Chapter 3

Use of NLP and SEM in Determining Factors for E-Service Adoption

Arghya Ray
Indian Institute of Management Ranchi, India

Pradip Kumar Bala
Indian Institute of Management Ranchi, India

ABSTRACT

With the emergence of digitalization on a large scale and the increasing penetration of the internet, there has been a need to perform analysis on a real-time basis. With the abundance of information available from various sources, user opinions when captured and analyzed properly can give interesting insights. It also reduces the efforts needed in conducting survey data for testing of any structural model. SEM technique being a “silver bullet” for estimating causal models, in this chapter, the authors have focused on explaining a new avenue of using structured equation modeling (SEM) through use of natural language processing (NLP) techniques on user opinion data available in various social platforms using an example of adoption of e-health services in India.

INTRODUCTION

In the last few decades, there has been an increase in the number of publications in the information systems (IS) area using structural equation modelling (SEM) techniques. The reason can be due to the increase in software packages to perform such covariance based (e.g., LISREL, EQS, AMOS, etc.) and component-based (e.g. PLS-PC, PLS-Graph, etc.) analysis techniques. SEM is a result of the conjunction of two traditions -- an econometric perspective (linear regression models) and a psychometric approach (factor analysis) (Chin, 1988). Though the two most widely used SEM based analytical methods are covariance-based SEM (CB-SEM) and variance-based SEM (Partial Least Square-PLS-SEM), CB-SEM clearly outperforms PLS in terms of parameter consistency and is preferable in terms of parameter accuracy as long as the sample size exceeds a certain threshold (250 observations). However, PLS analysis

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is preferred when the emphasis is on prediction and theory development, as the statistical power of PLS is always larger than or equal to that of CB-SEM (Reinartz, Haenlein, and Henseler, 2009).

Technology-based self-services (e-services) are changing the way in which service providers and consumers interact. This has raised a host of research and practice issues relating to the delivery of e-service (Rowley, 2006). Unlike traditional services, the technological services are not constrained by distance, and hence are convenient. SEM is useful in IS research, where many if not most of the key concepts are not directly observable (Roldán and Franco, 2012). A large portion of IS research during recent years has mainly applied SEM as an analytical methodology for theory testing (Gefen et al., 2000; Gerow et al., 2010). Over the years, SEM methods have been used in several contexts, including exploratory, confirmatory and predictive analysis (Westland, 2010).

But with the emergence of digitalization on a large scale and the increasing penetration of the internet, there has been a need to perform analysis on a real-time basis. SEM technique being a “silver bullet” for estimating causal models (Hair et al., 2014), our aim is to develop a model which can utilize the feedbacks and comments available in the e-service, m-service or web-service pages and feed into the SEM to churn out the most important factors affecting the adoption of the e-service. To the best of our knowledge, though NLP has been used in ontology-based studies, no research has been done on utilizing natural language processing (NLP) techniques in extracting the useful terms from the feedback provided by the customers in various social media pages, the m-service pages and in the webpage to prepare the data set for testing the SEM model. This ontology-based churning of important terms from the feedbacks will enable companies to understand the most important factors, highlighted by the customers, which makes them continue/discontinue the e-service. While the focus is on the adoption of e-services, retention of an e-service also plays an important role in determining the company’s long-term sustainability in the internet-world. Studies by Bain & Company, along with Earl Sasser of the Harvard Business School, have shown that even a 5 percent increase in customer retention can lead to an increase in profits of between 25 and 95 percent (Small Business Trends, 2014). The proposed technique can help to understand the factors affecting the Information System (IS) continuance and also the negative sentiments highlighted by the customers. With the recent advancement in technological innovations, increased competition and marketing dynamics shape ‘market orientation’ (Kohli and Jaworski, 1990; Narver and Slater, 1990), which in turn has forced firms to look into better strategies for technological adoption. Hence, a better understanding of the customer’s feedback can help firms provide better services and hence create better customer bases.

Background

Over the years, numerous research studies have been done both on Structural Equation Modelling (SEM) as well as on analyzing different relationships using SEM. Though in the year 1988, the issues in SEM and opinions on them were discussed (Chin, 1988); Anderson and Gerbing (1988) recommended a two-step approach for using SEM in different analysis. Over the years SEM has gained prominence and is used for analyzing the structural models in various fields, like, psychology (Quintana and Maxwell, 1999; MacCallum and Austin, 2000; Marsh, 2015; Hagger et al., 2018), information systems (Dickinger et al., 2008; Im et al., 2011; Montazemi and Qahri-Saremi, 2015), etc. to cite a few. SEM is now used in almost every field to analyze the model fit and the influence of the predictor variables. Researchers have also worked on different techniques to modify the SEM process to make to even better for solving even complex problems. Some of the notable works are “Effect of the Number of Variables on Measures of