

# Lean, mean NPD machine

We've all heard of lean manufacturing, but why shouldn't the same principles apply to design? By **Graham Cooke**.

Lean manufacturing has been a great success for many companies. Of 300 senior managers in UK manufacturing surveyed in 2007, more than a third had saved more than £500,000 since implementing the approach. But it doesn't stop there; lean supply chain and lean office are delivering equally impressive results as companies spread the concept across their organisations.

Yet one area that sees less attention from companies embarking on a lean journey is new product development (NPD). NPD has characteristics that make it difficult to apply the tools and techniques associated with more repeatable functions, like manufacturing or order processing.

Lean product development exists on two levels:

- Embedding lean preproduction preparation activities upstream in the product development process. This is the fundamental definition of design for lean, which deals with the requirements placed on the design of a product by a lean manufacturing operation and supply chain.
- Applying the fundamental concepts of lean (identification and elimination of waste) to the product development process. There are three main areas of interest here: lean processes, or the application of lean process improvement tools to repeatable sub processes within the overall NPD process; lean principles, or the identification and elimination of the forms of waste within product development; and the radical concepts that form the Toyota Product Development System.

Figure 1 shows the interrelation between these different aspects of the complete lean product development picture.

## Design for lean

Design for lean encompasses a variety of ideas and tools that ensure the new product will



integrate seamlessly with a lean manufacturing operation. This includes many of the following key concepts:

- Production line type identification
- Design for assembly (Poka Yoke)
- Modular assembly
- Multifunctional parts
- Parts/materials minimisation
- Operation minimisation
- Design for test
- Supplier selection
- Value analysis/engineering
- Statistical tolerancing
- Failure mode and effects analysis (FMEA)
- Single minute exchange of dies (SMED) facilitation.

But the most important aspect of design for lean is cross functional involvement. As early as possible in the design process, the manufacturing and supply chain functions should be aware of the new product and the appropriate

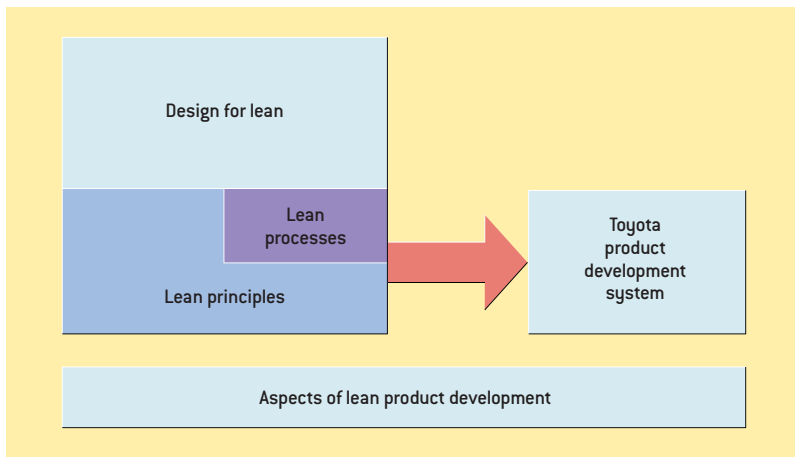
concepts listed above should be discussed and reviewed during the life of the design project.

Design for lean is an independent concept, but provides an important bridge between the manufacturing and development functions. Indeed, if a company is already applying lean in manufacturing and supply chain, it is a natural extension back into the product development process.

## Lean processes

NPD is a non linear, non repetitive process. Efforts to map and control it as if it were a manufacturing activity are very frequently doomed. However, the whole process contains sub processes (for example, prototype building or software testing) that are repetitive and which operate on short cycle times. As such, they resemble manufacturing operations and are candidates for lean process activities, where tools such as value stream mapping and Kanban

Fig 1: The elements of lean product development



systems can be applied directly. Some benefit may be seen with this approach, but it increases capacity only in those sub processes and does not necessarily produce major overall improvements.

**Lean principles**

To truly realise the potential of lean, it is necessary to think about the fundamental principles and how they apply to NPD. Lean is all about identifying and eliminating non value added activity or waste. To do this, it is important to think in terms of two customers: the manufacturing function; and those who buy the product.

There are many categories of waste and some map directly into the seven manufacturing wastes (transport, inventory, motion, waiting, over production, over processing and defects). However, some reflect the unique aspects of NPD activities:

- Disruption and distraction
- Communication barriers
- Using inappropriate or poor tools
- Inaccurate handover of information
- Generating useless information
- Missing the unvoiced customer requirement (testing to specification)
- Regenerating discarded information (results of failures)

Although lean manufacturing tools are not directly applicable to the overall NPD process, some of the underlying principles – like small batches, continuous feedback and cadence (time driven, rather than event driven, activity) – are a good place to start when eliminating waste. It is

also worth reviewing agile software development – many of the ideas and methodologies are rooted in lean thinking.

**Toyota Product Development System**

One approach based on the principles of waste identification and elimination is the Toyota Product Development System. This is a benchmark for companies undergoing a lean transformation in their manufacturing function and the tools and techniques employed to great effect by Toyota in its product development are often held up as the pinnacle of lean product development.

Whilst there is no doubting the results that Toyota has demonstrated with its approach, the applicability of the entire system across all industries is unproven. A more intelligent approach should combine lean process and lean principles activities with a thorough examination of the Toyota Product Development System to produce a bespoke combination of tools and methods that will deliver the best results.

**A plan for action**

There is no prescribed method that will work in all situations, but the following plan provides a framework on which to build.

- **Identify champions.** The lean journey is neither simple nor easy. Established ways of working often need to be challenged and enthusiasm needs to be invoked to encourage involvement. Positive results need to be identified and communicated to convince others. The whole

package requires strong leadership.

- **Engage others.** Identification of waste and the creation of ways to eliminate it are often best achieved in a team environment. Involvement of other functions is critical and strong facilitation is vital
- **Start small.** Identify pilot projects to achieve early success and facilitate the development of methods and ideas before scaling up
- **Identify waste.** Use brainstorming, structured reviews and process mapping to identify waste and where it occurs. Waste is often found in specification generation activities (generating useless information), activity driven reviews (waiting) and resource allocation (disruption and distraction) – but you can find it elsewhere!
- **Eliminate waste.** Combine reviewing best practice, applying lean ideas and creative problem



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solving to devise methods of working that do not generate waste. Implement and validate these new methods on pilot projects.

- **Review frequently.** Drive progress and maintain enthusiasm by reviewing progress frequently, defining actions and communicating success.
- **Scale up.** Build on pilot project success and devise a clear plan to scale up and roll out – but don't forget to review progress frequently!

**A way of thinking**

Lean is not prescriptive; it is more a way of thinking than a set of tools and methodologies. It provides a solid foundation to analyse day to day activities and bring about positive change. Applied to NPD, it can be as effective in improving performance as it has been in the world of manufacturing. Enjoy the journey!

**Author profile:**

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