USING BIG DATA TO MAKE BETTER DECISIONS IN THE DIGITAL ECONOMY

Abstract

The question this special issue would like to address is how to harvest big data to help decision-makers to deliver better fact-based decisions aimed at improving performance or to create better strategy? This special issue focuses on the big data applications in supporting operations decisions, including advanced research on decision models and tools for the digital economy. Responds to this special issue was great and we have included many high quality papers. We are pleased to present 13 of the best papers. The techniques presented include data mining, simulation, and expert system with applications span across online reviews, food retail chain to E-health.

Keywords: Big data, Business Analytics, Decision Support Systems, Data Mining, Digital Economy

Introduction

Big Data has become increasingly fashionable in recent years. Key trends led to the Big Data era are cheaper technology, increased use of smart phones and social media, more popular use of the cloud computing, internet of things (IoT), and Industry 4.0 (Zhong et al., 2015; Priya & Kumar, 2015; Pan et al., 2017). These global trends generate more volume, variety and velocity (3Vs) of data than ever before, which makes Big Data more difficult to manage and analyse. Manyika et al. (2011) pointed out that the big data analytics can be helpful to support global manufacturing and supply chain innovation by creating data transparency, improving human decision-making and promoting innovative business models. However, there is a lack of data analytics techniques available to help decision makers and practitioners to capture and harvest the potential value of data (Tan et al, 2015; Tan & Zhan, 2017; Tseng et al., 2015). Thus, a data analytic infrastructure that helps decision makers to make use of the high volume of data to serve as inputs for decision making is necessary. Although there is a variety of analytics techniques i.e. predictive analytics, data mining, case-based reasoning, exploratory data analysis, business intelligence, machine learning techniques, and so on, methods that capable to handle vast volume of unstructured data is still not well established (Wong, 2012).

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In the paper "Using Artificial Neural Networks to Predict Container Flows between the Major Ports of Asia", by Chuck Tsai and Linda Huang (National Ocean University, Taiwan), big data is used to support port operators and liners strategic planning. Chuck uses artificial neural

networks to predict container flows between major ports of Asia by considering GDP, interest rates, the value of export and import trade, the numbers of export and import containers, and the number of quay cranes. The forecasting results indicate that the prediction errors are relatively small in most selected ports, and thus, shipping companies can use the container flow prediction model to

Samuel Fosso Wamba (NEOMA Business School, France), Ji-fan Ren (Shenzen University), Shahriar Ackter (Wollongong University), Ram Dubey (Symbiosis International University, India) and Steve Childe (Plymouth University) in their paper "Modelling Quality Dynamics on Business Value and Firm Performance in Big Data Analytics Environment" examines the quality dynamics in big data environment that are linked with enhancing business value and firm performance. The study identifies that system quality (i.e., system reliability, accessibility, adaptability, integration, response time and privacy) and information quality (i.e., completeness, accuracy, format and currency) are key to enhance business value and firm performance in the big data environment.

In the paper "the role of social media data in operations and production", Hing Kai Chan (Nottingham University Ningbo), Ewelina Lacka (University of Strathclyde), Rachel Yee (Polytechnic University, Hong Kong), and Ming Lim (University of Derby) exploit the rich information contained in social media data for operation management research. A structured approach that involves the analysis of social media comments and a statistical cluster analysis to identify the inter-relationships among the important factors is proposed. The usefulness of the proposed approach is demonstrated using a real-life example. To mitigate the problem of information overload in social community, Kyoung-jae Kim (Dongguk University, South Korea) and Hyunchul Ahn (Kookmin University, South Korea) use social network analysis (SNA) and clustering techniques to improve the predictive accuracy of collaborative filtering algorithm. The experimental results indicate that the proposed model outperforms other comparison models, including conventional CF, with staistical significance.

To allow the establishment of a trusting relationship in buyer coalition schemes, an interesting approach is proposed in the paper "a group signature based buyer coalition scheme with trustable third party". Laor Boongasame (Bangkok University), Punnarumol Temdee (Mae Fah Luang University, Thailand) and Farhad Daneshgar (University of New South Wales, Australia) propose a solution in the form of an algorithmic design to tackle this problem. Two key features of the approach are the use of "group signature" to guarantee anonymity within the group and a new role called "authority" to maintain and implement the required anonymity. The approach is useful for applications in electronic commerce, information and communication technologies, as well as computer security.

In the paper "predictive analytics for truck arrival time estimation", Chintan Amrit, Sjoerd van der Spoel, and Jos van Hillegersberg (University of Twente), conducted a field study to predict the arrival times of 230 trucks using real traffic and weather data pertaining to a distribution centre in Europe. The experimental results show that while a big data approach delivers valuable insights, other factors, such as human or organizational factors, could influence the arrival time; therefore, these factors should be taken into consideration in future predictive models.

The dynamic equilibrium between the supply and demand service capacities is studied in the paper "supply chain resources integration optimisation in B2C online shopping". Jianming Yao (Renmin University, China) analyses the characteristics and service modes of supply chain resources integration in B2C, and consider the capacity target orientation consistency of the resource as an important optimisation objective. They evaluate such consistency by identifying the capacity characteristic factors and introducing them into supply chain resource integration. The supply chain resource integration process is undertaken using an evolutionary-based optimisation model.

A new data-driven approach for low yield diagnosis is proposed in the paper "analyzing semiconductor manufacturing big data for process root cause detection and yield enhancement". Chen-fu Chien, Chiao-Wen Liu and Shih-Chung Chuang (National Tsing Hua University, Taiwan) descried the challenges in the yield ramp-up stage that involve new production processes and unstable machine configurations, in which big data with multiple co-linearity and high dimensionality can hardly rely on previous experience for detecting root causes. The authors' proposed approach is able to detect possible root causes of excursion, reduce trouble shooting time, and improve production yield effectively.

In the supply chain, the bullwhip effect is causing inefficiencies, Erik Hofmann's (University of St. Gallen) study deals with the potential of big data on the improvement of the various processes to elaborating on the characteristic of big data that to mitigate the bullwhip effect and finds the data property 'velocity' relatively bears the greatest potential to enhance performance by operationalizing big data in the control engineering analyses. Xiaojun Wang (University of Bristol) and Dong Li (Liverpool University) presented that a potential scenario of using a prototype tracking tool that facilitate the utilization of sensor data, which is often unstructured and enormous in nature, to in chilled food chain management innovation through sensor data driven pricing decisions and demonstrated a way of modelling pricing and potential of performance improvement in chilled food chains to provide a vision of smooth transfer and implementation of the sensor data driven supply chain management. The study findings are encouraging the firms to explore innovation opportunities from big data and develop proper data driven strategies on building the competitive edges of the firms.

In marketing preferences, Alain Chong, Eugene Ch'ng, Martin Liu, and Boying Li (University of Nottingham, Ningbo) showed that the completed web crawling and scraping datasets were then pre-processed for Neural Network analysis and presented both of online reviews and promotional marketing strategies are important predictors of product demands and provides important implications for practitioners as they can better understand how online reviews and online promotional marketing can influence product demands that included the design of a Big Data can be used as a platform to investigate how Big Data can be used to understand and predict online consumer product demands. To discover customer value for marketing system, Wen-Yu Chiang (Aletheia University, Taiwan) proposes a FSLC model (Frequency, high Season, Locations of travelling and Cancellation times) via the data mining technologies for identifying valuable travellers for airlines. The author approach is found to be helpful to assist Taiwanese airlines to target high-value travellers to enhance growth and profit.

Jing Wu (Southwestern University of Finance and Economics, China), He Li (University of Memphis), Zhangxi Lin (Texas Tech University) and Khim-Yong Goh (National University of

Singapore) focused on the wearable device can be a key link between healthcare and big data and analytics, but the uncertainty of the implementation has led some firms to hesitate in adopting this technology to a competition model between the wearable device firms with and without strategies to considering the consumer's preference and network effects. The proposed model demonstrated that the investment on big data and analytics directly affects the firm's equilibrium price, market share and profit on impacting the firms' competition with consumers on heterogeneous preferences. In lieu of this, the study leads to explore marketing opportunities from big data and develop proper data driven strategies to improve firm's competitiveness.

Conclusions

Today's global manufacturing landscape is changing fast. Current technology advancement and big data development allow managers to have better insights into their operations. The IoT and big data provide enormous possibilities for firms to improve their operations performance. The Industry 4.0 and Internet of Things allow for the creation of smart factories where machines and networks are capable of exchanging and responding to information and autonomously managing the production process. Recently, the UK government advocate a new manufacturing concept i.e. Re-distributed Manufacture (RdM) which takes advantage of a number of newly emerging technologies such as 3D printing, additive manufacturing and big data to provide numerous benefits over existing systems. Thus, businesses will have to adapt to the changing patterns of data usage to operate effectively in an increasing digital age.

This issue touches upon many spectrums of data mining techniques and big data applications. The selected papers are interesting and span the areas of E-health, semi-conductor, wearable devices, distribution centre, and quality management. We hope the knowledge you gain from reading this special issue of outstanding papers will increase your understanding of the applications of big data in supporting managerial decisions in digital economy environment. We would like to thank the authors who responded to the call for papers as well as the numerous anonymous referees for their valuable inputs, in-depth and diligent work. We sincerely enjoyed putting this special issue together especially the time we spent debating the merits of the many high-quality papers that were reviewed and considered for publication.

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IJPR celebrate this year its 55th volume anniversary. Over the last 55 years, IJPR has witnessed various forms of paradigm shifts in production management. The Editor-in-Chief, Prof Alexandre Dolgui is leading a new generation of researchers that continue to explore and disseminate the cutting edge research of manufacturing and services operations. It was the foresight of Prof Dolgui that enabled this special issue (one of the earliest big data special issues in production management) to materialise.

Guest Editors for the Special Issue:

Professor Kim Hua Tan   Nottingham University Business School, UK
Professor Guojun Ji   Xiamen University School of Management, China
Professor Chee Peng Lim   Deakin University, Australia
Professor Ming-Lang Tseng   Lunghwa University of Science and Technology, Taiwan

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