Chapter 3
Demands and Sales Forecasting for Retailers by Analyzing Google Trends and Historical Data

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ABSTRACT

A supply chain includes several elements such as suppliers, manufacturers, retails, and customers. Forecasting the demands and sales is a challenging task in supply chain management (SCM). The main goal of this research is to create forecasting models for retailers by using artificial neural network (ANN) and to enable them to make accurate business decisions by visualizing future data. Two forecasting models are investigated in this research. One is a sales model that predicts future sales, and the second one is a demand model that predicts future demands. To achieve the mentioned goal, CNN-LSTM model is used for both sales and demand predictions. Based on the obtained results, this hybrid model can learn from very long range of historical data and can predict the future efficiently.

DOI: 10.4018/978-1-7998-3805-0.ch003

1. INTRODUCTION

Every moment, someone is buying something, and someone is selling something. The buyer has concerns about getting the product/service at his/her convenience, and the seller has concerns about fulfilling the demand of the buyer. In a supply chain, the seller needs to know about the market demand and sales information of the products, so he/she could measure a future demand of the products, and prepare inventory beforehand (Martins and Pato, 2019; Kamble et al., 2020).

Artificial Neural Network (ANN) helps supply chain managers to predict these values, and to investigate some topics such as optimization, forecasting, and decision support systems. In this study, ANN is used for forecasting future demands and sales of the stores of a grocery chain. To this aim, the historical sales dataset of the grocery chain and a demand dataset (captured from Google Trends) are utilized.

This book chapter is organized as follows. Section 2 is devoted to the literature review. The methodology is discussed in Section 3. In addition, the results and discussions are provided in Section 4. Finally, conclusions and potential future research are provided in Section 5.

2. LITERATURE REVIEW

Prediction of future demand and sales has been a very helpful tool for business decision-makers. Recently, ANN has gained significant attention in Supply Chain Management (SCM) because of its capability to predict future, to process large datasets, to handle very complex non-linear functions, and for its efficiency and robustness in prediction. ANN is helpful even if the data of the problem is partially present.

There are some researchers who have applied ANN to design their own prediction models to forecast demands and sales. Aburto and Weber (2007) developed an inventory management system for a supermarket and explained a hybrid intelligent model for forecasting demand in SCM. This hybrid model is a combination of autoregressive integrated moving average and neural network models. Yin et al. (2008) introduced an adaptive neural network model that had more accurate forecasting results than the traditional neural network. Amin-Naseri and Tabar (2008) applied a comparative study of various neural network models, and concluded that Recurrent Neural Network (RNN) model has the most precise forecasting results.

Google Trends and searches have been utilized in some investigations. Su (2008) analyzed the impact of the ease of online searches on consumers' online search intentions, and showed that there is a noticeable positive impact of cross-site and in-site searches on both priced and non-priced item searches. Ginsberg et al. (2009)