Hardeep Chahal · Jeevan Jyoti
Jochen Wirtz   *Editors*

Understanding the Role of Business Analytics

Some Applications

Springer

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Foreword

Changes in business environment have created many opportunities as well as uncertainties, which make the role of business research more important for the decision-makers. Since managers have to make quick but accurate decisions in order to sustain the competition, business and service firms require knowledge of advanced research techniques besides the routine projections and trend analyses. Recent research studies have highlighted the growing need for the application of advanced techniques in the business decision-making process as business analytical techniques provide managers with more confidence in dealing with uncertainty despite a flood of available data. In this context, the book edited by Dr. Chahal, Dr. Jyoti, and Dr. Wirtz is an excellent initiative to present the work of eminent researchers from various parts of the world including USA, UK, France, Singapore, Iran, UAE, and India. I have gone through the manuscripts of the contributors. The authors have analysed the data with the help of various analytical techniques like exploratory and confirmatory factor analysis, regression modelling, forecasting, structural equation modelling for better information of managers to take better quality decisions. The book will equip the stakeholders including managers, practitioners, entrepreneurs, researchers, and individuals working in the extant, complex, and uncertain environment with empowered knowledge and skills to use and interpret statistical techniques for attaining sustainable, competitive advantage.

I wish success and best of luck to all who have contributed in making this initiative successful.

Greater Noida, India

Prof. R. D. Sharma
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Preface

To sustain competition in current business environment, managers have to be more decisive to offer high-quality goods/services at cost-effective rates. In addition to the routine projections and trend analyses, they require the knowledge of advanced research techniques to make quick and accurate decisions.

Data in its raw form is usually useless, and the driving force behind any data-driven organization is insights and conclusions drawn from the data, which can suggest a new course of action. In order to draw insights and reach conclusions, managers need analytical tools and techniques to interpret data from various sources and use the results for better decision-making. Further, business analytical tools also help the researchers and academicians in better theory development. Many researchers have claimed that the availability of business analytics has played a great role in converting organizations into high-performance work systems. Companies using these techniques in their decision-making process are in a better position to compete and sustain competitive advantage by minimizing risk, investing in accurate innovations, and above all providing a better picture of what is practically viable and non-viable.

The significance of the analytical needs can be judged from the fact that a significant proportion of high-performance companies have high analytical skills among their personnel. And companies employing data analytical methods and techniques in their decision-making process are in a better position to compete and sustain competitive advantage. Among the various statistical techniques, structural equation models (SEMs), including confirmatory factor analysis, help in both theory building and predictive analysis, and their roles have become more crucial with the advent of big data. Carrying out predictive modelling on large data sets has the potential to generate fresh insights for business practitioners and drive new theories for management researchers. Addressing this need, our efforts in this context are to fill the extant gap and help managers and entrepreneurs in knowledge-based decision-making.

This edited book is a collection of ten chapters covering diverse data analytics topics including a conceptual chapter on big data (Chap. 2) and eleven empirical chapters on various functional areas like finance (Chaps. 3–6), marketing (Chaps. 7 –8), and HR/OB (Chaps. 9–10). The contributors have used basic techniques like correlation, forecasting, and trend analysis and advanced higher order modelling techniques like a gravity model and a panel data quantile-regression, structural equation modelling, mediation analysis, moderation analysis etc. These chapters are going to be very useful to the researchers and practitioners in the application of analytical tools and techniques for better strategic decision-making.

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Acknowledgements

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Dr. Hardeep Chahal is Professor in the Department of Commerce, University of Jammu, India. Her research interests focus on services marketing with an emphasis on consumer satisfaction and loyalty, service quality, brand equity, and market orientation. Her work has been published in refereed international journals like *Managing Service Quality*, *International Journal of Health Care Quality Assurance*, *International Journal of Bank Marketing*, *Journal of Relationship Marketing*, *Journal of Health Management*, *Management Research Review*, *Total Quality Management and Business Excellence*, *Corporate Governance*, *Global Business Review*. She has also co-edited books such as "Sustainable Competitive Advantage: A Road to Success" (Excel India Publishers, New Delhi, 2015), "Research Methodology in Commerce and Management" (Anmol Publications, New Delhi, 2004), and "Strategic Service Management" (Excel Books, New Delhi, 2010). She currently serves on the editorial boards of the *International Journal of Health Care Quality Assurance* (Emerald) and *Journal of Service Research* (IIMT, India). She was Visiting Fellow at the Loughborough University, UK, under Commonwealth Fellowship Scheme (British Academy Award) and also at Gandhi Institute of Business and Technology, Jakarta, Indonesia.

Dr. Jeevan Jyoti is Assistant Professor in the Department of Commerce, University of Jammu, India, and has rich experience in teaching and research in business education. Her areas of interest are strategic human resource management, organizational behaviour, and entrepreneurship. She has publications in reputed international refereed journals such as *Personnel Review*, *Cross Cultural Management: An International Journal*, *International Journal of Management Concepts and Philosophy*, *International Journal of Educational Management*,

IIMB Management Review, *Total Quality Management and Business Excellence*, *Metamorphosis: A Journal of Management Research*, *Vision: The Journal of Business Perspective*, *Global Business Review*, *SAGE Open*. She has, to her credit, one edited book and 17 chapters in edited books.

Jochen Wirtz is Vice Dean, Graduate Studies, and Professor of marketing at the NUS Business School, National University of Singapore. He has published over 200 academic articles, chapters, and industry reports, including five features in *Harvard Business Review*. He has more than 10 books including "Services Marketing: People, Technology, Strategy" (World Scientific, eighth edition, 2016), "Essentials of Services Marketing" (Pearson Education, third edition, 2018), and "Winning in Service Markets" (World Scientific, 2017).

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Chapter 1
Business Analytics: Concept and Applications

Hardeep Chahal, Jeevan Jyoti and Jochen Wirtz

Abstract The word business analytics has become a buzzword in the present era of experience economy. Primarily, the proliferation of the Internet and information technology has made business analytics a robust application area. On the other hand, it is equally impossible to deny its significant impact on the fields of information technology, quantitative methods and the decision sciences (Cegielski and Jones-Farmer 2016). Both industry and academia seek to hire talent in these areas with the hope of developing organizational competencies to sustain competitive advantage. Hopkins et al. (2007) and Hair et al. (2003) assert that adequate knowledge on business analytics techniques enables the analysts—practitioners, managers, etc—with capabilities that enable them to take quick and smart decisions and provide stable leadership to the organization to compete in the market effectively. On the other hand, it provides a platform for the researchers and academicians to lay down path for the theory development. However, Hawley (2016) pointed that business analytics focuses more on understanding the organizational culture than mere technology. Thus, for successful implementation and harnessing the benefits of business analytics the knowledge of an organization's motivation, strengths and weaknesses is necessary (Hawley 2016).

Keywords Business analytics · Decision making · Statistical techniques
Quantitative analysis · Business applications

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1.1 Introduction

The word business analytics has become a buzzword in the present era of experience economy. Primarily, the proliferation of the Internet and information technology has made business analytics a robust application area. On the other hand, it is equally impossible to deny its significant impact on the fields of information technology, quantitative methods and the decision sciences (Cegielski and Jones-Farmer 2016). Both industry and academia seek to hire talent in these areas with the hope of developing organizational competencies to sustain competitive advantage. Hopkins et al. (2007) and Hair et al. (2003) assert that adequate knowledge on business analytics techniques enables the analysts—practitioners, managers etc—with capabilities that enable them to take quick and smart decisions and provide stable leadership to the organization to compete in the market effectively. On the other hand, it provides a platform for the researchers and academicians to lay down path for the theory development. However, Hawley (2016) pointed that business analytics focuses more on understanding the organizational culture than mere technology. Thus, for successful implementation and harnessing the benefits of business analytics the knowledge of an organization's motivation, strengths and weaknesses is necessary (Hawley 2016).

Business analytics comprises techniques and processes, namely statistical analysis; forecasting; predictive analysis and optimization, which maintain and sustain business performance (Davenport and Harris 2006; Hopkins et al. 2007). It is
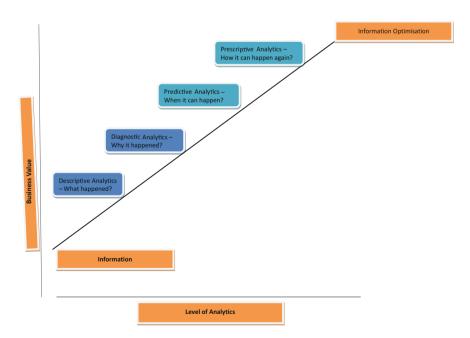

Fig. 1.1 Business analytics stages

spread across four stages—descriptive analytics, diagnostic analytics, predictive analytics and prescriptive analytics (Fig. 1.1). Each stage helps the practitioners in harnessing business value depending upon the nature of importance and business objectives. Accordingly, business analytics has a wide range of application in varied business areas that include customer relationship management, human resource management, financial management, marketing, supply chain management across all sectors. Its application facilitates and equips business and service organizations with better understanding of primary and secondary data for decision-making. The effective application of business analytics can help the business and service organizations to improve profitability, increase market share and revenue and provide better return to a shareholder.

1.2 Business Analytics: Its Applications

Research, in the last few decades, highlights on the growing need of application of advanced techniques in the business decision-making for managers (Evermann and Tate 2016). The role of business analytics has become paramount due to complex business problems, limited ability to analyse the available solutions and shortage of time for decision-making (Davenport and Harris 2006). They claim that business analytical techniques provide managers with more confidence in dealing with uncertainty in spite of the availability of huge data. Besides, these techniques are of great interest and utility to behavioural and social scientists also, who continually struggle with complex phenomenon, to detect pattern buried in complex quantitative data. Hopkins et al. (2007) and Hair et al. (2003) assert that adequate knowledge on business analytics techniques enables the analysts—practitioners, managers, etc—with capabilities that enable them to take quick and smart decisions and provide stable leadership to the organization to compete in the market effectively. On the other hand, it provides a platform for the researchers and academicians to lay down path for the theory development.

While highlighting on the significance of the analytical needs, Davenport and Harris (2006) claimed that most of the high-performance work systems/organizations have employees with high analytical capabilities. And companies using such techniques in their decision-making process are in a better position to compete and sustain competitive advantage. Among the various statistical techniques, structural equation models (SEMs), including confirmatory factor analysis, help in both theory building and predictive analysis and their role has become more crucial with the advent of big data. The predictive modelling enables managers and the researchers to have fresh insights for their future endeavours (Shmueli and Koppius 2011). Addressing this need, our efforts in this context will fill the extant gap and will help managers and entrepreneurs in a knowledge-based decision-making (Hair Jr. et al. 2011).

This edited book is a collection of ten research papers including a conceptual paper on big data (Chap. 2) and nine empirical papers in the areas of finance

(Chaps. 3–6), marketing (Chaps. 7–9) and HR/OB (Chap. 10) that can help the researchers and practitioners in the application of analytical tools and techniques for strategic decision-making.

The second chapter on big data analytics delves upon the underlying technologies used by organizations for value generation. The author has discussed the challenges faced by business organizations in monitoring the data that has grown from terabytes to exabytes and petabytes. Further, the compounded rate of data is further growing much fast. The deluge of data generated, which is both valuable and challenging, along with emerging technologies and techniques that are used to handle it is referred to as the evolution and era of "big data". She further expressed that to leverage the large volume of data for driving the business enterprises, timely and accurate insights derived out of the big data are a big challenge. Further, handling and analysis of big data are a challenge for all types of organizations with respect to its storage and technical expertise. The chapter highlights big data characteristics like volume, value, variety, velocity, veracity and variability and its analysis through exploratory, confirmatory and qualitative data analyses. Further, technologies like Hadoop and Apache Spark in handling big data have also been discussed.

The following section of the chapter discusses in brief the contribution of the papers in the three functional areas: finance; marketing and HR/OB.

1.3 Finance

Nowadays, macroeconomic models are being used to forecast the future of the economy. Modern economics and business management are using econometric applications for extensive training of its personnel. Managers are using econometric applications for devising optimal economic strategies for better insight, superior value, optimized solutions and sustain competition. Econometric applications provide organizations with a potent set of tools to unlock the power of information for effective decision-making (Kolluru and Mishra 2012). In this context, Huseyni, Celik and Eren (Chap. 3) used a gravity model approach to analyse the primary factors that influence Turkey's vehicle (car, minibus, bus, van and truck) exports to its major trading partners over the period of 2005–2015. For this purpose, a gravity model and a panel data quantile regression approaches have been performed by the bootstrap method for empirical results. The results revealed that the population of importer country and the amount of per capita income are positively correlated with the amount of Turkish automotive exports. Additionally, when the distance between importer country and the capital of Turkey increases, the amount of Turkish automotive industry exports was more likely to have a decreasing behaviour. Further, exporting to an EU member country has a statistically significant increasing impact on the amount of automotive industry exports. The estimation results also indicated that the real exchange rate was not a statistically significant determinant of the amount of automotive industry exports during the sample

period. The authors concluded that Turkey cannot exactly succeed to use the competitive advantage of the possible declines on real exchange rates due to higher costs of imports in the automotive industry.

The authors of fourth chapter, Wani, Haque and Raina, empirically proved the positive correlation of gross domestic product (GDP), inflation, lending interest rate (LIR) and capital-to-risk weighted assets ratio (CRAR) with the net interest margin (NIM) in the banking industry. The study established that a favourable macroeconomic environment proves to be a main driver for encouraging NIM with a prudent control over CRAR along with NPLs. The study suggested installing the latest advances and practices of risk management especially on the credit front, which will also help the banks to utilize excessive capital rather than accumulating it unnecessarily.

In fifth chapter, Rangotra analysed the impact of various reforms undertaken by the Government of India to improve liquidity, transparency and security in the Indian bond market. It considers reforms initiated by the Government of India since 1992 that include introduction of system of primary dealers, establishment of Clearing Corporation of Indian Limited as a clearing house, introduction of screen-based trading in government securities through Negotiated Dealing System-Order Matching (NDS-OM), trading of bonds through stock exchanges, introduction of delivery versus payment system. The impact of reforms on the Indian bond market has been examined by analysing the combined gross borrowing of centre and state government through government securities (increased by around 8900% from 1991–92 to 2016–17), secondary market transactions in government securities (increased by around 430,000% from September 1994 to September 2017), net corporate debt outstanding (increased by around 225% from June 2010 to September 2017), total trade in corporate bond market (increased by around 1450% from 2007–08 to 2016–17) and other variables related to the liquidity and size of Indian bond market. The impact of reforms is found to be positive for all the dimensions but has a significant impact only on the size and liquidity of the Indian bond market. Mor, Jaiswal, Singh and Bhardwaj (Chap. 6) have focused on demand forecasting of the short lifecycle dairy products. They have compared the performances between different forecasting models for the prediction of group of dairy products. Authors compared the moving average, regression, multiple regression and Holt-Winters models based on MAPE, MAD, MSE and RMSE for the demand forecasting of a time series formed by a group of dairy products.

1.4   Marketing

Contemporary business organizations use business intelligence and analytics to solve the magnitude and impact of data-related problems (Chen et al. 2012). It is creating an exemplary change in the way data are being used, and the marketing and sales department is no exception to this. It is pivotal that marketing professionals should become tech savvy and use technology to harness the importance of

business analytics (Proschoolonline 2017). In the context of marketing, business analytics integrates market and customer-related data, technology, quantitative analysis and computer-based models to provide managers with various relevant prospective for better and optimal decision-making. Among varied areas in marketing, relationship management with customers and employees is a pivotal area in the service economy that demands continuous monitoring by service firms to sustain competitive advantage.

In this context, three papers are based on primary data that encompass customers' and employees' perspectives and are analysed using advanced structural equation modelling technique to understand how it helps in decision-making for enhancing organizational performance. Raina, Klaus, Dutta and Chahal have studied the impact of customer experience on marketing outcomes in financial services. The study establishes customer experience as multidimensional construct comprising brand experience, service experience and post-purchase experience. The study has used systematic data analytical process that includes exploratory factor analysis, item analysis and confirmatory factor for construct validation. The authors have also established the relationship between customer experience and marketing outcomes (customer satisfaction, behavioural loyalty intentions, word of mouth and service value) using structural equation modelling. The result revealed that moment of truth is the most important factor that has to be considered by financial services for creating favourable customer experience quality followed by outcome focus, peace of mind and product experience. Further, product experience has low association with customer satisfaction, behavioural loyalty intentions, word of mouth and service value. The relatively weak association with all marketing outcomes suggests that customer awareness about competitive services has increased and they no more accept every type of services from the same service provider because of varied customers' choices and their ability to compare offerings with different service providers.

The study by Kaur, Chahal and Gupta (Chap. 8) has used advanced structural equation modelling and moderation techniques to re-investigate the role of market orientation and environmental turbulence in marketing capabilities and business performance. The paper has explored and established marketing capabilities as multidimensional scale using three-stage process—EFA, item analysis and CFA— that consist of: outside in, inside out and spanning dimensions and market orientation as a function of four factors relating to intelligence generation I (customers needs), intelligence generation II (customers satisfaction), intelligence dissemination and responsiveness, both of which play significant role in enhancing organizational performance. The authors used advanced marketing analytics to establish positive relationship of marketing capabilities with market orientation and organizational performance. Further using SEM-based mediation modelling approach, authors also found that marketing capabilities act as a mediating variable between market orientation and marketing capabilities and market orientation and financial performance relationships. Further using SEM-based multigroup analysis, Gupta et al. have established the moderating role of environment turbulence in marketing capabilities and market orientation relationship.

1.5 Human Resources/OB

Understanding organization and its people have gained immense attention in the present business scenario due to the value attached to human aspects for providing sustainable competitive advantage. Human resources are rare, valuable and cannot be copied or substituted (Barney 1991). These have immense creative capabilities to upgrade the innovative domain of an organization. Though cultural diversity results in knowledge sharing at various platforms in the organization, it also has adjustment issues. In this context, Kour, Jyoti and Pereira (Chap. 9) have evaluated the role of cultural adjustment (CCA) and work experience between cultural intelligence (CQ) and knowledge sharing relationship in the banking sector. Structural model explains the indirect effect of CQ on knowledge sharing with cross-cultural adjustment as mediator. Further, the role played by language proficiency and work experience has also been evaluated. The result revealed that CCA mediates the combined effect of CQ and work experience on knowledge sharing. The study contributes towards cultural intelligence theory. It helps in understanding the complex relationships in organizational setup, which can be of immense use for the practitioners at the workplace. The last chapter by Kumar, Singh and Rana analyses the impact of employer branding on organizational attractiveness in Indian organizations using factor analysis, Pearson's r and step-wise multiple regression analysis techniques. The results indicate that employer branding has a positive and significant relationship with organizational attractiveness. Since economic value, application value, social value and development value emerged as strong predictors of attracting and retaining employees, employers can provide employees with marketable skills through training and development in return for effort and flexibility. The authors believed that the study findings can help in identifying varied EBs aspects that are effective in extracting organizational attractiveness and incorporating them into the organizational culture.

There is significant evidence that the ability to make better decisions improves with the usage of quantitative-, qualitative- and financial-based techniques. Hence, this book offers a relevant resource that can help the audience (research scholars, practitioners, market researchers, etc.) in the application and interpretation of statistical practices, using real-world applications from the fields of marketing, human resources, finance, operations research and information technology relating to issues like preferences of a customer base, quality of manufactured products, high-performance human resource policy, employee resilience, availability of financial resources, operational flexibility, etc.

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Chapter 2
Big Data Analytics: The Underlying Technologies Used by Organizations for Value Generation

Bhavna Arora

Abstract The expansion of Internet and its applications globally has witnessed generation of high volume of data resulting in high volume of information. In the contemporary era of digital world, data is seen as the driving force behind the progression of business enterprises. Today, the data that is generated worldwide has grown ranging from terabytes to exabytes and petabytes, and the compounded rate of data further growing is much fast. The data generated widely has many forms and structures. The deluge of data generated, which is both valuable and challenging, along with emerging technologies and techniques that are used to handle it is referred to as the evolution and era of "Big Data". As the big data is generated from multitudinous sources, majority of this data exists in unstructured form that demands specialized processing and storage capabilities, unlike the structured data that uses storage and processing of traditional relational structures. This results in high complexity and uncertainty in data. The usage of statistical analysis, computer-based models and quantitative methods that can help the business organizations to improve insights for better operations and decision-making is referred as business analytics. To work intelligently and focus on value generation, organizations need to focus on business analytics. The analytics are a critical component of big data computing. As defined in the literature, an intelligent enterprise has the characteristics similar to human nervous system and is responsive to external stimuli. To leverage the large volume of data for driving the business enterprises, timely and accurate insights derived out of the big data are a big challenge. The technologies like Hadoop and Apache Spark assist in handling big data on both fronts. However, handling and analysis of big data are a challenge for any organization with respect to its storage and technical expertise. Business analytics is used in business organizations for value generation by data manipulation along with business intelligence and report generation. Advanced analytics are also used by business enterprises that use techniques of data mining, data optimization and predictive forecasting.

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