



**UNIVERSITI PUTRA MALAYSIA**

**IMPLEMENTATION OF LEAN PROCESS MANAGEMENT THROUGH  
ENHANCED PROBLEM SOLVING CAPABILITIES**

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**By**

**PUVANASVARAN A/L A.PERUMAL**

**Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia  
in Fulfilment of the Requirement for the degree of Doctor of Philosophy**

**May 2009**



## **DEDICATION**

**To my dear wife for her support and encouragement**

**To my children, Hari and Kishor for their love and support**



Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfillment of the requirement for the degree of Doctor of Philosophy

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**May 2009**

**Chairman : Megat Mohamad Hamdan, PhD**

**Faculty : Engineering**

All Original Equipment Manufacturers (OEM) organizations in Aerospace, Automotive and Electronics industries had to upgrade their functions. These organizations including suppliers and solutions providers are duty bound to improve their functions through strategic initiatives. One such initiative is Lean Process Management. Lean Process Management has proven to aid organizations in developing manufacturing and administrative management solutions and make the organization a leaner at the same time a 'fitter' one, achieving World Class standards in terms of production, quality, marketing, etc, etc.

The issue or problem is, although a number of authors, experts, researchers have discussed the lean process management as part organization centric issues, they failed to provide an effective lean process management system. Besides the need to formulate an effective lean process as suggested by some authors, another important



reason suggested is the employee's development aspect regarding how to unlock the infinite potential of their workforce. This employee's development is basically the problem solving capabilities of the employees while implementing the Lean through clear cutting protocols or processes of Lean Process Management. The employees need to be developed and equipped to contribute optimally to the process. Because of this scenario, the main objective of this study is to develop an employees development system which the author has acronym or trademark it as People Development System (PDS) to enhance problem solving capability among its employees while implementing the lean process management there. Although, the PDS can be implemented throughout the organization, if it is implemented in a particular department in an organization, it will be feasible to study and analyze its effectiveness in-depth. So, this study documents and analyzes the implementation of Lean process in the Kitting Department of the aerospace company, CTRM AC.

Qualitative and quantitative measures were also used to document the case study. The outcome of the people development system needs to be measured to understand its value in developing the problem solving capabilities among the employees. Only with developed and equipped employees, the Kitting Department can reduce its wastages, optimize its performance and thereby play a crucial role in making CTRM AC a world class organization. As pertinent results of the PDS implementation, in general Kitting Department successfully achieved to meet their Department Key Performance Indicator and particularly the employees' are also improve by practicing good lean behaviors and skill and knowledge in using lean tools which lead to better leanness level by improving employees' problem solving capabilities in eliminating waste. The study proposed a PDS framework and performance



measurement model for CTRM AC. This model could be replicated in any organization and also in various sectors. Also, it can be modified according to the industries in which it can be implemented. The study also has produced two PDS Manuals as a guide for the Management as well as the shop floor people to practice PDS concept optimally. This study provided a practical as well as theoretical knowledge about the successful PDS practices, which can be implemented in any industry. On the whole, the lean process management and the resultant PDS is having positive applications, and importantly could also have positive applications in the future as well.



Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Doctor Falsafah

**PELAKSANAAN SISTEM PROSES PENGURUSAN LANGSING MELALUI  
KEBOLEHAN PENYELESAIAN MASALAH**

Oleh

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Semua organisasi perusahaan OEM di dalam industri Aeroangkasa, Otomotif, dan Elektronik harus meningkatkan fungsi kegiatan mereka. Organisasi- organisasi ini adalah juga termasuk para pembekal dan penyelesaian masalah yang bertanggungjawab untuk meningkatkan fungsi kegiatan mereka melalui inisiatif terhadap strategi perusahaan. Salah satu inisiatif tersebut adalah pengurusan proses langsing. Ini kerana pengurusan proses langsing telah terbukti membantu organisasi- organisasi di dalam membangunkan pemecahan masalah terhadap pengurusan pembuatan dan pentadbiran, serta pada masa yang sama ia juga membuatkan organisasi tersebut sebagai satu sistem pembelajar yang sesuai di dalam mencapai standard kelas dunia di dalam bidang pengeluaran, mutu, pemasaran, dan sebagainya.

Di sini , isu atau masalahnya adalah, bahawa meskipun beberapa penulis, pakar, peneliti telah membincangkan pengurusan proses langsing sebagai suatu bahagian dari sudut isu- isu yang berpusat pada organisasi, ternyata mereka gagal



menyediakan satu sistem pengurusan proses langsing yang berkesan. Seperti mana yang disarankan oleh beberapa penulis, selain keperluan terhadap formulasi dari satu proses langsing yang berkesan, juga adalah pentingnya aspek pembangunan pekerja. Ini adalah kerana pembangunan pekerja tersebut pada dasarnya tertakluk kepada kemampuan pemecahan masalah oleh para pekerja di dalam menerapkan proses langsing. Disebabkan perkara tersebut, maka para pekerja perlu dibangunkan dan dipersiapkan untuk menyumbang secara optimum terhadap pembangunan sesuatu proses. Terhadap usaha ini, maka kajian yang dilakukan adalah untuk membangunkan satu sistem pembangunan pekerja yang penulis dalam hal ini menyatakannya sebagai Sistem Pembangunan Manusia (PDS) untuk meningkatkan kemampuan pemecahan masalah di antara pekerja ketika menerapkan pengurusan proses langsing. Walaupun PDS dapat digunakan pada keseluruhan organisasi, apabila ia dapat dipraktikan pada suatu jabatan tertentu di organisasi, maka ia mudah dipelajari dan dianalisa secara berkesan dan mendalam. Oleh itu, apa yang terkandung di dalam kajian dan analisa ini adalah dari proses langsing yang dipraktikan di jabatan '*kitting*' dari perusahaan aeorangkasa CTRM.

Kajian atau thesis ini dibuat secara sistematik ke dalam tujuh Bab dan diuraikan bahagian demi bahagian, di mana pengukuran kuantitaif dan kualitatif telah digunakan terhadap kajian masalah. Di dalam kajian ini, hasil dari sistem pembangunan manusia perlu diukur untuk memahami nilai dari pembangunan kemampuan pemecahan masalah di antara pekerja. Maka, hanya dengan pembangunan dan penyediaan keupayaan para pekerja di jabatan '*kitting*', ia dapat mengurangkan pembaziran dengan mengoptimumkan keupayaannya. Oleh kerana itu, ia memainkan peranan penting di dalam menjadikan CTRM AC sebagai





organisasi kelas dunia. Hasil dari penerapan PDS, secara umumnya jabatan '*kitting*' telah berjaya mencapai KPI jabatannya dan meningkatkan pekerjaannya terhadap penerapan perilaku dan kemampuan langsing yang baik, serta pengetahuan di dalam menggunakan pengetahuan langsing untuk mencapai satu tahap kelangsingan yang lebih baik. Kajian ini juga telah menghasilkan satu kerangka kerja PDS dan model pengukuran keupayaan untuk CTRM AC. Model ini juga dapat digunakan di jabatan lain serta berbagai organisasi di sektor lainnya dengan syarat ia dapat diubahsuai menurut jenis industrinya. Di dalam kajian ini juga penulis telah menghasilkan dua manual PDS sebagai alat petunjuk untuk pengurusan mahupun penerapan daripada para pekerja di bahagian '*shop-floor*' agar dapat mencapai penggunaan optimum. Kajian ini telah memberikan penambahan suatu pengetahuan praktikal dan juga teoritikal mengenai penerapan PDS yang baik supaya dapat digunakan di semua industri. Secara umum, dengan pengurusan proses langsing dan apa yang dihasilkan dari PDS dalam kajian ini telah memberikan sesuatu yang positif terhadap penggunaannya di masa depan.



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I also wish to express my sincere appreciation to the company that I attached in, for providing me place to implement my developed system. CTRM AC (Composites Technology Research Malaysia Sdn Bhd), Malaysia' premier manufacturer of composite aero structures and provider of other Engineering services which is fully owned by the Government Lease Company (GLC) Malaysia. This made the participatory action research was more valuable with real application. In addition, I also would like to acknowledge the University Technical Malaysia Melaka for the scholarship granted.

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I certify that a Thesis Examination Committee has met on 21 May 2009 to conduct the final examination of Puvanasvaran a/l A. Perumal on his thesis entitled "Implementation of Lean Process Management Through Enhanced Problem Solving Capabilities" in accordance with the Universities and University Colleges Act 1971 and the Constitution of the Universiti Putra Malaysia [P.U.(A) 106] 15 March 1998. The Committee recommends that the student be awarded the Doctor of Philosophy.

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Date: 17 July 2009

## DECLARATION

I hereby declare that the thesis is based on my original work except for quotations and citations, which have been duly acknowledged. I also declare that it has not been previously or concurrently submitted for any other degree at UPM or other institutions.



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**PUVANASVARAN A/L A.PERUMAL**

Date: 21 MAY 2009

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## ABBREVIATIONS

CI	Continuous Improvement
CNC	Computer Numeric Control
CRM	Customer Relationship Management
CTRM AC	Composites Technology Research Malaysia Sdn. Bhd
DEC	Decentralized Responsibilities
DOA	Degree of Adoption
DOC	Degree of Management Commitment
DOL	Degree of Leanness
DRFT	Do it Right First Time
DSA	Delivery Schedule Achievement
EI	Employee Involvement
EW	Elimination of Waste
FSU	Floor Space Utilization
GLC	Government Lease Company
GM	General Manager
GR	Goods Report
GROUP	Group Involvement
GUI	Graphical User Interface
HRD	Human Resources Development
HRM	Human Resource Management
IF	Integrated Functions
IQC	Incoming Quality Control
IT	Information Technology
JIT	Just In Time
KPI	Key Performance Index
LPM	Lean Process Management
MD	Managing Director
MFT	Multifunctional team
MIT	Massachusetts Institute of Technology
MNC	Multinational Company



MRN	Material Review Number
MRP	Material Requirement Planning
NDT	Non Destructive Test
NRFT	Not Right the First Time
NVA	Non Value Added
OEE	Overall Equipment Efficiency
OEM	Original Equipment Manufacturers
PDCA	Plan Do Check Action
PDS	People Development System
PM	Performance Measurement
PO List	Purchasing Order List
PP	People Productivity
PSC	Problem Solving Capabilities
PULL	Pull instead of Push
QA	Quality Assurance
QC	Quality Control
QCC	Quality Control Circle
QCDAC	Quality, Cost, Delivery, Accountability, and Continuous Improvement
QLEAD	Quality Leadership
R&D	Research and Development
SCM	Supply Chain Management
SD	Standard Deviation
SDD	Strategy Development Department
SMT	Self Management Team
SPSS	Statistical Package for Social Sciences
ST	Stock Turns
TNA	Training and Analysis
TPM	Total Productive Maintenance
TQM	Total Quality Management
TRAIN	Training
UK	United Kingdom
USA	United State of America





VA	Value Added
VAPP	Value Added per Person
VCS	Visual Control System
VI	Visual Indicator
VIF	Vertical Information Functions
VPC	Visual Production Control
VSM	Value Stream Mapping
VSM/FM	Value Stream Manager/ Functional Manager
WEMP	Workers Empowerment
WIP	Work in Progress
ZD	Zero Defects

