Viability of Lean Manufacturing Tools and Techniques in the Apparel Industry in Sri Lanka

A dissertation submitted to the Department of Mechanical Engineering of the University of Moratuwa in partial fulfilment of the requirements for the Degree of Master of Engineering in Manufacturing Systems Engineering

by

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Sri Lanka

January 2011
Dedication

To my dear parents and wife,

University of Moratuwa, Sri Lanka.
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Declaration

"I hereby declare that this submission is my own work and that, to the best of my knowledge and behalf, it contains no material previously published or written by another person nor materials, which to substantial extent, has been accepted for the award of any other academic qualification of a university or any other institute of higher learning except where acknowledgement is made in the text."

S.K.P.N. Silva
31.01.2011

I endorse the declaration by the candidate.

Dr. Chandana Perera
(Supervisor)
31.01.2011

Dinesh Samarasinghe
(Chairman)
31.01.2011
Abstract

Lean Manufacturing can be considered as a business strategy which was originated and developed in Japan. It tries to identify waste and eliminate it. Thus it leads to improvement in productivity and quality and companies can achieve a competitive advantage over others. Starting from the automotive industry, it has rapidly spread into many other industrial sectors and there has been significant development and localization of the Lean Manufacturing concept in both developed and developing countries worldwide. In implementing this concept there are tools and techniques developed by Toyota which can be used effectively.

The initial step of this research is to study about the Lean Manufacturing. It starts by looking at how Lean Manufacturing first began. Then it seeks to identify the core principles, tools and techniques of Lean Manufacturing. After that an extensive literature review was carried out to find successful Lean tools and techniques currently use in worldwide. The next step is to identify tools which are used frequently and which are not used. There will be a study to find out the barriers of implementing other tools and techniques.

After studying the global scenario the next step is to look at the Sri Lankan context. Sri Lankan industries, especially apparel sector have attempted to implement this, but a little research work is carried out in regarding its suitability. This research is an attempt to identify a suitable Lean model for the apparel industry in Sri Lanka using real world data, structured surveys, observations, and on site interviews. Also the study will reveal period of Lean implementation, suitable implementation methods, order of implementation, tools which are avoided, sustainability of different tools, challenges faced, ways of overcoming challenges and benefits achieved after applying Lean Manufacturing concepts in the apparel sector of Sri Lanka.

The findings states Lean Manufacturing can be applied to mass production apparel industries and has made positive impacts. As implementation of Lean concepts is still in development stage, the full benefit is not yet achieved. However current situation suggests that the industry can go forward with Lean. In this research the author has come up with a model which can be used to implement Lean in a systematic manner and each manufacturer must develop their own Lean system through training, experiments and kaizen.
Originality of the research: The research builds up a Lean Model which is not yet developed for the apparel sector in Sri Lanka. It can be further modified to suit the global apparel industry and other industries as well.

Keywords: Lean Manufacturing, Lean tools and techniques, Apparel industry, Viability, Sri Lanka
Acknowledgement

It was great opportunity for me to spend time to carry out Final research project module as a requirement of degree curriculum. I wish to express my gratitude to the following individuals and groups, who contributed their time for this work in order to complete successfully.

First of all, I would like to express my gratitude to Dr. Chandana Perera and Mr. Dinesh Samarasinghe, Lecturers, who have supervised me a lot in carrying out this kind of a research. Secondly my gratitude goes to Dr. Ruwan Gopura, who was the coordinator, for his helpful tips and advices to achieve the desired goals of the module.

Finally, I express my gratitude towards the above mentioned people again and to everybody who supported me even in a word to make my effort a success.
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<table>
<thead>
<tr>
<th>Notations / Nomenclature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>dept.</td>
<td>department</td>
</tr>
<tr>
<td>pgm.</td>
<td>program</td>
</tr>
<tr>
<td>etc.</td>
<td>et cetera</td>
</tr>
<tr>
<td>BOI</td>
<td>Board Of Investment</td>
</tr>
<tr>
<td>CAD</td>
<td>Computer Aided Design</td>
</tr>
<tr>
<td>CAM</td>
<td>Computer Aided Manufacture</td>
</tr>
<tr>
<td>CEO</td>
<td>Chief Executive Officer</td>
</tr>
<tr>
<td>CME</td>
<td>Canadian Manufacturers and Exporters</td>
</tr>
<tr>
<td>CPSH</td>
<td>Cost Per Standard Hour</td>
</tr>
<tr>
<td>CTSR</td>
<td>Cut To Ship Ratio</td>
</tr>
<tr>
<td>DIFOT</td>
<td>Delivered In Full, On Time</td>
</tr>
<tr>
<td>DTD-FG</td>
<td>Dock-to-Dock Finish Goods</td>
</tr>
<tr>
<td>DTD-RM</td>
<td>Dock-to-Dock Raw Material</td>
</tr>
<tr>
<td>DTD-WIP</td>
<td>Dock-to-Dock Work In Progress</td>
</tr>
<tr>
<td>ERP</td>
<td>Enterprise Resource Planning</td>
</tr>
<tr>
<td>FTT</td>
<td>First Time Through</td>
</tr>
<tr>
<td>FSS</td>
<td>Floor Space Savings</td>
</tr>
<tr>
<td>GSP</td>
<td>Generalized System of Preferences</td>
</tr>
<tr>
<td>IE</td>
<td>Industrial Engineering</td>
</tr>
<tr>
<td>JIT</td>
<td>Just – In – Time</td>
</tr>
<tr>
<td>LEI</td>
<td>Lean Enterprise Institute</td>
</tr>
<tr>
<td>LM</td>
<td>Lean Manufacturing</td>
</tr>
<tr>
<td>M &amp; S</td>
<td>Mark and Spencer</td>
</tr>
<tr>
<td>MI</td>
<td>Michigan</td>
</tr>
<tr>
<td>OEE</td>
<td>Overall Equipment Effectiveness</td>
</tr>
<tr>
<td>PDCA</td>
<td>Plan Do Check Act</td>
</tr>
<tr>
<td>POUS</td>
<td>Point – Of – Use – Storage</td>
</tr>
<tr>
<td>RFID</td>
<td>Radio Frequency Identification</td>
</tr>
<tr>
<td>RM-OTD</td>
<td>Raw Material On Time Delivery</td>
</tr>
<tr>
<td>SMED</td>
<td>Single Minute Exchange of Dies</td>
</tr>
<tr>
<td>SPSS</td>
<td>Statistical Package for the Social Sciences</td>
</tr>
<tr>
<td>Acronym</td>
<td>Description</td>
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<td>--------------------------------------</td>
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<tr>
<td>SQDC</td>
<td>Safety Quality Delivery Cost</td>
</tr>
<tr>
<td>SQDCM</td>
<td>Safety Quality Delivery Cost Morale</td>
</tr>
<tr>
<td>TBM</td>
<td>Time Based Management</td>
</tr>
<tr>
<td>TPM</td>
<td>Total Productive Maintenance</td>
</tr>
<tr>
<td>TPS</td>
<td>Toyota Production System</td>
</tr>
<tr>
<td>TSD</td>
<td>Total Systems Development</td>
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<td>EU</td>
<td>European Union</td>
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<td>UK</td>
<td>United Kingdom</td>
</tr>
<tr>
<td>USA</td>
<td>United States of America</td>
</tr>
<tr>
<td>VSM</td>
<td>Value Stream Mapping</td>
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