APPLICATION OF BIG DATA AND BUSINESS ANALYTICS

EDITORS

DR. SNEHA KUMARI

DR. K. K. TRIPATHY

DR. VIDYA KUMBHAR

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DR SNEHA KUMARI
Assistant Professor, Vaikunth Mehta National Institute of Cooperative Management, Maharashtra, India

DR K. K. TRIPATHY
I.E.S. Director, Vaikunth Mehta National Institute of Cooperative Management, Maharashtra, India

DR VIDYA KUMBHAR
Deputy Director, Symbiosis Institute of Geoinformatics, Symbiosis International (Deemed University), Maharashtra, India

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About the Editors

Dr Sneha Kumari is a PhD as a full-time Junior Research Fellow from the Symbiosis International (Deemed) University. She has completed her Undergraduate in Agriculture at the Indian Council of Agriculture Research Fellowship and her Masters in Agribusiness Management under Indian Council of Agriculture Research. She has also completed her PGDBA in Human Resource Management and Marketing Management. She is an Assistant Professor at Vaikunth Mehta National Institute of Cooperative Management – a National Institute of Ministry of Agriculture and Farmers Welfare, Government of India. She has a rich experience as Statistical Officer, Researcher and Assistant Professor. She is also associated with different institutes for various educational and research related project assignments. She has published several research papers in the area of big data, agriculture, sustainability in ABDC and Scopus journals and has attended several national and international conferences.

Dr K. K. Tripathy is a PhD from Department of Management Studies of Indian Institute of Technology Delhi on "Micro-finance Management and its Impact on Rural Livelihoods"; Masters in Economics and Bachelor of Law (LLB). He is an Officer of Indian Economic Service (IES), Government of India. He joined the IES in 1999. Prior to joining the IES, he also worked as an Executive Magistrate in the Government of Odisha after joining the Odisha Administrative Service in 1998. He is presently the Director of the Vaikunth Mehta National Institute of Cooperative Management – a National Institute of Ministry of Agriculture and Farmers Welfare, Government of India. During his 21 years of public service, he has served in the Ministry of Human Resource Development (MHRD), Ministry of Agriculture and Farmers Welfare, Ministry of Rural Development, Ministry of Food Processing Industries, Planning Commission and United Nations Development Programme. He has published around 70 research articles and has attended several international and national conferences. His areas of research are rural development, microfinance and agriculture.

Dr Vidya Kumbhar is PhD in Computer studies from Symbiosis International (Deemed University). Her area of specialization includes data science and analytics, software development, big data handling, spatial data mining, spatial decision support system and agro-informatics. She is also associated with different institutes for various educational-related assignments. She has worked on software development projects in National Informatics Centre, Pune and currently working on different research projects funded by government and private organizations. She has published various research papers in National and International Journals and conferences. She is also acting as a reviewer for national and international journals indexed in Scopus and web of science.

Preface

According to Kitchin (2014) Big data is defined as huge volume of structured and unstructured data. Boyd and Crawford (2012) have defined big data's cultural, technological and scholarly phenomenon while Fan, Han, & Liu (2014) have defined big data as the ocean of information.

5 Vs of Big Data

While the term "big data" is relatively new, the act of gathering and storing large amounts of data is characterized by 5 Vs (Jeble, Kumari, & Patil, 2016)

Volume: Organizations collect data from a variety of sources, including business transactions, social media and information from sensor or machine-to-machine data. In the past, storing it would've been a problem – but new technologies (such as Hadoop) have eased the burden.
Velocity: Data streams in at an unprecedented speed and must be dealt with in a timely manner. Radio Frequency Identification (RFID) tags, sensors and smart metering are driving the need to deal with torrents of data in near-real time.
Variety: Data comes in all types of formats – from structured, numeric data in traditional databases to unstructured text documents, email, video, audio, stock ticker data and financial transactions.

At Statistical Analysis System (SAS), two additional dimensions is considered when it comes to big data:

Variability: In addition to the increasing velocities and varieties of data, data flows can be highly inconsistent with periodic peaks. Is something trending in social media? Daily, seasonal and event-triggered peak data loads can be challenging to manage. Even more so with unstructured data.
Veracity: Today's data comes from multiple sources, which makes it difficult to link, match, cleanse and transform data across systems. However, it's necessary to connect and correlate relationships, hierarchies and multiple data linkages or data can quickly spiral out of control.

Big Data and Business Analytics is conceived to provide a platform for academicians and practitioners to identify and explore the solutions to various problems in society, environment and industry using advance analytic tools.

Business analytics is the process of converting data into insights (Xavier, Srinivasan, & Thamizhvanan, 2011). It is "the extensive use of data, statistical and quantitative analysis, explanatory and predictive models, and fact-based management to drive decisions and actions." With the increase in the availability of data, analytics has now become a major element in both the top line and the bottom line of any organization. However, the rate of absorption of analytics in decision-making is slow. This is due to the fact that there are several ambiguities in the definition and scope of analytics (Jeble, Kumari, Venkatesh, & Singh, 2019). An effective use of analytics must grow with time and experience in most individuals. There is much more in analytics besides descriptive data collection and reporting. By 2025 there will be an increasing need for more data analytics to be involved in business. Effective performance management analytics is an integration of IT-based solutions, management accounting applications and analytical methods. Therefore descriptive, predictive and prescriptive analytics are essential for any business.

Use of analytics in better decision-making has evolved since past. In late 1960s technology-based analytics had been the base of the decision support system (Jeble, Kumari, & Patil, 2018). Later in 1987 scanner panel data was used to analyze decision-making in retail shops which was further followed by OLAP, a software analytical tool. In 1990 Enterprise resource planning system became the prime use for analytics in company. This led to the evolution of analytics using internet, e-commerce, mobiles, sensors and software analytical tools. With time Big Data Predictive Analytics has been used in decision-making in different streams. Analytics in big data has been useful in improving the visibility and coordination (Dubey et al., 2018). Businesses can have better decision-making capability with the use and better understanding of data analytics (Agrawal, 2014).

Why is Big Data Important?

The importance of big data doesn't revolve around the availability of data, but the purpose of data. One can take data from any source and analyze it to find answers that enable (1) cost reductions, (2) time reductions, (3) new product development and optimized offerings, and (4) smart decision-making. When big data is combined with high-powered analytics, managerial decisions can be performed such as:

- Determining root causes of failures, issues and defects in near-real time.
- Generating sustainable solutions for any stream.
- Recalculating entire risk portfolios in minutes.
- Detecting fraudulent behavior before it affects any organization.

Application of Big Data and Business Analytics

Big data has been in use by government institutes for forecasting weather patterns, discovering seismic activities that predicts earthquakes and preparing descriptive reports. It has been in use by the Economists to stimulate economic growth.

Big data mining is the patterns in the data that is normally not looked by the users. This unlooked data also leads to several important informations which can make decision-making smooth.

Big data is used in health insurance for predicting customer dissatisfaction through speech to text data from call center recordings (Devenport & Dyche, 2013). Several retail banks have focused on exploiting big data at times of financial crisis for doing a better job.

Linked In has used big data and data scientists to develop product features and product offerings. This has helped the consumers as well as the companies to make decisions about the product.

Google have constantly developed new products and services that have big data algorithms for search. Most of the companies are masters in developing standard reports and multidimensional reports through big data analytics. In many companies, big data is directly focused on products, services and customers. Senior managers have used predictive analytics as the next step in data analytics.

Big data not only allows knowledge discovery efforts but also they need to promote them. The sooner the business executives understand the value of knowledge discovery the better competitor they become. This can lead to high level innovations and high rewards.

Big Data and Business Analytics for Decision-Making

In the current era, world is challenged with demanding customers, high competition, short product lifecycles, rising costs of labor and materials, unemployment and unsustainability. Globalization is making it even more challenging as blurring boundaries among countries create level playing field for selling products and services across the globe. Firms need to make operational, tactical and strategic decisions based on available information. In addition to traditional decision support systems, big data provides additional tools to arrive at decisions.

Big data can provide valuable competitive intelligence (Jeong et al., 2016), help in dramatic cost reductions, substantial improvements and development of sustainable goals for the world.

Objectives

Data Science & Business Analytics will bring together researchers, engineers and practitioners and encompass wide and diverse topics of application in almost every field. It will also invite the participation of scholars, analysts and data scientists to present their ideas, concepts and proof of works indicating application of Big Data and Business Analytics.

Target Audience

The primary target audience of this book includes researchers, academicians and data scientist from a variety of disciplines interested in analyzing and application

of big data analytics. A secondary target audience consists of data analysts, students and scholars pursuing advanced study in big data.

Organization of the Book

The book is organized into eight chapters. A brief description of each of the chapters follows:

Chapter 1 authored by Sneha Kumari, Vidya Kumbhar and K. K. Tripathy analyses and compares the big data on soil parameters of a district with the standards paving a way for mapping the crops with suitability of soil health The major component of agriculture production includes the type of seed, soil, climatic conditions, irrigation pattern, fertilizer, weed control and technology used. Soil is one of the prime elements in modern times for agriculture. Soil is one of the primary and important factors of crop production. The available soil nutrient status and external applications of fertilizers decides the growth of crop productivity. This chapter focuses on the application of soil data on soil health management for sustaining agriculture understanding the causal relationship between soil health parameters, cropping pattern and crop productivity.

Chapter 2 authored by Nilisha Prashant Itankar, Yogesh Patil, Prakash Rao and Viraja Bhat reviews the big data on heavy metals playing a crucial role in the economic development of a nation. Industries utilizing heavy metals, consequently, emanate large volume of metal containing liquid effluents. Since metals are non-renewable and finite resources, their judicious and sustainable use is the key. Hazardous metal laden water poses threat to human health and ecology. Apart from metals, these industrial effluents also consist of toxic chemical. Conventional physical–chemical approach technologies are not efficient enough, consume energy and are thus not cost effective. It is known that biomaterials (i.e., microorganisms, plants & agricultural biomass) have the ability to bind metals, in some cases selectively, from aqueous medium known as "metal biosorption."

Chapter 3 authored by Girish Joshi and Bindya Kohli designs a conceptual framework with clear land bank ownership records in dematerialized form, so that it can be easily maintained and traded like commodities. Secondary data published in the form of previous research work in Geographical Information System and business analytics has been used to analyze the cases on land bank dematerialization. This chapter discusses on practices like digitization of land records, conceptual dematerialization, use of analytical dashboards for analysis of data and associated benefits. This change can help India to transform its land management process and will help to explore commercial utilization of agricultural land and urban land plots for planned development.

Chapter 4 authored by Tihana Škrinjarić presents the potentials of including online search volume data in modeling the demand series of consumer products. Forecasting future demand for products of a company represents one of the important parts of planning and conducting business in general. Thus, the purpose of this chapter is twofold. The first purpose is to give a critical overview of the existing research on the topic of forecasting and now casting demand and

consumption. The other purpose is to fill the gap in the literature by empirically comparing several approaches of modeling and forecasting demand and consumption on real data.

Chapter 5 authored by Vishita Rajesh Khanna analyses and compares variety of tastes in the food industries. For sustaining in such environment companies create their unique selling point and big data helps them to analyze market situation for such purpose. Companies combine big data with technologies like machine learning and artificial intelligence to get faster and more personalized experiences. This can be an opportunity for the food industries to reduce food loss and gain better returns on investment by going for a digital transformation.

Chapter 6 authored by Ritambhara Singh reviews to develop a strong research base for the academia and the industry to understand the importance of data analytics in International trade. This chapter focuses on the case of cotton trade from India and explores different methodologies developed by the World Bank and International Trade Center to analyze the big data available on export and import. Through big data analysis, this chapter finds out the export performance, market demand, export potential and attractive markets for Indian cotton. This chapter also explores the trade competitiveness of Indian cotton over the years. The data through appropriate analysis can address some simple yet complicated questions in trade like what export potential the commodity holds, if the commodity is competitive or not in international market, what are new markets to look up to, and other similar questions. In other words, this information could make huge difference in decision-making of traders and policymakers directly, and farmers indirectly.

Chapter 7 authored by Raj Krishna deals with the big data of Aadhaar Project of the Central Government of India, its features, its impact upon the welfare schemes of government. This chapter paves the way for the Aadhaar scheme.

Chapter 8 authored by Dr Irem Ucal Sari, Duygu Sergi and Burcu Ozkan establishes and presents customer segmentation and RFM analysis first, then a real case application of RFM analysis on customer segmentation for a fuel company. At the end of the application part, possible strategies for the company are generated.

Dr Sneha Kumari
Assistant Professor, Vaikunth Mehta National Institute of Cooperative Management, Pune, India

Dr K. K. Tripathy
I.E.S. Director, Vaikunth Mehta National Institute of Cooperative Management, Pune, India

Dr Vidya Kumbhar
Assistant Professor, Symbiosis Institute of Geoinformatics, Symbiosis International Deemed University, Pune, India

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Foreword

World has generated data in every field giving rise to big data. There is plenty of data everywhere and data storage is becoming critical at present. The importance of big data doesn't revolve around the availability of data, but the purpose of data. Researchers, academicians, policy makers and practitioners are consistently driving ways to find out the application of big data. With so much of data, it is time to understand the big data and how analytics can help in better decision making and manage things. Application of Big Data and Business Analytics at present needs to be explored among academicians, practitioners, policy makers and researchers. The book will have academic and managerial implications to manage the decision-making process. This book explores a number of perspectives on how big data and business analytics can help in better decision making. The book can be an asset for the readers at the present time. The authors from different countries and universities have made a contribution in organizing their research ideas into research chapter meeting the scope of the book. The chapters in the book have been selected carefully, providing a fine balance between trends in big data analytics and it's application in different streams. The chapters have diverse themes in application of big data analytics.

The chapters selected have been classified into Themes like data visualization, multiple aspects of data analytics, predictive analytics, application of data analytics in industry, agriculture and service sector followed by the challenges in digital technologies. The chapter on Customer Segmentation Using RFM Analysis: Real Case Application on a Fuel Company establishes and presents a real case application of RFM analysis on customer segmentation for a Fuel company with possible strategies for the company are generated. The chapter on Applications of Big Data Analytics: A Boon for the Food Industry analyses big data with technologies like machine learning and artificial intelligence to get faster and more personalized experiences generating an opportunity for the food industries to reduce food loss and gain better returns on investment by going for a digital transformation. The chapter on Big Data for Sustainable Rural Development with special reference to MGNREGA addresses the application of big data related to rural employment with special reference to the world's largest public works and wage employment generating poverty alleviation programme – Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) on Rural Development. The authors have done an appreciable work in presenting the applications of big data and business analytics in different managerial decision making. The application of big data can be seen in descriptive, predictive and prescriptive analytics.

All the chapters are topical. The chapters are well-balanced covering the application of big data and business analytics by academicians, researchers, industrial experts, policy makers and practitioners. This book will bring together researchers, engineers and practitioners and encompass wide and diverse topics of application in almost every field. It will also invite the participation of scholars, analysts and data scientists to analyze the application of Big Data and Business Analytics by the contributors from different countries. The book paves a way for the readers to understand how big data can be efficiently utilized in better managerial applications. Dr. Sneha Kumari, Dr. K. K. Tripathy; Vaikunth Mehta National Institute of Cooperative Management and Dr. Vidya Kumbhar, Symbiosis International (Deemed University) have done a commendable job as book editors in making the application of big data analytics research available for a wide audience.

Dr. Lt. Col. Anupama Munshi
Veteran, Faculty and Researcher, India

Dr. Lt. Col. Anupama Munshi (retd) is a doctorate in Management with 17 years of experience in Indian Army in handling big data of entire gamut of Human Resource Development functions , Human Resource Management and Industrial Relations. She has dealt with the application of big data in decision making in the Army. She is an expert in application of big data in designing & implementing training programs to enhance efficiency & motivation levels. She has also applied the big data for imparting teaching and training to officers of Indian Army as well as officers of other armies in subjects like Quality control, Logistics & Supply chain management, Transport management, Tendering and procurement for Defense supplies. She is the First Lady Officer of Indian Army to command an Independent Food Inspection Unit for providing logistics support to a specialized brigade and was first officer of Army Service Corps to be awarded General Officer Commanding in Chief's Commendation card for outstanding service. She has also worked as a Professor in Symbiosis International Deemed University, Pune and is the visiting faculty for many renowned Management Institutes in Pune. She is consistently involved in researches of application of big data in the Indian Army.

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