Contents

Certificate i
Abstract iii
Acknowledgements v
List of Tables xi
List of Figures xiii
Chapter 1: INTRODUCTION 1
1.1 Need for Inventory Management 1
1.2 Multi-Item Inventory 3
1.3 Retail Multi-Item Inventory Management with Purchase Dependency 3
1.4 Organization of the Thesis 5
Chapter 2: LITERATURE REVIEW 7
2.1 Managing Multi-Item Inventory 7
2.1.1 Retail Inventory Management 12
2.1.2 Demand Dependency in Multi-Item Inventory Management 18
2.1.3 Classification and Clustering for Multi-Item Inventory Management 19
2.2 Data Mining for Multi-Item Inventory Management 20
2.2.1 Data Mining Techniques 21
2.2.2 Data Mining Applications in Multi-Item Inventory Management 24
2.3 Literature Gap 25
2.3.1 Applying Traditional Techniques to find Purchase Dependencies 25
2.3.2 Problem Identification 27
Chapter 3: OBJECTIVES, SCOPE AND METHODOLOGY 29
3.1 Objectives of the Research 29

3.2 Scope of the Research 30 3.3 Methodology 31 **PURCHASE** DEPENDENCY DEPICTED BY Chapter 4: RULE **EXTRACTED THROUGH DATA MINING 35** 4.1 Consumer Insight Mining 35 4.2 Purchase Dependency in the context of Inventory Management 36 4.3 Modelling for Retail Multi-Item Inventory Management in the context of Purchase Dependencies 37 4.4 Purchase Dependency depicted by Rule Extracted through Data Mining 39 4.4.1 Purchase Dependency depicted by Association Rule 39 4.4.1.1 Illustration of the Procedure for Examining an Association Rule 41 4.4.1.2 Analysis & Result 50 4.4.2 Purchase of an A-Class Item Depending on the Purchase of an Item of other class 59 4.4.2.1 Numerical Illustration of the Problem 63 4.4.2.2 Procedure for identifying Purchase Dependency of A-class Items on the Items of B or C-class 70 4.4.2.3 Experimental Results and Discussions 70 Chapter 5: USING PURCHASE DEPENDENCY FOR RETAIL MULTI-**ITEM INVENTORY MANAGEMENT 75** 5.1 A Generic Procedure for Designing Inventory Replenishment Policy in the context of Purchase Dependency 76 5.1.1 Detailed Procedure 76

.... 79

5.1.1.1 Converting Random Numbers into Transaction or Demand Data

5.1.1.2 Simulating Inventory Replenishment Policies with Generated
Future Demand Data 81
5.1.1.3 Comparison of Performance of Inventory Replenishment Policies
82
5.1.2 Working with various Replenishment Policies in Multi-Item Inventory with
Purchase Dependency 82
5.1.2.1 Inventory Replenishment Policies based on Individua
Replenishment of Associated Items 84
5.1.2.2 Inventory Replenishment Policies based on Joint Replenishment o Associated Items 85
5.1.3 Experimental Results 88
5.1.3.1 Generation of Past Transaction Data and Future Demand Data 88
5.1.3.2 Setup for Simulation 90
5.1.3.3 Individual Replenishment Policies 92
5.1.3.4 Joint Replenishment Policies 94

- 5.1.4 Results & Discussion 96
- 5.2 Designing Inventory Replenishment Policy in Retail Sale with Customer Profile-Induced Purchase Dependency 98
- 5.3 Designing Inventory Replenishment Policy for Kismis and Basmati in a Retail Store $\dots 107$

Chapter 6: A TECHNIQUE FOR MINING QUANTITATIVE ASSOCIATION RULE 111

- 6.1 Quantitative Association Rule 113
- 6.2 Procedure for Mining Generalized Quantitative Association Rules with Discrete Quantities 116

- 6.3 Mining Quantitative Association Rules from Sale Transaction Data of Kismis and Basmati 122
- 6.4 Relevance of Quantitative Association Rule for depicting Purchase Dependency
 124

Chapter 7: CONCLUSIONS AND SCOPE FOR FUTURE WORK 127

- 7.1 Review of the Research 127
- 7.2 Implications of the Research 128
- 7.3 Contributions of the Thesis 129
- 7.4 Limitations 130
- 7.5 Scope for Further Research 131

PUBLICATIONS OUT OF THIS WORK 133

REFERENCES 135