

## Improving the innovation performance of lean product development companies with a customized framework for innovation

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### Abstract

Innovation has become a field of rigorous investigation during the past 30 years. The Product Development and Management Association (PDMA) has been conducting longitudinal research on best product innovation practices since 1990. Utilizing the PDMA best practices research data as well as the actual practices of PDMA Outstanding Corporate Innovator (OCI) award winning companies, "Thota Framework for Innovation", was developed in 2011 to help companies delivering average innovation performance to improve their performance by systemic implementation of innovation best practices. In the current paper, The Toyota lean product development principles are illustrated within the Thota framework for innovation. Underperforming organizations practicing lean product development principles can customize the Thota framework for innovation by integrating lean development principles into the Thota framework and build capabilities for both incremental and more innovative products. Customizing the innovation process to suit business needs is a characteristic of the best innovation practice companies.

**Key Words:** *Lean product development, Thota framework for innovation, innovation performance*

### Introduction

Companies, both small and big can create the future they envision by nurturing a culture of innovation. While the popular press celebrates success stories of entrepreneurial and innovative leaders, specific prescriptions for leading non-innovative companies into systematic innovators are lacking. Thota (2011) took the first step towards remedying this situation with the publication of Thota framework for innovation in the Management of Innovation and Entrepreneurship Journal of the Tsinghua University in China. In the Tsinghua article, Thota (2011) illustrated the application of Thota framework for innovation with the Product Development Management Association (PDMA) Outstanding Corporate Innovator (OCI) award winning company, BMW. The BMW won the prestigious PDMA OCI award in 2002. The current paper extends Thota's 2011 paper by incorporating the Toyota lean product development subsystem principles (Morgan and Liker, 2006) into the Thota framework for innovation. Toyota's lean product development system success is based on people, process and tools and technology subsystems. The Thota framework for innovation is based on three organizing principles implemented through eight actions. Underperforming organizations can integrate lean product development principles into the eight actions specified in the Thota framework for innovation and improve their overall innovation performance with the customized framework.

#### 1. The 3 organizing principles of Thota framework for innovation

The three organizing principles for the Thota framework for innovation (Thota, 2011) are:

- I. People Innovate
- II. Process supports people to innovate
- III. Tools & Methods support processes

People innovate, not the processes or tools and methods deployed to support innovation. Motivating people to innovate is an important task for leaders of innovation. A single person, no matter how knowledgeable she is, is not as smart as the people she employs in her business and the people in the ecosystem in which her business competes.



Dr. Hamsa Thota is the President of Innovation Business Development, Inc., an innovation consulting and training company in the USA. Dr. Thota has 25 years of senior R&D management experience in the US food industry and holds 10 US patents. He is co-author of Key Concepts in Innovation, a fundamental reference book on innovation. He was a visiting professor at the Management School of the Zhejiang University in China and an Honorary Professor at the Geely Automotive engineering Institute in China. He is a past president of the PDMA.

### Best Wishes

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Senior leaders of organizations must ask the following question. "How am I motivating my people to identify, prioritize, and develop compelling solutions to create outstanding experiences for my customers? Successful leaders of innovation leverage the collective wisdom of their people to make winning business decisions. They challenge and motivate their people to take quantum leaps in creativity and innovation. In high innovation performance organizations people view innovating as a co-creation (Thota and Munir, 2011) effort, take initiative with trust and embrace change resulting from innovation (Figure 1).

## 2. The 8 actions to implement Thota framework for innovation

The Thota framework for innovation contains eight actions (Table 1) to implement innovation. These eight actions, derived from the practices of best innovation performance companies, and comparative performance assessment studies (CPAS 2003) by the Product Development and Management association (PDMA), are put in practice in the people, process and tools & methods frames illustrated in Figure 2.

**People frame:** The people frame is the first frame in the Thota framework for innovation. It incorporates actions 1-3. Specific focus areas in the people frame include culture, vision, mission, strategy, value proposition, governance mechanisms, teams, structures and roles (Figure 2). Successful leaders of innovation often set bold and audacious goals and articulate a future oriented vision. They understand that the three categories of innovation projects (radical, more innovative and incremental) belong in their innovation project portfolio, and fund them at levels appropriate to achieve strategic business goals. They organize their businesses for success.

For customers, a value proposition describes what is in it for them. Also, it motivates the cross functional new product development teams by providing a clear direction for what needs to be built (Sawhney 2010). It guides pricing, channels for entry of new products, support services needed for launching new products, and the ecosystem partners needed to deliver on the promise to customers (Sawhney 2010). A strong value proposition can be developed for each innovation project within a clearly defined product innovation charter (PIC) (Crawford, 1980).

**Process frame:** The process frame includes the front end of innovation (Thota and Munir, 2011), new product development (NPD) process and the portfolio management process (Actions 4-5). The NPD process is a formal process. It is also a flexible process. Cross-functional team work is the foundation. Top performing businesses review their NPD process periodically (i.e. every 2-5 years) to ensure that the process is appropriate to respond to changes in their market place (Thota 2011). The senior management allocates resources across a portfolio of innovation projects in alignment with the business strategy.

**Tools & Methods frame:** The tools & methods frame includes market research tools, financial, project management and engineering tools as well as metric for measuring innovation performance (Actions 6-8) (Thota 2011).

## 3. Toyota lean production system illustrated within the Thota Framework for innovation

In their book, "Toyota Product Development System", James M. Morgan and Jeffrey K. Liker (2006) described the Toyota's lean product development system as consisting of three interrelated and interdependent subsystems (process, people and tools and technology) and defined the lean product development system with four process, six people and three tools and technology subsystem principles (Table 2).

Table 3 incorporates lean product development principles of Morgan and Liker (2006) into the Thota framework for innovation. It can be seen from Table 2 that organizations implementing lean product development principles do not emphasize the use of portfolio management process to implement new product development strategy, and market research tools to gain customer insights. This situation can be remedied by integrating the lean product development principles into the Thota framework for innovation and implementing the customized framework to improve overall innovation performance. Companies can improve their innovation performance with insights gained into customer needs with the most frequently used market research tools (Table 4). Also, the utilization of culture, mission, vision, goals, governance, and new product development strategy as tools from the people frame of the Thota framework for innovation (Figure 2) will compliment the continuous learning and improvement mindset of lean development with an innovation mindset. The product innovation charter (PIC) is one of the most underutilized tools to improve new product development performance. Lean product development companies can improve their innovation performance through disciplined use of the PIC across the portfolio of innovation projects. With a customized innovation framework, lean development companies can build upon their continuous improvement capabilities (i.e. capabilities for incremental innovations) with more innovative customer solutions generated from customer insights (i.e. capabilities for more innovative new to the company and new to the world products).

## Summary

In this paper, The Toyota lean production system is illustrated within the Thota framework for innovation. Underperforming organizations practicing lean product development principles can customize the Thota framework for innovation by integrating lean development principles into the Thota framework and improve their incremental and more innovative product development capabilities. Customizing the innovation process to suit business needs is a characteristic of the best innovation practice companies.

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Figure 1: Habits of Innovative Businesses



## Workshop on Engineering Optimization

PDMA India and Indian Institute of Technology Madras (IITM) have jointly organized a three day Workshop on Engineering Optimization - Theory and Practice by Prof. S.S.Rao, University of Miami, Florida, USA on 5th, 6th and 7th January 2012 at IIT Madras, India.

Prof. Rao has extensive teaching and research experience at Miami, Purdue, San Diego State University, Indian Institute of Technology Kanpur, and NASA Langley Research Center.



From Left: Mr.S.Srinivasan, President, PDMA India;  
Prof.N.Siva Prasad, Professor, Dept. of Mechanical Engineering, IIT Madras;  
Prof.S.S.Rao, University of Miami, USA &  
Prof.K.Chandrasekaran, Dean, RMK Engineering College

Prof. Rao has published more than 175 technical papers in internationally reputed journals and more than 125 papers in conference proceedings in the areas of engineering optimization, reliability-based design, fuzzy systems, active control of structures, and vibration engineering. He served as Associate Editor for the ASME Journal of Mechanisms, Transmissions, and Automation in Design and the journal of Microelectronics and Reliability. Currently, he serves on the editorial boards of Engineering Optimization and Reliability Engineering and System Safety.

The objective of the workshop was to expose participants to the most practical and up-to-date optimization techniques, state-of-art optimization software tools and solving practical design problems.

There were about 57 participants from across industry verticals, academia and Government Organizations. The workshop was well received by the participants.

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Figure 2: Thota Framework for Innovation



Table 1: Eight actions for systematic implementation of innovation

1. Develop, train and engage management in NPD and innovation
2. Develop the Best R&D and Product Development Project Teams
3. Use strategy to drive innovation
4. Customize innovation process to business, and use it consistently
5. Use portfolio management process to implement strategy
6. Learn when to use what market research tools
7. Learn when to use what engineering, design & R&D tools
8. Learn when to use what innovation team support tools

Table 2: Morgan and Liker Toyota lean product development system with people, process and tools and technology subsystems principles

Process subsystem
<ol style="list-style-type: none"> <li>1. Establish customer-defined value to separate value-added activity from waste</li> <li>2. Front load the product development process while there is maximum design space to explore alternative solutions thoroughly</li> <li>3. Create a leveled product development process flow</li> <li>4. Utilize rigorous standardization to reduce variation, and create flexibility and predictable outcomes</li> </ol>
People subsystem
<ol style="list-style-type: none"> <li>1. Develop a chief engineer system to integrate development from start to finish</li> <li>2. Organize to balance functional expertise and cross-functional integration</li> <li>3. Develop towering technical competence in all engineers</li> <li>4. Fully integrate suppliers into the product development system</li> <li>5. Build in learning and continuous improvement</li> <li>6. Build a culture to support excellence and relentless improvement</li> </ol>
The Tools and Technology subsystem
<ol style="list-style-type: none"> <li>1. Adapt technology to fit your people and processes</li> <li>2. Align your organization through simple, visual communication</li> <li>3. Use powerful tools for standardization and organizational learning</li> </ol>

Ref: Morgan and Liker (2006)

## Lecture Meeting on Leveraging Optimization Techniques in Engineering using MATLAB and Simulink

PDMA India and Indian Institute of Technology Madras (IITM) have jointly organized a lecture meeting on Leveraging Optimization Techniques in Engineering using MATLAB and Simulink by Mr.Pradeep Nanjappa, Senior Technical Evangelist, MathWorks India on 6th January 2012 at IIT Madras, India.

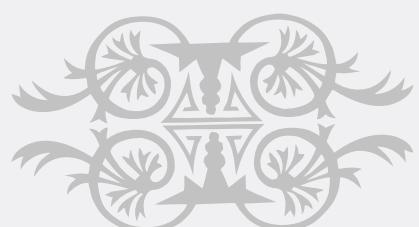


Speaker: Mr. Pradeep Nanjappa,  
Senior Technical Evangelist, MathWorks India

There were about 40 participants attended the lecture meeting. Several organizations including the following nominated their employees to attend the lecture meeting.

- Tata Consultancy Services
- HCL Limited
- FLSmidth Limited
- Royal Enfield Limited
- GE India
- Rane TRW Steering Systems
- India Pistons Limited

The lecture meeting was well received by the participants.



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**Table 3: Morgan and Liker Toyota lean product development subsystem principles incorporated into the Thota framework for innovation**

Actions to systematic implementation of innovation (Thota framework for innovation)	Morgan and Liker Toyota lean product development subsystem principles
Develop, train and engage management in NPD and innovation	<ul style="list-style-type: none"> <li>• Develop a chief engineer system to integrate development from start to finish</li> <li>• Build in learning and continuous improvement</li> <li>• Build a culture to support excellence and relentless improvement</li> </ul>
Develop the Best R&D and Product Development Project Teams.	<ul style="list-style-type: none"> <li>• Organize to balance functional expertise and cross-functional integration</li> <li>• Develop towering technical competence in all engineers</li> <li>• Fully integrate suppliers into the product development system</li> <li>• Utilize rigorous standardization to reduce variation, and create flexibility and predictable outcomes</li> </ul>
Use strategy to drive innovation	<ul style="list-style-type: none"> <li>• Establish customer-defined value to separate value-added activity from waste</li> </ul>
Customize innovation process and use it consistently	<ul style="list-style-type: none"> <li>• Create a leveled product development process flow.</li> <li>• Front load the product development process while there is maximum design space to explore alternative solutions thoroughly</li> </ul>
Use portfolio management process to implement strategy	
Learn to use what market research tools	
Learn when to use what engineering, R&D and design tools	<ul style="list-style-type: none"> <li>• Adapt technology to fit your people and processes</li> </ul>
Learn when to use what innovation team support tools	<ul style="list-style-type: none"> <li>• Align your organization through simple, visual communication</li> <li>• Use powerful tools for standardization and organizational learning</li> </ul>

**Table 4: Most used market research tools by the best performing companies**

## Most Used Market research Tools by frequency of use in innovation projects

- |       |  |
|-------|--|
| <65%  | <ul style="list-style-type: none"> <li>• Beta Testing</li> <li>• Customer Site Visits</li> <li>• Alpha Testing</li> <li>• Voice of the Customer</li> <li>• Gamma Testing</li> <li>• Lead Users</li> <li>• Ethnography</li> </ul> |
| 40% ↓ |  |

## Workshop on New Product Development

Two workshops on NPD have been conducted in Pune on 13th, 14th and 15th January 2012 and in Bangalore on 20th, 21st and 22nd January 2012. Dr. Hamsa Thota, Founder & President of Innovation Business Development Inc. conducted the workshops in both locations. The objective of the workshop was to expose to participants to the current best practices of New Product Development (NPD), state-of-art tools and techniques. Participants are encouraged to appear for NPD Certification.



Pune Workshop Participants

About 25 participants attended the workshop in each location. The workshops in both locations have been received extremely well. Several organizations including the following nominated their employees to attend the workshop.

- Tata Consultancy Services
- Tractors and Farm Equipments Ltd
- Titan Industries
- Tata Toyo Radiator Ltd
- Bharti Airtel Ltd
- Infosys (Finacle) Ltd.
- Eureka Forbes Ltd.

The lecture meeting was well received by the participants.



Bangalore Workshop Participants