Chapter 42
Social Media Big Data Analytics for Demand Forecasting: Development and Case Implementation of an Innovative Framework

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ABSTRACT

Social media big data offers insights that can be used to make predictions of products' future demand and add value to the supply chain performance. The paper presents a framework for improvement of demand forecasting in a supply chain using social media data from Twitter and Facebook. The proposed framework uses sentiment, trend, and word analysis results from social media big data in an extended Bass emotion model along with predictive modelling on historical sales data to predict product demand. The forecasting framework is validated through a case study in a retail supply chain. It is concluded that the proposed framework for forecasting has a positive effect on improving accuracy of demand forecasting in a supply chain.

INTRODUCTION

Big data represents a tremendous opportunity for companies, as it can help to make better decisions in an operational, tactical and strategic level (Schroeck, Shockley, Smart, Romero-Morales, & Tufano, 2012), with direct impact on business profitability (Waller & Fawcett, 2013). The ability to draw insights from different types of data creates huge value for a firm (Dijcks, 2013; Kiron & Shockley, 2015). Big data presents a far greater opportunity than what is being utilized. Only 0.5% of big data is being utilized and analysed while there is potential for so much more (Guess, 2015). Bearing in mind this huge potential,

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literature providing empirical evidence of the business value added by big data analytics in a supply chain remains little and even poor (Wamba, 2017).

All supply chain operations and activities are set in motion by the final customers' demand (Syntetos et al., 2016). Demand forecasting is used as a basis to make supply chain strategy (Marshall, Dockendorff, & Ibáñez, 2013) and forecasting weaknesses is one of the main reasons for supply chain failures (Zadeh, Sepehri, & Farvaresh, 2014). Demand Forecasting can be improved significantly by using big data (Chao, 2015), especially the big data from social media (Arias, Arratia, & Xuriguera, 2014). With an increase in social media activity, there has been an emergence of academic and industrial research that taps into these social media data sources. However, the utilization of these data sources remain at an early stage and outcomes are often mixed (Yu, Duan, & Cao, 2013).

Companies face a challenge in forecasting with regards to analysing their historical data in the same breath as big data from social media (Papanagnou & Matthews-Amune, 2017). There has been an increased focus from supply chain practitioners to leverage effects from unstructured big data such as social media data, but there is very little support in terms of empirical evidence (Syntetos et al., 2016). Integration of social media analytics and supply chain management is needed to comprehensively establish 'what can be actually done' in the field of forecasting with the help of analytics. There is a paucity of predictive frameworks for forecasting using social media big data. This paper aims to bridge the gap between traditional forecasting techniques and big data analytics utilization and contributes towards a forecasting platform using social media big data as well as historical sales data.

This work presents a framework to utilize social media big data in Bass-Emotion Model introduced by Fan, Che, & Chen (2017). The proposed framework uses the results of sentiment analysis on Facebook and Twitter for demand forecasting. This work provides empirical evidence on the usage of social media big data for demand forecasting in supply chain management (Choi, 2018; Schaer, Kourentzes, & Fildes, 2018). It is one of the first studies that incorporates word analysis, topic modelling and sentiment analysis to provide social media data parameters to the Bass- Emotion model.

LITERTATURE REVIEW

Big Data Analytics in Supply Chain Management

Diverse, massive and complex data on different domains of business and technology which cannot be efficiently addressed by the traditional technologies, skills, and infrastructure is referred to as big data. Most big data researchers and practitioners in general agree on three dimensions that characterize big data: volume, velocity and variety (Zikopoulos & Eaton, 2011). Big data analytics in supply chain management can be described as applying analytical techniques on big data to facilitate optimization and decision making in a supply chain (Souza, 2014). The use of big data analytics can help us understand 'what has happened, what is happening at the moment, what will happen and why things happen' (Feki & Wamba, 2016 p.1127). Three distinct analytics approaches for answering these questions have been classified as descriptive, predictive, and prescriptive analytics (Hahn & Packowski, 2015). The most valued use of big data analytics in a supply chain is the ability it provides to analysts in predicting a reaction or an event by detecting changes based on current or historical data (Sanders, 2014). The utilization of current data, is very effective in improving a supply chain which is seeing a start in its use now in industry. Amazon has patented 'Anticipatory Shipping' which predicts based on an analysis of previous orders and other