and more companies start their journey towards Lean R&D. As in production, Lean is here to stay. Your question is whether to lead this transformation, or to be forced to follow your competitors.

What is the challenge for companies with ambitions to learn about and deploy Lean R&D?
The key to a successful implementation of Lean R&D is in the changed way of thinking, leading to a changed way of acting that is supported by different methods. Although many Lean methods seem simple on the surface, they have a much more profound effect when the thinking is changed accordingly. This is a challenge, especially for leaders, as the old way of thinking and acting is what have made them successful.
How is a R&D organization set out to improve its operations going to make a transformation towards Lean R&D? The shift to a Lean R&D system, and its benefits is within reach. If management leads the way, engineers will embrace the change as it makes sense from their perspective. Involving the engineers is also the key to success as they provide all the value added work that in the end deliver the products.

1. Prepare the organization
   - Introduce concept of Lean R&D
   - Set-up shared vision and goal of the R&D organization
   Key managers need a first introduction to understand the fundamentals of Lean. Pairing this with a review or set-up of vision and objectives for the organization serve to create a guiding star, both for the organization as such and for the Lean R&D transformation. Strategy workshops involving both management and key engineering disciplines are a common approach to achieve this.

2. Create a stable base
   - Stabilized workflow through a visual management system and standardized problem solving (A3 & PDCA)

3. Establish a structure for continuous improvements
   - Develop a continuous improvement system based on problem solving methods
   - Establish a common way of handling improvements
   The 3rd step is when overall R&D efficiency is starting to show significant benefits in the engineering productivity. Improvements are though not yet a coherent system and therefore great benefits will be found in some specific areas, while the full potential can not be realized across the R&D organization.

4. Knowledge capturing and re-use methods and structures
   - Standardize methods and deploy structures to support knowledge value stream such as trade-off curves and other techniques
   - Assign ownership of critical knowledge value streams
   With the 4th step performed the work to realize the full benefits of Lean R&D is in place. When the organization can focus on bridging knowledge gaps and execute projects without unplanned loop-backs the engineering efficiency is improved radically. Superior product quality and features that can attract new customers. The continuously improving product offer then becomes a sustainable competitive advantage.

Figure 3. The transformation phases need to be timephased but can to some extent be run in parallel. Early pilots within the organization are recommended to set positive examples and get validation of results.

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BOOK REVIEWS

**Toyota Product Development System** – Jeffrey K. Liker
This is the Bible of Lean R&D. However, this makes it also about as fun to read. It’s perfect to use as an encyclopedia of Lean R&D, but lacks in the systematic view and can be difficult to appreciate as a reader.

**Product Development for the Lean Enterprise** – Michael J. Kennedy
Gives good insight in the concept of Lean R&D and its potential. It is written as a novel which makes it easy to read. However, the change methodology proposed in this book is not recommended.

**Ready, Set, Dominate** – Michael J. Kennedy
This is the sequel to Product Development for the Lean Enterprise. Kennedy has developed his ideas on how to implement Lean R&D into organizations. You will find business case driven arguments for Lean R&D together with a much improved change methodology widely recognized as benchmark.
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