Lean Product Development

Kenneth G. KREAFLE*

Lean Systems Program Director and Toyota Executive in Residence,
Institute of Research for Technology Development, University of Kentucky, College of Engineering,
Lexington, KY 40506-0108, U.S.A.

Received November 5, 2010; final version accepted December 28, 2010

The University of Kentucky’s Lean Systems Program recently merged with the Institute of Research for Technology Development (IR4TD) to provide broader and complete service to both domestic and international customers. The new organizational structure of IR4TD, including the Lean is shown in Fig. 1. Our immediate goal is to assist industry in implementing Lean thinking and strategies to improve performance. This lecture will focus on specific examples on achieving this goal using Lean principles and several lean tools that were developed by Toyota.

KEYWORDS: Lean manufacturing, IR4TD, Toyota production system

1. History

The University of Kentucky’s Lean Systems Program was initiated and funded in 1993 by Toyota Motor Manufacturing Kentucky plant whose operation began in 1986. This program was part of a mutually beneficial relationship building between Toyota and the University of Kentucky, clearly articulated and envisioned by the then Toyota Kentucky president, Mr. Fujio Cho. The long term impact on education and research was intended to create goodwill through corporate citizenship rather than a short term profit-oriented benefit to Toyota. We hoped and intended to make this collaboration a show-case for academia and industry relationships. As of today, UK’s Lean program has achieved international recognition for its uniqueness and an authentic relationship with Toyota, the founder of the Toyota Production System (the original Japanese version of Lean Systems).

As of today, UK’s Lean program has served 48 different states in the US and 33 countries worldwide, as shown in Fig. 2. Lean Philosophy, the core of the program, will be addressed by Kozo Saito in one of the plenary lectures of this conference in relation to Hitozukuri and Monozukuri [1].

2. Introduction

Toyota’s Chairman, Fujio Cho, stressed the importance of the common mission between industry and academy in research to continually improve manufacturing processes [2]. Based on his work and focusing on the pull principle which is a customer driven method, the Lean Manufacturing Program has distinguished itself from other programs that focus merely on profit. This is not an easy process to practice in the current, very competitive, business world. Therefore, our Lean program offers cultural background and win-win thinking which support this process by satisfying the customer-first principle, which seems contradictory to traditional short-term profit-oriented business models and current thinking in the US. This paradigm shift in thinking has been taught through specific examples of problem solving where the 8-Step problem solving process and 5 why method, shown in Fig. 3, were applied.

This lecture will provide specific examples of continuous improvement not only in manufacturing processes but in many other industries and educational institutions like University of Kentucky. For readers who are interested in lean thinking, here is an actual example for your practice [3]: In the automobile assembly process, it has been a regular practice to use a buffer as a reservoir to keep an assembly line moving even in the case that automobile parts were not delivered to the line. This auto assembly plant had 90 buffer vehicles, which is reasonable for this size of auto plant. However, the assembly line had been experiencing frequent stops of the line due to running out of parts. A general manager who is responsible for this assembly process thought increasing buffer from 90 to 120 to be a solution, because the larger number in the buffer means more stock to endure longer time periods for the shortage of parts. However, a senior executive who is familiar with lean thinking ordered to reduce the buffer number from 90 to 50.

This may be against common sense and intuition, because reducing the buffer means less number in stock of parts worsening the situation of the parts shortage and increasing the frequency in stopping the line. If our focus is productivity on the current line system, a solution would be to increase the buffer. But if our focus is continuous

* Corresponding author. E-mail: ken.kreafle@tema.toyota.com
improvement of the system, increasing the buffer does not help find the root cause for stopping the line and shortage of parts. Lowering the buffer number helps us see problems in the assembly process which caused the frequent stoppages and identify the problem. Once problems are identified, curing the problem at the source is possible.

The above example supports the Fig. 3 chart of the eight step problem solving process, which is aimed at making continuous improvements in their own processes of operation. Identifying problems is the first and most important step for continuous improvement. Thus, companies which are truly interested in implementing continuous improvement (or Kaizen) system to their operation, their managers and executive members should encourage workers to find the problem and reward them when they find problems rather than punishing them which is often the case in American society [2].

3. Concluding Remarks

Toyota Production System, TPS, has been developed in Japan under the influence of Japanese culture where harmony is more important than individual performance. UK’s Lean program is an American version of TPS where difference in Japanese and American culture has been adjusted for TPS tools to work best in American culture. UK’s Lean Manufacturing Program has been continually improving its program to adjust the changing society, but its basic principles sustain the same. In joining with UK’s IR4TD, Fig. 1, the program has more completely taken to task the initiative to become a worldwide leader in the teaching of Lean practices to industry to solve real world problems.
Acknowledgment

A special acknowledgment goes to Mrs. Allison Hehemann for her efforts in the creation and editing of this lecture abstract. We thank Dr. Ishimoto for organizing this very interesting sustainability workshop.

REFERENCES