

**DEVELOPMENT OF A CUSTOMIZABLE
PRODUCTION LINE LAYOUT PLANNING SYSTEM
FOR SRI LANKAN FAST FASHION APPAREL
INDUSTRY**

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Degree of Master of Philosophy

Department of Textile & Clothing Technology

University of Moratuwa

Sri Lanka

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DECLARATION

I declare that 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.

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ABSTRACT

Fast fashion apparel industry is having a significant growth in international markets. Frequent fluctuation of customer demand with smaller batch quantities and, short lead-times, are the key characteristics of fast fashion apparel products. Main target markets of Sri Lankan ready-made apparel industry are rapidly adapting the fast fashion strategy. In order to retain and attract the customers of Sri Lankan ready-made apparel industry, it is essential to address the frequent problems related with fast fashion apparels. This research addresses the increased changeover cost related with production line layouts, which is the major problem in terms of fast fashion apparels.

The developed production layout planning system uses dynamic cellular manufacturing concept as the basis. A comprehensive literature review, case study on a selected factory, and questionnaires were used to determine the essential features included in the developed system. The developed system consists of two mathematical models, an algorithm and a computer program to determine the optimum layout solutions that minimize the costs of machine set-ups, machine relocations, material handling, and workload balancing. The developed system is validated using case studies conducted in five apparel manufacturing factories that are currently producing fast fashion apparels. According to the validation results, the developed system is capable of achieving significant cost saving percentages compared to current state in the selected factories.

Key words: fast fashion, layout planning, dynamic cellular manufacturing system

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LIST OF ABBREVIATIONS

Abbreviation	Description
CFP	Cell Formation Problem
CMS	Cellular Manufacturing System
DCFP	Dynamic Cell Formation Problem
DCMS	Dynamic Cellular Manufacturing System
EDB	Export Development Board
GL	Group Layout
GS	Group Scheduling
GT	Group Technology
KWC	Kilbridge and Wester Column
LCR	Largest Candidate Rule
MGI	Machine Group Identification
MMD	Multi/Mixed Model Deterministic
MMS	Multi/ Mixed Model Stochastic
MPS	Master Production Schedule
MTM	Method Time Measurement
PF/MG	Product Families/Machine Grouping
PFI	Product Family Identification
PMTS	Predetermined Motion Time System
RPW	Ranked Positional Weight
SCMS	Static Cellular Manufacturing System
SMD	Single Model Deterministic
SMS	Single Model Stochastic
SMV	Standard Minute Value

TMU	Time Measurement Unit
UALBP	U-shaped Assembly Line Balancing Problem
UK	United Kingdom
US	United States
WIP	Work In Progress

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