# AN IMPROVED APPROACH TO LINE BALANCING FOR GARMENT MANUFACTURING

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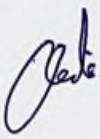
Signature:  Date: 08-06-2013

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## DEDICATION

This report is dedicated to the Factory Manager of Quantum Clothing Lanka (Pvt) Ltd, Sri Lanka, Mr. Lakshman Perera to let him know the performance of the studied production line for further improvements.

## ACKNOWLEDGEMENT

In conducting this research, many individuals supported me in numerous ways. First of all, I thank Professor H.S.C. Perera, Department of Management of Technology, University of Moratuwa, Sri Lanka, Dr. T. S. G. Peiris, the Course Coordinator of M.S.c in Operational Research (2008 Batch) and Dr. S.T.W.S. Yapa, Department of Decision Sciences, University of Sri Jayewardenepura, Sri Lanka for the valuable guidelines provided me to select this area for the research.

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## ABSTRACT

Most of the time, production managers in the garment industry are unable to complete the orders at the scheduled time. One of the reasons is the unavailability of a Line Balancing procedure that could encompass the stochastic nature of the garment manufacturing process, which is manifested through the likes of variability of operating times, machine breakdowns, reworking and breaks of operators The objective of this research is to introduce a new line balancing procedure through giving due consideration to the above mentioned stochastic nature of the process. Having selected a sewing line which consists of experience operators in a garment factory, the process times of operations, time spent for selected non value added activities were recorded. After that, probability distributions were fitted for each operation. In addition to processing times, hypothetical probability distributions were assumed with regard to breaks of operators. Next, an initial algorithm was developed. Afterwards, the work of each operator was modelled in Arena in order to test the algorithm. Then, the initial algorithm was developed by adding different activities in order to make all decisions with regard to work allocation so that the expected line target is achieved with minimum number of operators. The first step of the algorithm is collecting necessary information (order size, available time for the production, cycle times of operations, and types of failures of resources). Second step is estimating Standard Probability Distributions with regard to operations, failures of resources and determining the required production rate. Third step is developing the precedence diagram for the manufacturing process. Next step is simulating the work of workstations after assigning one operator and one feasible operation to them. Afterwards, the number of operators and number of operations required for workstation is finalized based on the analysis of simulated daily production quantity. In order to use this algorithm in the real world, a data base should be maintained to record cycle times, types of failures of resources, up times and down times with a view to estimate probability distributions. Moreover, this algorithm assumes every operator is multi skill and performs consistently.

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| Abbreviation | Description |
|---|---|
| SMV | Standard Minute Value |
| SPD | Standard Probability Distribution |

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