

1705/07  
LB/DON/08/2013

# EFFECT OF THE LEVEL OF STATISTICAL PROCESS CONTROL (SPC) PRACTISES ON QUALITY PERFORMANCE

LIBRARY  
UNIVERSITY OF MORATUWA, SRI LANKA  
MORATUWA

W.M.S.K. Wijebahu

Reg No.8/8717

Dissertation submitted in partial fulfillment of the requirements for the degree Master  
of Science

University of Moratuwa	UNIVERSITY OF MORATUWA
	LIBRARY
104517	ACCESSION NO.
	CLASS NO.

Department of Textile and Clothing Technology

University of Moratuwa

Sri Lanka

June 2012

677"12"

677:65(043)

THI

104517

104517

## DECLARATION

"I declare this is my own work and this thesis does not incorporate without acknowledgement any material previously submitted for a Degree or Diploma in any other University or institute of higher learning and to the best of my knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgement is made in the text.

Also, I hereby grant to University of Moratuwa the non-exclusive right to reproduce and distribute my thesis/dissertation, in whole or in part in print, electronic or other medium. I retain the right to use this content in whole or part in future works (such as articles or books).



Signature:

03/07/2012  
Date:

The supervisor should certify the thesis with the following declaration.

The above candidate has carried out research for the Masters thesis  
under my supervision.



Signature of the supervisor:

03/07/2012  
Date

## ABSTRACT

Statistical process control (SPC) is a powerful technique for improving process quality by systematically eliminating special or assignable causes of variation. SPC is not a simple and automatic task. The successful application of SPC requires focused to following ingredients. Such as management commitment, usage of control charts ,identification of critical measurement , operator responsibility ,process definition ,training for SPC ,teamwork ,organizational cultural change ,update the knowledge of process ,audit the SPC practices and performance ,computers and SPC software packages.

The purpose of this study is to investigate the level of SPC practices and the impact on organizational performance in terms of quality. The study mainly focus to lean applied apparel manufactures in Sri Lanka to analysis out the level of SPC practicing as well as the effect of SPC to the performance of key quality factors. The study was conducted utilizing the statistical process control integrated with quality performance questionnaire which was previously tested by researchers.

This study describes the process and outcomes of the 11 ingredients underlying the SPC practices. Data collected form 20 lean implemented apparel industry in Sri Lanka and data analyzed to find the level of statistical process control practicing and the quality performance. Used SPSS software calculated standard deviation, correlations and the mean value. Further used to Excel sheet to analyze collected the data.

The collected data was analyzed according to company vise to measure the SPC practicing level. The key quality performances were analysis with level of the SPC practicing. The result was discussed according to the collected data and also discussed.

According to the result the lean applied apparel manufacturer are practicing SPC 78.40 % and there is positive trend in key quality performance with SPC practicing level.

## ACKNOWLEDGEMENT

I wish to all those who have contributed to the accomplishments of this task: Ganga, my loving wife, who has been by my side and has been a constant motivation for me to work until completion of this project. Her part in my completion of this dissertation has been monumental.

I am greatly indebted to my loving parents R.P.A Rajapaksha , A Panagoda (Mother-in-law) , and Upali Panagoda (Father-in-law) , for their support, prayers, and belief in me, that I achieve in my dissertation. My wife G E Panagoda ,my son Sandaru Wijebahu and my daughter Kalani Wijebahu, have been there in spirit, and in prayers for me to complete this goal.

Dr .Dhramasri Wickramasinghe, my supervisor, who has been a strong force of inspiration for me, completing this project. I specially offer thank to my supervisor for the support and the encouragement. And, to my friend Afham , who helped in my survey and offered support to collect data and analysis the data, you've been a true friend.

I do wish to convey my sincere gratitude to Sri Lanka Institute of Textile and Apparel for sponsoring me for Master degree programme and owe thank to Nishantha Team Leader , Director (Training and Technical) Mr D P L P Jayaweera and Director (Administration) Mr Vasantha Wijerathne to encouragement. Finally I convey my thanks to employees' response my questionnaire.

## CONTENT

Declaration of the candidate & supervisor	i
Abstract	ii
Acknowledgments	iii
Content	iv
List of Figure	vi
List of Table	vii
CHAPTER 1: Introduction	1
1.0 Introduction to the Problem	1
1.1 Background of the Study	4
1.2 Statement of the Problem	4
1.3 Purpose of the Study	4
1.4 Objective of the Study	5
1.5 Significance of the Study	5
CHAPTER 2: Literature Review	6
2.0 Introduction	6
2.1 Statistical process control	6
2.2 Organizational performance	13
2.3 Quality performance	13
2.4 Lean manufacturing	15
2.5 Lean manufacturing and SPC	17
2.6 Statistical process control and quality performance	18
2.7 Chapter summery	19
CHAPTER 3: Methodology	21
3.0 Introduction	21
3.1 Theoretical Framework	21
3.2 Theoretical Framework for objectives	22
3.3 Sampling Design	22
3.4 Participant Group	23

3.5 Questionnaires Development	24
3.6 Data Collection	24
3.7 Data Analysis	25
3.8 Limitations of Methodology	26
CHAPTER 4: RESULT AND DISCUSTION	27
4.0 Introduction	27
4.1 Level of implementation and practices Statistical process control	27
4.1.1 Level of management commitment	27
4.1.2 Level of identification of critical measurement	28
4.1.3 Level of operator responsibility	29
4.1.4 Level of process definition	30
4.1.5 Level of control chart usage	30
4.1.6 Level of training	31
4.1.7 Level of team work	32
4.1.8 Level of organization culture change	33
4.1.9 Level of update knowledge of process	33
4.1.10 Level of audit or review of SPC	34
4.1.11 Level of computer software usage	35
4.2 Level of SPC practices	36
4.3 Level of Quality performance	37
4.3.1 Level of SPC practices and the mean monthly rejection	37
4.3.2 Level of SPC practices and the mean rework percentage	39
4.3.3 Level of SPC practices and the average audit pass rate	40
4.3.4 Level of SPC practices and the average final audit pass rate	42
CHAPTER 5: Conclusion, Discussion and recommendations	44
5.0 Introduction	44
5.1 Summery of the Discussion	44
5.3 Conclusion	45
REFERENCES	46

## List of Figures

Figure 2.1: Basic function of SPC	08
Figure 3.1: Theoretical Farm work	22
Figure 4.1: Mean value variation of the management commitment	28
Figure 4.2: Mean value variation of identification of critical measurement	28
Figure 4.3: Mean value variation of the operator responsibility	29
Figure 4.4: Mean value variation of process identification	30
Figure 4.5: Mean value variation of the control chart usage	31
Figure 4.6: Mean value variation of the training SPC	31
Figure 4.7: Mean value variation of team work	32
Figure 4.8: Mean value variation of the organization culture change	33
Figure 4.9: Mean value variation of the update knowledge of process	34
Figure 4.10: Mean value variation of the audit or review of the SPC	34
Figure 4.11: Mean value variation of the computer software usage	35
Figure 4.12: Level of the SPC practices	37
Figure 4.13: Average SPC Level Vs mean rejection percentage	38
Figure 4.14: Average SPC Level Vs mean average rework percentage	39
Figure 4.15: Average SPC Level Vs mean average daily audit pass percentage	41
Figure 4.16: Average SPC Level Vs mean average final audit pass percentage	42

APPENDIX I

48

APPENDIX II

53



## List of Tables

Table 3.1: Question numbers and Ingredient of SPC	23
Table 4.1: Mean value and Standard deviation of level of the SPC	36
Table 4.2: The correlation between the level of SPC implementation and practices with the average monthly rejection percentage	38
Table 4.3: The correlation between the level of SPC practices with the average rework percentage	40
Table 4.4: The correlation between the level of SPC practices with the average audit pass rate per day	41
Table 4.5: The correlation between the level of SPC practices with the average final audit pass percentage	42