

# Conclusion and Future Work

### 8.1 Introduction

Previous chapter contain the evaluation details about the newspaper circulation and sales forecasting system. This Chapter contains the overall achievement of this research, limitation and future woks of the project.

### 8.2 Achievement

Newspaper is a one of the key news providing source in the Sri Lankan society. Due to technology development today most of electronic mass media is popular but still newspaper played significant role in Sri Lankan as well as in global 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. Considering matter this reach project mainly focused to develop feasible solution for newspaper circulation and sales forecasting in Sri Lankan Newspaper Industry. To introduce this solution this research project selected The Associated Newspapers of Ceylon Limited, one of the key newspaper publishers in Sri Lanka. Address the research problem this research introduced web based solution for newspaper circulation. Newspaper circulation has three main processes such as newspaper issuing, return collection and payment collection. Propose solution have two modules such as circulation module and forecasting module. In Circulation module have three sub modules. Such as newspaper issue handling module, newspaper returns handling module and payment handling module. Three modules integrated together and it's generated several reports that need to Circulation Departments such as issue details reports, paper dispatch reports and customer outstanding report etc; this web base solution developed by using PHP server side scripting language and MySQL RDBMS used for Database

handling and WAMP server used for web server. Most of these technologies open source freely available tools. Forecasting module is other main module in this solution. Newspaper sales forecasting in day by day consider as time dependable matter. Therefore, this research plans to use time series analysis to forecast the data. This reach used data set that contains net sales value of particular paper in particular month under particular customer. This research used past three years sales data to forecast.

Data Preprocessing is a most importance and it remove garbage values in the dataset. Weka (Waikato Environment for Knowledge Analysis) is data mining software developed at University of Waikato, New Zealand by using Java. This software containing collocation of machine learning algorithms that using data mining such as data pre- processing, classification, regression clustering, association rules and visualization. From Weka version 3.7.3(=> 3.7.3) this data mining software facilitated to developed, evaluated and visualized the time series analysis based forecasting models. Weka 3.7.13 data mining tool that include time series forecasting package that allowed to perform time series related forecasting mechanism, by using Gaussian, Linear Regression, Multilayer Preceptron Regression and SMO Regression and predict the newspaper sales forecasting. Then use of testing and evaluation algorithms that available in Weka, (Mean Squared Error (MSE), Mean Absolute Error (MAE), Root Mean Squared Error (RMSE) and Relative Absolute Error (RAE)) researcher identify more accurate forecasting technique is Linear Regression that use for newspaper sales forecasting. However, Linear Regression and SMO Regression can used for sales forecast in customer wise or city wise. Used of selected technique this system forecast various outputs that needed by publishing company. Most of research conducts only for forecasting but this research considers both forecasting and circulation of the newspapers. Use of this solution publishing companies can transfer forecasting data to the circulation system.

The main objective of this research is to find out feasible solution for handle Newspaper Circulation process and develop Newspaper Sales Forecasting solution for Sri Lankan Newspaper Industry. To achieve this main objective, this research has following sub objectives. Such as,

- Identify current process of newspaper circulation.
- Identify the issues of current circulation process. Circulation process includes newspaper sales, Newspaper return handling and the payment collections.
- Introduces feasible solution for handle newspaper circulation.
- Identify individual customer's sales, returns, payments and outstanding details.
- Introduces accurate sales forecasting solution and identifying the sales patterns in Sri Lankan newspaper industry,
- Reduced unnecessary cost for newspaper returns and wastage of newspaper printing.

Achieved the first two objectives this research used interviews and observation techniques for gather information. Then identify the process of the circulation process and current issues of the process. Address this issues researcher then design system. Circulation process has three sub processes such as newspaper issue, newspaper returns and payment handling.

Then address the issues researcher developed the web base solution. PHP use as quarry lunge, MYSql for data base. This system has three main module for handling issues, retunes and payments. In addition maintain customer master file. After developing the system, researcher tests the system by using test cases. Finally evaluate system run smoothly handle newspaper sales, returns, payments and outstanding details.

This research achieved final two objectives by using sales forecasting module. After developing the data set in monthly basis sales details this research used the Weka data mining software and predict result by using several forecasting techniques such as Gaussian, Linear Regression, Multilayer Preceptron Regression and SMO Regression. Consider the prediction results and actual as well as output of the evaluation algorithms that build in Weka (Mean Squared Error (MSE), Mean Absolute Error (MAE), Root Mean Squared Error (RMSE) and Relative Absolute Error (RAE)) this research identified the most suitable algorithms for newspaper sales forecasting. Therefore, researcher identified Linear Regression is most suitable techniques for newspaper sales forecasting. However, forecast the city and customer wise newspaper sales both Linear Regression and SMO Regression method can be used.

Use of this accurate techniques company can reduce the unnecessary cost regarding to newspaper printing and distribution, it helps to company gain profit.

Finally this research identified some patterns for newspaper sales that help for decision making for company management. That include paper wise demand changers, customer wise changers, district wise as well as nation wise changers can be identified. Use of these patterns company management can make effective decisions for newspaper sales, promotions, cost management etc;

### **8.3 Limitations and Future work**

This research mainly focuses to forecast the accurate sales prediction. Therefore, this research tries to predict day by day sales forecast. However, currently Company gathers returns in monthly basis, therefore, identify returns in date is difficult. Based on that this, research cannot predict the sales in particular date. This was the main limitation.

Increase the accuracy of this forecasting method future researchers may use data related to the day as well as may used large data set. As well as researchers may find out more sales patterns that helps to decision making to the company management.

### **8.4 Summary**

This chapter considers the overall achievement of the project as well this chapter describes limitation and future work related to this project.

## References

- [1] Wikipedia.org. "Newspaper" ..[Online]. Available: <http://en.wikipedia.org/wiki/Newspaper> . [Accessed: 31-01-2015 ].
- [2] Central Bank of Sri Lanka. "SOCIO- Economic services" in *Economic and Social Statistics of Sri Lanka 2014*, vol. XXXVI. Colombo 1: Statistics Department Central Bank of Sri Lanka, 2014, p.160.
- [3] Wikipedia.org. "List of Newspapers in Sri Lanka" ..[Online]. Available: [http://en.wikipedia.org/wiki/List\\_of\\_newspapers\\_in\\_Sri\\_Lanka](http://en.wikipedia.org/wiki/List_of_newspapers_in_Sri_Lanka). [Accessed: 31-01-2015 ].
- [4] Cyber College.com. 'newspapers' .. [Online]. Available: <http://www.cybercollege.com/frtv/newsp1.htm>. [Accessed: 31-01-2015 ].
- [5] Rootsweb.ancestry.com. 'Newspapers in Ceylon'. [Online]. Available: <http://www.rootsweb.ancestry.com/~lkawgw/newsceylon.htm>. [Accessed: 31-01-2015 ].
- [6] G. İncesu, B. Aşıkil, and M. Tez, "Sales Forecasting System for Newspaper Distribution Companies in Turkey," *Pak. J. Stat. Oper. Res.*, vol. 8, no. 3, pp. 685–699, 2012.
- [7] Granger, C.W., Newbold, P., 1974. Spurious regressions in econometrics. *J. Econom.* 2, 111–120.
- [8] L. Hetemäki and M. Obersteiner, "US newsprint demand forecasts to 2020," *Int. Inst. Appl. Syst. Anal. ILASA Interim Rep. IR-01-070*, 2001.
- [9] T. Heskes, J.-J. Spanjers, B. Bakker, and W. Wiegerinck, "Optimising newspaper sales using neural-Bayesian technology," *Neural Comput. Appl.*, vol. 12, no. 3–4, pp. 212–219, Dec. 2003.
- [10] M. K. Calli and M. Weverbergh, "Forecasting newspaper demand with censored regression," *J. Oper. Res. Soc.*, vol. 60, no. 7, pp. 944–951, 2008.
- [11] K. Joreskog, "Censored Variables and Censored Regression." Scientific Software International, 2002.

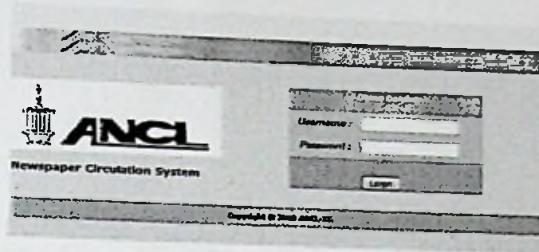
- [12] T. Ragg, W. Menzel, W. Baum, and M. Wigbers, "Bayesian learning for sales rate prediction for thousands of retailer," *Elsevier Sci.*, vol. 43, pp. 27–144, 2002.
- [13] C. Napagoda, "Web Site Visit Forecasting Using Data Mining Techniques," *Int. J. Sci. Technol. Res.*, vol. 2, no. 12, pp. 170–174, 2013.
- [14] R. Kumar and A. Balara, "Time Series Forecasting Of Nifty Stock Market Using Weka," *JRPS Int. J. Res. Publ. Semin.*, vol. 05, no. 02, Mar. 2014.
- [15] S. Singhal and M. Jena, "A Study on WEKA Tool for Data Preprocessing, Classification and Clustering," *Int. J. Innov. Technol. Explor. Eng. IJITEE*, vol. 2, no. 6, pp. 250–253, 2013.
- [16] K. K. Sureshkumar and N. M. Elango, "An Efficient Approach to Forecast Indian Stock Market Price and their Performance Analysis," *Int. J. Comput. Appl.*, vol. 34, no. 5, pp. 4103–5942, 2011.
- [17] M. Kannan, S. Prabhakaran, and P. Ramachandran, "Rainfall Forecasting Using Data Mining Technique," *Int. J. Eng. Technol.*, vol. 2, no. 6, pp. 397–401, 2010.
- [18] P. Guhathakurta, "Long lead monsoon rainfall prediction for meteorological subdivisions of India using deterministic artificial neural network model," *Meteorol. Atmospheric Phys.*, vol. 101, no. 1–2, pp. 93–108, Sep. 2008.
- [19] P. Perez, M. P. Frias, M. D. Perez-Godoy, A. J. Rivera, M. J. del Jesús, M. Parras, and F. J. Torres, "An study on data mining methods for short-term forecasting of the extra virgin olive oil price in the Spanish market," in *Hybrid Intelligent Systems, 2008. HIS'08. Eighth International Conference on*, 2008, pp. 943–946.
- [20] Lake House.lk.  
 'Publication'.2014.[Online].Available:<http://www.lakehouse.lk/main/#>.  
 [Accessed: 31-01-2015 ].
- [21] L.Welling and T. Thomson, *PHP and MySQL Web Development*, Third edition, Indianapolis, Indiana: Sams Puublishing, 2005, pp. 2-7.
- [22] Webopedia.com. 'PHP'.. [Online]. Available:  
<http://www.webopedia.com/TERM/P/PHP.html> . [Accessed: 22-07-2015 ].

- [23] Webopedia.com. 'WAMP',. [Online]. Available:  
<http://www.webopedia.com/TERM/W/WAMP.html> . [Accessed: 22-07-2015 ].
- [24] Pentaho.com. 'Time Series Analysis and Forecasting with Weka',. [Online]. Available:  
<http://wiki.pentaho.com/display/DATAMINING/Time+Series+Analysis+and+Forecasting+with+Weka> . [Accessed: 01-11-2015 ].
- [25] Waikato.ac.nz. 'Weka 3: Data Mining Software in Java',. [Online]. Available:  
<http://www.cs.waikato.ac.nz/ml/weka/> . [Accessed: 01-11-2015 ].
- [26] K. Driessens and R. Bouckaert. *Class GaussianProcesses* [Online]. Available:  
<http://weka.sourceforge.net/doc.dev/weka/classifiers/functions/GaussianProcesses.html> . [Accessed: 05-11-2015].
- [27] M. Ware. *Class Multilayer* [Online]. Available:  
<http://weka.sourceforge.net/doc.dev/weka/classifiers/functions/MultilayerPerceptron.html> . [Accessed: 05-11-2015].
- [28] E. Frank and L.Trigg. *Class LinearRegression* [Online]. Available:  
<http://weka.sourceforge.net/doc.stable/weka/classifiers/functions/LinearRegression.html> . [Accessed: 05-11-2015].
- [29] R. Bouckaert. *Class SMOreg* [Online]. Available:  
<http://weka.sourceforge.net/doc.stable/weka/classifiers/functions/SMOreg.html> . [Accessed: 05-11-2015].
- [30] Vernier.com. 'What are Mean Squared Error and Root Mean Squared Error',. [Online]. Available: <http://www.vernier.com/tit/1014/> . [Accessed: 06-11-2015].
- [31] Eumetcal.org, 'Mean Absolute Error (MAE) and Mean Squared Error (RMSE)',. [Online]. Available:  
<http://www.eumetcal.org/resources/ukmeteocal/verification/www/english/msg/vercontvar/uos3/uos3ko1.htm> . [Accessed: 06-11-2015].
- [32] Gepsoft.com. 'Relative Absolute Error',. [Online]. Available:  
<http://www.gepsoft.com/gxpt4kb/Chapter10/Section2/SS15.htm> [Accessed: 06-11-2015].

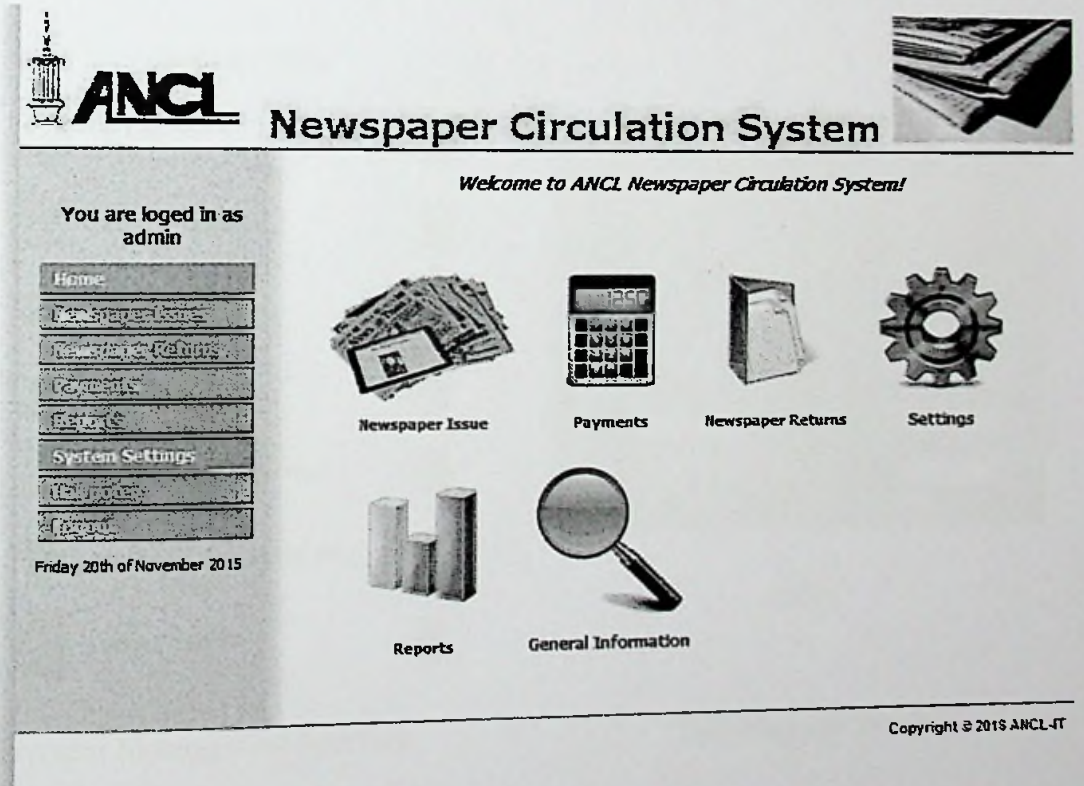


- [33] Tutorialspoint.com, 'SDLC-Overview', 2015. [Online]. Available: [http://www.tutorialspoint.com/sdlc/sdlc\\_overview.htm](http://www.tutorialspoint.com/sdlc/sdlc_overview.htm) .[Accessed: 06-11-2015].
- [34] Tutorialspoint.com, 'SDLC-Waterfall Model', 2015. [Online]. Available: [http://www.tutorialspoint.com/sdlc/sdlc\\_waterfall\\_model.htm](http://www.tutorialspoint.com/sdlc/sdlc_waterfall_model.htm) . [Accessed: 06-11-2015].





System Login Interface



Home Page

### Newspaper Issue Management



Issue Newspapers



Edit Issue Newspapers



Delete Issue Newspapers



Issue Details



Label Print and Despatch Report



RE-Issue Newspapers (Weekly)



### Issue Management Interface

Newspaper Issue			
Customer ID	<input type="text"/>	Issue Date	<input type="text"/>
School Name	<input type="text"/>	Issue Month	<input type="text"/>
		Newspaper Name	<input type="text"/>
Number of Copies Issue	<input type="text" value="50"/>	Number of Free Copy Issue	<input type="text" value="30"/>
		Cancel	Save

Continue

Back

### Newspaper Issue Interface

### Newspaper Payments



Payments



Edit Paper Payments



Unidentified Payments



Payment Details



Payment Details (Paper Wise)



Payment Details (Customer Wise)



Payment Reports



### Payment Management Interface













Newspaper Payments			
Customer ID	<input type="text"/>	Issue Month	<input type="text"/>
School Name	<input type="text"/>	Payment Mode	Cash
Issue Value	<input type="text"/>	Payment (in Rupee)	<input type="text"/>
Return Value	<input type="text"/>		<input type="text"/>
Receipt No	<input type="text"/>	Location	Head Office
Payment date	20/11/2015	Signature	<input type="text"/>
		Cancel	Save

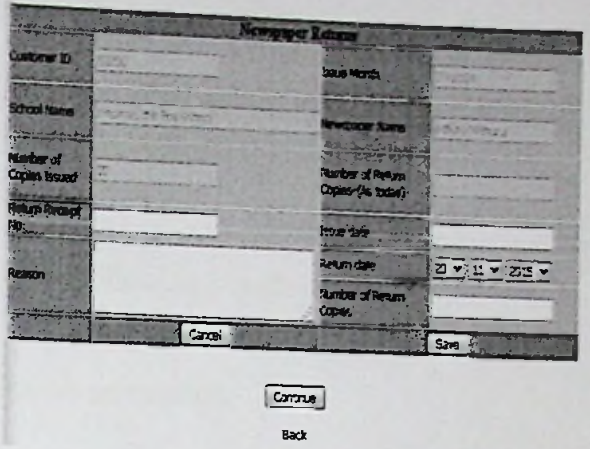
Continue

Back

### Add Payment Details

### Newspaper Returns

-  Return Newspapers 
-  Edit Return Newspapers 
-  Delete Returns 
-  Unidentified Returns 
-  Return Details 
-  Customerwise Return Report 



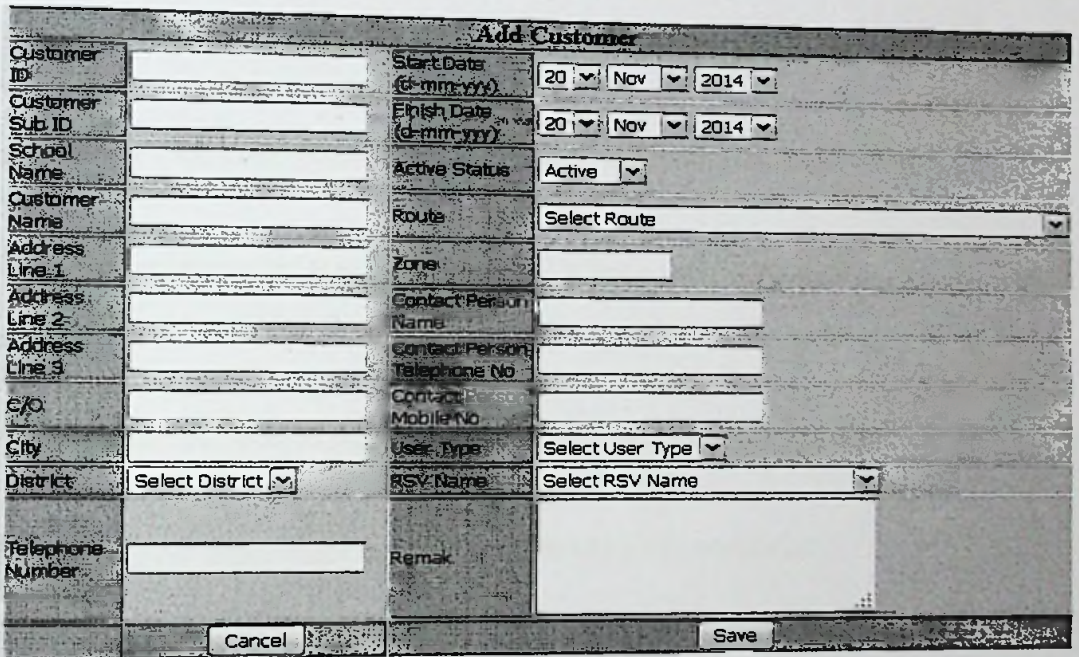
The screenshot shows a 'Newspaper Returns' form with the following fields:

- Customer ID
- School Name
- Member of Copies Issued
- Return Receipt No.
- Reason
- Issue Month
- Newspaper Name
- Number of Return Copies (As Issued)
- Issue Date
- Return Date (dropdown: 20, 11, 2015)
- Number of Return Copies

Buttons: Cancel, Save, Continue, Back

Return Management Interface

Add Return Details



The screenshot shows an 'Add Customer' form with the following fields:

- Customer ID
- Customer Sub ID
- School Name
- Customer Name
- Address Line 1
- Address Line 2
- Address Line 3
- G/O
- City
- District (dropdown: Select District)
- Telephone Number
- Start Date (d-m-yy): 20 Nov 2014
- Finish Date (d-m-yy): 20 Nov 2014
- Active Status (dropdown: Active)
- Route (dropdown: Select Route)
- Zone
- Contact Person Name
- Contact Person Telephone No.
- Contact Person Mobile No.
- User Type (dropdown: Select User Type)
- RSV Name (dropdown: Select RSV Name)
- Remark

Buttons: Cancel, Save

Customer Details Input Interface

## Interview questionnaire

This interview guide prepare for the achieve following objectives

- Identify current process of newspaper circulation.
  - Identify the issues of current circulation process. Circulation process includes newspaper sales, Newspaper return handling and the payment collections.
- 1) What are the major functions exists in Circulation Department?
  - 2) What are the main processes being present in above-mentioned functions?
  - 3) What are the issues that you are facing in this existing process?
    - a) How you solved those issues?
  - 4) What are the benefits that you're gained by the existing processes?
  - 5) Is that your department users familiar to basic IT operations?