

LIB/2016/1106/2016
IT 01/132

Feasible Solution for Newspaper Circulation and Sales Forecasting in Sri Lankan Newspaper Industry

Sisuru Sahmith Kekiriwaragodage

139167P

LIBRARY
UNIVERSITY OF MORATUWA, SRI LANKA
MORATUWA

Dissertation submitted to the Faculty of Information Technology,
University of Moratuwa, Sri Lanka for the partial fulfillment of the requirements of
the Master of Science in Information Technology.

April 2016



004 *16"
004-(0-13)

TH 3167

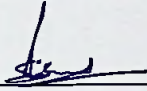
Soft copy contents in
a compact DVD
(Acc. TH3160 - TH3180)

TH 3167

Declaration

I declare that this thesis is my own work and has not been submitted in any form for another degree or diploma at any university or other institution of tertiary education. Information derived from the published or unpublished work of others has been acknowledged in the text and a list of references is given.

Name of Student: Sisuru Shamith Keiriwaragodage

Signature of the Student: 

Date: ~~15/03/2016~~ 28/04/2016

Supervised by:

Name of Supervisor: Dr. Lochandaka Ranathunga

Signature of Supervisor: ***UOM Verified Signature***

Date: 28/04/2016

Dedication

I would dedicate this thesis to my beloved parents who have never failed to give me a tremendous support, for giving all not only throughout my project but also throughout my life. As well they teach me that even the largest task can be accomplished if it is done one step at a time.

Acknowledgement

I wish to express my eternally grateful and gratitude to my project supervisor Dr. Lochandaka Ranathunga who untiringly shared his knowledge, precious guidance, encouragement, advices and help given to complete the project successfully. Also I am thank to Prof A.S Karunananda and my project coordinator Mr. Saminda Premarathne who gave me guidance and advices to complete the project successfully.

I am also grateful to Air Vise Marshal Lal Perera (Deputy General Manager Sales and Marketing - The Associated Newspapers of Ceylon Ltd) and his staff, Mr. Kapila Kumara (Head of Information Technology- The Associated Newspapers of Ceylon Ltd) and his staff who spared their valuable time with me in sharing their knowledge and experience about Newspaper Circulation/Distribution Process.

Importantly I would like to thank my parents for the encouragement and undying support not only throughout my project but also throughout my life.

Finally, the support of University of Moratuwa is also sincerely acknowledged.

Thank you.

Abstract

Newspaper is a one of the key mass media news provider in Sri Lankan society. Newspaper is perishable item that valued only one day. Therefore, newspaper publishing companies need to print accurate quantity of copies of newspapers and deliver the sales point on-time, maintain the minimum returns without oversupply or shortage supply to the market. By this newspaper publishers can enjoy high profitability and reduce unnecessary publishing cost. Therefore, companies need smooth circulation process and accurate newspaper forecasting solution. This research project main objective is to introduce a newspaper circulation system and sales forecasting system in Sri Lankan newspaper industry. Research introduced a web base solution for handling newspaper circulation that include newspaper issuing, returns handling and mode of payment. Circulation system developed PHP scripting language and MySQL used for database. Developing this Circulation system research is used in Waterfall model. This research develop a newspaper sales forecasting solution by using data mining techniques such as classification, prediction and time series regression techniques which will be used to analyse and forecast newspaper sales time dependent data points such as paper wise forecasting in next month issue, customer wise issue, district wise issue, city wise issue etc; on the other hand, newspaper company can identify movement of newspaper buyers between agencies, seasonal changes in demand between newspapers and identify sales patterns regarding to agencies, newspapers, district and nationally wise ; This research use popular Weka (Waikato Environment for Knowledge Analysis) software for time series analysis and its allows to create forecasting models, evaluating and visualizing the results. Finally this research developed Newspaper circulation system that handles by the main circulation process. Evaluation of the sales forecasting this research identified the Linear Regression is most suitable method for forecasting the newspaper sales forecasting. However, Linear Regression and SMO Regression methods can be used for forecast city wise and agent wise newspaper sales, as well as this research identified the sales patterns that help to make management decision. By using this system Newspaper companies may reduce their unnecessary cost relating to Newspaper sales and distribution.

Table of Contents

Chapter 1	1
Introduction	1
1.1 Introduction.....	1
1.2 Background and Motivation	1
1.3 Aims and Objectives.....	4
1.4 About Solution.....	4
1.5 Structure of dissertation	6
1.6 Summary.....	6
Chapter 2	7
Present Learning of the Newspaper Circulation and Sales Forecasting	7
2.1 Introduction.....	7
2.2 Background Literatures.....	7
2.3 Background of the Company	13
2.4 Summary	13
Chapter 3	14
Technologies Use for Developing Newspaper Circulation and Sales Forecasting System	14
3.1 Introduction.....	14
3.2 About PHP	14
3.3 About MySQL	15
3.4 WAMP Server.....	16
3.5 Preprocessing	16
3.6 Forecasting Techniques	17
3.7 WEKA Data Mining Software.....	17
3.8 Evaluation Techniques.....	19
3.9 Summary	21
Chapter 4	22
Approach for Developing Newspaper Circulation and Sales Forecasting System ...	22
4.1 Introduction.....	22
4.2 Approach of the System Development	22
4.3 Circulation Module Development.....	23

4.4 Sales Forecasting Module development	24
4.5 Summary	26
Chapter 5	27
Design of Newspaper Circulation and Sales Forecasting System.....	27
5.1 Introduction.....	27
5.2 System Design	27
5.3 Circulation Module	32
5.4 Newspaper Sales Forecasting Module	35
5.5 Summary	38
Chapter 6	39
Implementation Process of Propose Solution	39
6.1 Introduction.....	39
6.2 Circulation Module Implementation.....	39
6.3 Forecasting Module implementation	41
6.4 Summary	42
Chapter 7	43
Assessment of the Newspaper Circulation and Sales Forecasting System	43
7.1 Introduction.....	43
7.2 Evaluation of the Newspaper Circulation System	43
7.3 Evaluation of the Newspaper Sales Forecasting System	53
7.4 Summary	98
Chapter 8	99
Conclusion and Future Work	99
8.1 Introduction.....	99
8.2 Achievement	99
8.3 Limitations and Future work.....	102
8.4 Summary	102
References	103
Appendix	107



List of Figures

Figure4. 1: Waterfall Model	23
Figure5. 1: Top Level Design for Newspaper Circulation and Sales Forecasting System	27
Figure5. 2: Level 0 Data Flow Diagram for Newspaper Circulation and Sales Forecasting System	28
Figure5. 3: Level 1 Data Flow Diagram for Newspaper Circulation and Sales Forecasting System	29
Figure5. 4: Level 2 Data Flow Diagram for Payment Module	30
Figure5. 5: Use Case Diagram for Newspaper Circulation and Sales Forecasting System	31
Figure5. 6: Entity Relationship Diagram for Circulation Module	34
Figure5. 7: Top Level Design for Newspaper Sales Forecasting Module	35
Figure5. 8: Newspaper Forecasting Module Expected Outputs	36
Figure6.1 Sample ARFF File	41
Figure7. 1 Forecasting Result of Daily News- Agent 1107	55
Figure7. 2 Forecasting Result of Sunday Observer- Agent 1107	55
Figure7. 3Forecasting details of Dinamina- Agent 1107	56
Figure7. 4 Forecasting details of Silumina- Agent 1107	56
Figure7. 5 Forecasting details of Tinakaran- Agent 1107	57
Figure7. 6 Forecasting details of Tinakaran Varamangari-Agent 1107	57
Figure7. 7 Sales Variance in 2012 to 2014	94
Figure7. 8 Weekday paper Sales in 2012 to 2014	95
Figure7. 9 Weekend Newspaper Sales in 2012 to 2014	95
Figure7. 10 Colombo Inner District Sales in 2012 to 2014	96
Figure7. 11 Colombo 6 Sales in 2012 to 2014	96
Figure7. 12 Agent 1107 Sales in 2012 to 2016	97
Figure7. 13 Cross Customer Sales changers in 2012 to 2014	97

List of Tables

Table 2.1 Summarized Forecasting issues in Literatures	12
Table 7. 1 Selected Sample	54
Table 7. 2 Forecasting Results of Daily News-Agent 1107	55
Table 7. 3 Forecasting Result of Sunday Observer- Agent 1107	55
Table 7. 4 Forecasting Result of Dinamina- Agent 1107	56
Table 7. 5 Forecasting details of Silumina- Agent 1107	56
Table 7. 6 Forecasting details of Tinakaran- Agent 1107	57
Table 7. 7 Forecasting Details of Tinakarn Varamanjari- Agent 1107	57
Table 7. 8 Performance Comparison with Forecasting Output Agent1107	58
Table 7. 9 Performance Comparison with Forecasting Output Agent1118	59
Table 7. 10 Performance Comparison with Forecasting Output Agent1374	60
Table 7. 11 Performance Comparison with Forecasting Output Agent 2221	61
Table 7. 12 Performance Comparison with Forecasting Output Agent 3117	62
Table 7. 13 Performance Comparison with Forecasting Output Agent 4128	63
Table 7. 14 Performance Comparison with Forecasting Output Agent 5166	64
Table 7. 15 Performance Comparison with Forecasting Output Agent 6107	65
Table 7. 16 Performance Comparison with Forecasting Output Agent 7122	66
Table 7. 17 Performance Comparison with Forecasting Output Agent8329	67
Table 7. 18 Performance Comparison with Forecasting Output Agent Average	68
Table 7. 19 Performance Comparison with Forecasting Output City Ampara	69
Table 7. 20 Performance Comparison with Forecasting Output City Anuradhpura	70
Table 7. 21 Performance Comparison with Forecasting Output City Colombo 6	71
Table 7. 22 Performance Comparison with Forecasting Output City Galle	72
Table 7. 23 Performance Comparison with Forecasting Output City Jaffna	73
Table 7. 24 Performance Comparison with Forecasting Output City Kaduwela	74
Table 7. 25 Performance Comparison with Forecasting Output City Kandy	75
Table 7. 26 Performance Comparison with Forecasting Output City Kegalle	76
Table 7. 27 Performance Comparison with Forecasting Output City Kurunagala	77
Table 7. 28 Performance Comparison with Forecasting Output City Monaragla	78
Table 7. 29 Performance Comparison with Forecasting Output City Average	79

Table 7. 30 Performance Comparison with Forecasting Output Ampara District	80
Table 7. 31 Performance Comparison with Forecasting Output Anuradhapura District	81
Table 7. 32 Performance Comparison with Forecasting Output Colombo inner District	82
Table 7. 33 Performance Comparison with Forecasting Output Colombo Outer District	83
Table 7. 34 Performance Comparison with Forecasting Output Galle District	84
Table 7. 35 Performance Comparison with Forecasting Output Jaffna District	85
Table 7. 36 Performance Comparison with Forecasting Output Kandy District	86
Table 7. 37 Performance Comparison with Forecasting Output Kegalle District	87
Table 7. 38 Performance Comparison with Forecasting Output Kurunagala District	88
Table 7. 39 Performance Comparison with Forecasting Output Monaragal District	89
Table 7. 40 Performance Comparison with Forecasting District Average	90
Table 7. 41 Performance Comparison with Forecasting Output Island Wide	91
Table 7. 42 2015 Newspaper actual issue and Variances in island wide sales	93