EVALUATING OVERALL PERFORMANCE OF AMT IMPLEMENTATION BY CONDUCTING A TECHNICAL NEED ANALYSIS FOR SRI LANKAN APPAREL INDUSTRY

Akalanka S.L.

Supervised by

Dr. H. S. C. Perera

University of Moratuwa

This thesis was 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

Department of Mechanical Engineering
University of Moratuwa
Sri Lanka
DECLARATION

This Dissertation paper contains no material which has been accepted for the award of any other degree or diploma in any University or equivalent institution in Sri Lanka or abroad, and that to the best of my knowledge and belief, contains no material previously published or written by any other person, except where due reference is made in the text of this Dissertation.

I carried out the work described in this Dissertation under the supervision of Dr. H.S.C Perera.

UOM Verified Signature

Signature
Name of Student : Akalanka S.I.
Registration No. : 05/8646

Supervisor’s comments:

UOM Verified Signature

Signature
Name of Supervisor : Dr. H.S.C. Perera
abstract

advance manufacturing technology (amt) possess tremendous advantages and challenges for organizations. based on the previous studies of amt implementation, we investigated the impact of conducting a proper technical need analysis on pre installation phase of amt implementation to the overall performance.

our research was designed to manipulate several factors of technical need analysis, inconvenienced factors of implementation phase and performance factors of post implementation phase, by surveying 102 plants that had implemented advance-manufacturing process on apparel industry in sri lanka over the past five years. the questionnaire was designed by means of operational and concepts chart, which was made by analyzing the various critical factors that were influencing to success implementation of amt in global context.

the results indicated that the key to successful amt planning is conducting of a technical need analysis, which ultimately defines the path throughout the project. this laid a strong foundation for implementation and commissioning of needful amt, provided the necessary and adequate organizational infrastructure to a selected manufacturing system. further, we can conclude that for some extent sri lankan apparel entrepreneurs focus on a technical need analysis. even in such an analysis, they mostly concern on technical aspects, but less attention given on financial, organizational and operational related factors. the fact of overall performance of amt implementation is not attaining to a satisfactory level is further reflected with the above results. we were unable to gain a variety of technological implementation in our survey, as most of the firms did not have a proper inventory of such adaptations. in addition, difficulties aroused to collect data on amts for the last five years. in some cases, the entrepreneurs not willing to reveal their technical and business updates due to competitiveness of apparel industry.

further research could be carried out in the field of sri lankan apparel industry in the areas of evaluating opportunities and barriers to automation related amt and evaluating cost benefits of design software tools to the sme entrepreneurs.
Acknowledgement

First, I wish to express my sincere gratitude to Mechanical Engineering Department of the University of Moratuwa, Sri Lanka, for the opportunity given me to follow Master of Engineering in Manufacturing System Engineering. I deeply honour to all the lecturers of the course for their utmost intellectual and academic guidance to enhance my knowledge and refresh the experiences on novel manufacturing techniques.

I sincerely commemorate with heartfelt gratitude, our previous course coordinator, late Prof. G. K. Watugala on behalf of every student for his tremendous effort and support extended to us.

This dissertation would not be possible without the helping hand of my supervisor, Dr. H.S.C. Perera, who steered me to find such an interesting topic for my study. I graciously extend my gratitude to him. Let me also say ‘thank you’ to Dr. U.P Kahangama and Dr. S.M. Piyasena, for their immense and unforgettable commitments.

This study would have been a dream for me, without the cooperation of the staff of the apparel industries who contributed to this research by filling the questionnaires. I am greatly indebted to them for dedicating their precious time.

I’m also grateful to all my fellow mates for their tremendous support extended to me throughout the course and wish them all the very best.

Last, but not least, I thank my family and friends who have been always being with me, supporting unconditionally in every ways to make this project a success.
# Table of Contents

Abstract ........................................................................................................................................... ii
Acknowledgement ........................................................................................................................... iii
Table of Contents .............................................................................................................................. iv
List of Figures ................................................................................................................................... v
List of Tables ...................................................................................................................................... v
1. INTRODUCTION ........................................................................................................................... 1
   1.1 Project Background .................................................................................................................. 1
   1.2 Need Analysis Concept .......................................................................................................... 2
   1.3 Technical Need Analytical Model for AMT Implementation Process ................................. 3
   1.4 Research Objectives .............................................................................................................. 5
2. LITERATURE SURVEY .................................................................................................................... 7
   2.1 Importance of Pre-Installation Phase .................................................................................. 7
   2.2 Justification for Barriers in Planning and Installation Phases ............................................. 9
   2.3 Performance Monitoring ....................................................................................................... 13
3. METHODOLOGY ........................................................................................................................... 17
   3.1 Research Methodology ......................................................................................................... 17
   3.2 Questionnaire Design ........................................................................................................... 18
   3.3 Operational and Concept Chart for the Questionnaire ....................................................... 21
   3.4 Data Collection ..................................................................................................................... 23
   3.5 Survey and Construct Measurements .................................................................................. 24
   3.6 Development of Hypotheses ............................................................................................... 24
   3.7 Statistical Analysis Approaches ........................................................................................... 25
4. RESULTS AND ANALYSIS ............................................................................................................ 27
   4.1 Usage of AMT Categories ..................................................................................................... 27
   4.2 Reliability Test on the Responds Data .................................................................................. 27
   4.3 Level of Factor Contribution on Identified Strategies ......................................................... 28
   4.4 Correlation between Overall Performance and Technical Need Analysis ....................... 31
   4.5 Correlation between Overal Performance and Reflected Issues ........................................ 32
   4.6 Classification of AMT Projects ............................................................................................. 32
5. DISCUSSION .................................................................................................................................... 34
   5.1 Usage of AMT Categories ..................................................................................................... 34
   5.2 Level of factor contribution on identified strategies ............................................................. 35
   5.3 Correlation between overall performance and Technical Need Analysis ......................... 37
   5.4 Correlation between Overall Performance and Reflected Issues ...................................... 38
   5.5 Classification of AMT Projects ............................................................................................. 39
6. CONCLUSIONS .............................................................................................................................. 41
7. LIMITATIONS AND DIRECTIONS FOR FUTURE RESEARCH .................................................... 43
   7.1 Limitations ............................................................................................................................. 43
   7.2 Future Research ..................................................................................................................... 44
References .......................................................................................................................................... I
Appendices-A .................................................................................................................................... IV
Appendices-B Raw data – Questionnaire part B ............................................................................. X
Appendices-C .................................................................................................................................... XII
List of Figures

Figure 1.1: Phases of AMT implementation .......................................................... 1
Figure 1.2: Process of Technical Need Analysis ..................................................... 3
Figure 1.3: AMT implementation process chart ..................................................... 4
Figure 3.1: Research Methodology outline ........................................................... 177

List of Tables

Table 3.1: Information surveyed in Questionnaire part A ........................................ 199
Table 3.2: Information surveyed in Questionnaire part B ......................................... 19
Table 3.3: Information surveyed in Questionnaire part C ......................................... 20
Table 3.4: Information surveyed in Questionnaire part D ......................................... 21
Table 3.5: Concept chart for designing questionnaire of part B ................................. 21
Table 3.6: Concept chart for designing questionnaire of part C ................................. 22
Table 3.7: Concept chart for designing questionnaire of part D ................................. 23
Table 3.8: Summary of hypothesis ........................................................................... 25
Table 4.1: Usage of advanced manufacturing technology by responding firms .......... 27
Table 4.2: Cronbach’s alpha values for factors ......................................................... 28
Table 4.3: Statistically analyzed results for strategies ............................................... 29
Table 4.4: Hypothesis values for factors related to technical need analysis .................. 29
Table 4.5: Hypothesis values for factors related to implementation and commissioning .... 30
Table 4.6: Hypothesis values assigned for performance ............................................ 31
Table 4.7: Correlation between technical need analysis factors and performance .......... 31
Table 4.8: Correlation between overall performance and reflected issues .................... 32
Table 4.9: Profile of technology used among respondents ......................................... 33