

**Big Data Analytic Capabilities Playing
a Critical Role in Sustainability
performance of Supply Chain at
Australian Organisations**

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the degree of

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CERTIFICATE OF ORIGINALAUTHORSHIP

I, Bara'ah Ahmad Shdifat declare that this thesis is submitted to fulfilment the requirements for the award doctor of Philosophy (Information System), in school Information, Systems and Modelling at the Faculty of Engineering and Information Technology at the University of Technology Sydney.

This thesis is wholly my own work unless otherwise referenced or acknowledged. In addition, I certify that all information sources and literature used are indicated in the thesis.

This document has not been submitted for qualifications at any other academic institution.

This research is supported by the Australian Government Research Training Program.

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Doctoral Research Publications to Date

1. Book chapter

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2. Conference Papers

Cetindamar, D., Shdifat, B., & Erfani, S. (2020, January). Assessing big data analytics capability and sustainability in supply chains. In Proceedings of the 53rd Hawaii International Conference on System Sciences.

Shdifat, B., Cetindamar, D., & Erfani, S. (2019, August). A literature review on big data analytics capabilities. In 2019 Portland International Conference on Management of Engineering and Technology (PICMET) (pp. 1-6). IEEE.

3. Journal Papers

Cetindamar, D., Shdifat, B., & Erfani, E. (2021). Understanding Big Data Analytics Capability and Sustainable Supply Chains. *Information Systems Management*, 1-15.

Abstract

Climate change is undoubtedly one of the key challenges facing sustainability for contemporary business and society. It is widely recognized that current violations associated with climate change are going to make addressing it a critical issue for future generations. Unfortunately, Australia faces significant environmental and economic impacts of climate change across several sectors. Thus, focusing on short-term temporary solutions may lead to poor sustainability. Consequently, sustainability performance has become a necessity. Supply chain management is one of the driving forces to achieving business's sustainability. To attain a sustainable supply chain, an organisation has to social, economic, and environmental concerns across its entire supply chain.

Nowadays, organisations are dealing with large amounts of data, not only for important decisions but also in their day-to-day activities. A considerable amount of records or data, known as Big Data (BD) has become a new source for boosting sustainable supply chain performance (SSCP) because it allows the efficient use of vast volumes of strategic, operational, and tactical information across the supply chain phases. Embracing the advantages of big data is not enough towards addressing sustainability issues, investing in human and technology capabilities of big data analytics(BDA) is seen as a strategic capability that will help a business respond to social, environmental, and economic issues in an uncertain environment. By doing so, big data analytics capabilities(BDACs) can improve an organisation's sustainable performance.

The main goal of this study is to provide empirical evidence concerning the influence of BDACs on SSCP and obtain insights regarding its impacts. Therefore, two key motivations behind this research. Firstly, even though BDA has received more attention from scholars and practitioners because of the predicted valuable benefits, such as increased productivity and future economic growth, few empirical studies investigate data analytics from a capability perspective. Many prior studies

have also primarily paid more interest to infrastructure and analytics tools (non-human capabilities). Nonetheless, they do not offer a holistic picture of BDACs (BDA human and non-human capabilities). Furthermore, there is a scarcity of measurement scales for BDACs and SSCP. Secondly, there is a limited managerial and academic understanding as to how organisations can harvest the maximum benefit from BDA to respond to supply chain sustainability issues by adopting and reconfiguring appropriate BDA human and non-human capabilities. Empirical studies of the relationship between BDACs and SSCP have hardly been conducted. Prior empirical studies investigate the influence of BDACs on three sustainability dimensions (environment, social, and economic), but they do not consider all sustainability dimensions simultaneously

There are two adopted research strategies to meet the thesis's core objectives and answer the research questions. Firstly, to set the foundations for BDACs and SSCP, we carried out a systemic literary review. Secondly, we conducted a questionnaire-based survey method to collect data from Australian IT-related managers. Quantitative data (73 responses) were used to empirically evaluate and test causal relationships (proposed hypotheses) between research variables. Our findings suggest that BDACs have a positive influence on an organisation's sustainability performance in the supply chain. However, this impact is direct without a moderated effect.

Our study yields some interesting theoretical and empirical contributions. Firstly, a capability-based measurement for BDACs and a multi-dimensional measurement of SSCP, including environmental, social and economic performances, is proposed. Secondly, a novel empirically validated BDACs-SSCP model is developed, using the fragmented and disconnected relevant literature (Big Data and sustainable supply chain literature) as a baseline. This model successfully assesses the impact of BDACs on sustainability performance in supply chains and can act as a guiding mechanism for organisations. Finally, this thesis provides a case study from Australia for the extant literature on BDACs. In practical respect, organisations can achieve sustainability performance outcomes by employing BDA human and non-human capabilities. Additionally, practitioners might build long-term strategies to develop their capabilities

and organisational culture to transform their businesses into a sustainable future. Last but not least, the developed sustainability of companies will further improve their social and environmental performances, which will benefit all of society.

Keywords:

Big data analytics capabilities, Supply chain management, Sustainable supply chain performance, Social performance, Environmental performance, and Economic performance.

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Abbreviations

BD	Big Data
BDA	Big Data analytics
BDACs	Big Data analytics capabilities
SC	Supply chain
SCM	Supply chain management
SSCM	Sustainable supply chain management
SSCP	Sustainable chain supply performance
SP	Social performance
ENP	Environmental performance
ECP	Economic performance
CMV	Common method bias
CIO	Chief Information Officer
IS	Information System
IT	Information Technology
IoT	Internet of Things
RBV	Resource-based view
DCV	Dynamic capabilities view
AVE	Average variance extracted
FA	Factor analysis
CR	Composite reliability
GoF	Goodness-of-Fit
Q	Predictive relevance