Towards a Conceptual Framework for Investigating the Impact of Organisational Resources, Entrepreneurial Orientation Dimensions and Big Data Analytics on Business Performance of South African E-commerce SMMEs

Marungwane Leshego Mogale

University of Cape Town, Cape Town, South Africa

mglmar007@myuct.ac.za

Abstract

Data Analytics (BDA) is a crucial component of high-performing e-commerce businesses. In South Africa, where Small, Medium and Micro Enterprises (SMMEs) are key contributors to economic growth, it is crucial to understand the resources and capabilities they should have in place to adopt BDA and positively impact their business performance. This paper aims to review current literature detailing organisational resources, BDA, and its impact on the business performance of South African e-commerce SMMEs and develop a conceptual framework. While various studies show the impact of BDA on business performance in large organisations, and developed and developing economies, the impact it has on business performance, as well as that of organisational resources and entrepreneurial orientation dimensions on South African e-commerce SMMEs, is not well explored. This research adopted a deductive approach, using a systematic approach to literature, 411 journal and conference proceedings articles were retrieved from 2016 to date. 15 articles were selected after analyses and synthesis through a narrative literature approach. Key organisational resources that enable the use of BDA were identified from the literature and used to develop a conceptual framework that can be used for future studies using empirical data. This research is in progress and the preliminary findings were derived through a literature review, that highlights organisational resources such as IT infrastructure, IT human resources, financial resources, risk-taking, innovativeness and proactiveness as relevant to the usage of BDA and its influence on business performance.

Keywords- Big Data Analytics, SMMEs, E-commerce, Resource-based View, Dynamic Capabilities View, Entrepreneurial Orientation

1 Introduction

Big data analytics (BDA) is a growing area of interest, and businesses are becoming aware of its value to productivity, profitability, and competitive advantage. BDA is a process needed to understand large volumes of data and extract meaningful information and knowledge to gain actionable insights to establish a competitive advantage (Ferraris et al., 2019). Studies show the predictive value from processing large volumes of data has a strategic potential to transform business processes and create capabilities for tackling key business issues (Batistič & van der Laken, 2019). BDA plays a significant role in business innovation through the creation and introduction of new products and services. It enables data-driven decision-making and creates innovative ways of managing processes and activities that lead to better business performance (Ferraris et al., 2019; Seseni & Mbohwa, 2021). Small, Medium and Micro Enterprises (SMMEs) are among businesses that should take advantage of BDA, though faced with many challenges including the lack of financial resources, IT infrastructure and technical skills. The reduction in memory, storage, and bandwidth prices have made it possible for more businesses to enter the BDA market more economically, which also offers opportunities for SMMEs (Ferraris et al., 2019).

Research has found that the demonstration of risk-taking, innovativeness and proactiveness by SMMEs has positively impacted their business performance (Lomberg et al., 2017; Dubey et al., 2020). Akter & Wamba (2016) drawing from the Resource-based View (RBV) argues that BDA is a key element of high-performing e-commerce businesses. Shan et al., (2019) drawing from Dynamic Capacities View (DCV) found in their study that IT technology capabilities such as IT infrastructure and IT human resources influence competitive advantage directly thus increasing business performance. Idle resources such as financial resources aid businesses in adapting to changing consumer demands and market conditions (Shan et al., 2019). This is particularly crucial in South Africa, where financial resources may have an impact on an SMME's success since it is one of their major challenges (Seseni & Mbohwa, 2021).

This paper posits that organisational resources such as IT infrastructure and IT human resources, risk-taking, innovativeness and proactiveness influence the adoption of BDA which impacts business performance. While various studies show the impact of BDA on business performance in large organisations, and developed and developing economies, to our knowledge, the impact it has on business performance, as well as that of organisational resources and entrepreneurial dimensions on South African e-commerce SMMEs, is not well explored. The objective of this paper is to explore current literature to gain an empirical understanding of the problem that will guide the development of a conceptual framework.

2 Method

To identify existing literature, this paper adopted a systematic review which aims to locate, assess, and synthesise data from related research using a replicable, scientific, and transparent process methodology (Hussain et al., 2020). The primary search was conducted on credible databases with high-ranking journals and conference proceedings, these include Google Scholar, EbscoHost, IEEE Xplore, Science Direct, Emerald and Scopus. The search terms were defined based on the scope of this paper and the defined objectives. The search was carried out using the following search string multiple search strings in Table 1 and was limited to the title only. Multiple search strings were used to obtain base knowledge focusing on BDA and business performance and to contextualise this review to e-commerce and South African SMMEs. The combination of all key search terms does not return any results as the

objective of this study is a gap in the literature. The selection was limited to literature published in 2016 onwards, with earlier sources being reviewed to extract vital background information and only journal and conference proceedings papers were included. The secondary search was carried out using citation chaining to find other related articles to those found in the primary search and fill the gaps in the search strategy; both backward and forward searching were used. After removing all duplicate articles and applying all exclusions, a total of 15 papers were selected for analysis and synthesis, and this sample size was considered big enough to provide an overview of BDA, organisational resources, business performance and e-commerce of South African SMMEs. A narrative approach to literature review was used for analysis and synthesis, which is conducted by summarising earlier studies with an emphasis on theories, frameworks, fundamental variables, and their research findings considering hypothesised correlation (Rahman, 2018).

Search String	Results
1. ("big data" OR "big data analytics" OR "data analytics") AND ("business performance" OR "competitive advantage" OR "firm performance")	81
2. ("big data" OR "big data analytics" OR "data analytics") AND "e-commerce"	156
3. ("big data" OR "big data analytics" OR "data analytics") AND ("SME" OR "SMME" OR "startup" OR "entrepreneu*")	76
4. ("SME" OR "SMME" OR "startup" OR "entrepreneu*") AND "South Africa"	91
5. "e-commerce" AND "South Africa"	7
Total	411

Table 1: Search String

3 Literature Review

SMMEs are one of the main boosters of economic growth and development, as they reduce the unemployment rate by employing a significant portion of the workforce (Ncube & Zondo, 2022). In South Africa, 98.5% of the total businesses are SMMEs, of which 25.8% of the workforce is employed. These businesses contribute 39% of the gross domestic product (GDP) of the country (Seseni & Mbohwa, 2021). The Coronavirus outbreak changed global trends such as the increase in e-commerce sales in developed and developing countries including South Africa, this demand gave rise and opportunities for SMMEs to enter the e-commerce market (Bhatti et al.,2020).

E-commerce in South Africa generated $6.78 billion in revenue in 2020, $7.56 billion in revenue in 2021 and is estimated to generate $8.74 billion by the end of 2022 (Statista, 2021). E-commerce platforms generate large volumes of data, and the ability to extract meaningful information and knowledge to gain actionable insights has been a key driver in enabling competitive advantage and an environment where decisions are made based on insights rather than human intuition (Batistič & van der Laken, 2019; Ferraris et al., 2019). BDA offers e-commerce SMMEs an opportunity to understand their customer needs through behavioural analysis, increase conversions through price optimisation and increase the return on investment (Akter & Wamba, 2016; Seseni & Mbohwa, 2021). BDA adds

business value as it gives managers the capability to make data-driven decisions based on evidence rather than intuition and reduces human judgement error due to its precision (Batistič & van der Laken, 2019; Ferraris et al., 2019).

Mikalef et al., (2018) discuss the various characteristics of big data found in literature, including the 3Vs (volume, variety, and velocity), 5Vs (volume, velocity, variety, veracity, value) and 7Vs (volume, velocity, variety, veracity, value variability, visualisation). (1) Volume refers to the quantity of data that increases exponentially daily, increasing the need for IT infrastructure which can store and process this data; (2) Velocity refers to the speed at which data is created, collected and processed in real-time which enables a faster decision-making process and allows businesses to be agile; (3) Variety refers to the types of data generated from different digital platforms which could either be structured or unstructured; (4) Veracity represents the reliability and quality of the collected data, which should contain less noise, be complete and dated; (5) Value refers to the strategic and informational benefit of big data that allows businesses to make decisions and create a competitive advantage (Akter & Wamba, 2016; Ferraris et al., 2019). (6) Variability describes the dynamic potential made possible by analysing big data, and (7) Visualisation refers to the representation of insights found in the data (Mikalef et al., 2018). This paper adopts the 7 characteristics, as big data in the e-commerce market presents dynamic opportunities such as the ability to track user behaviour and find ways to convert and retain customers, while the visualisation of insights can assist businesses to optimise for sales, improve decision making and user experience (Akter & Wamba, 2016).

RBV theory defines organisational resources and capabilities as foundations for competitive advantage and to ensure long-term sustainability. RBV focuses on inimitable, valuable, rare, incomparable internal resources. These resources can be tangible assets such as technologies and intangible assets such as employee and management skills which are used to increase performance and gain a competitive advantage. The effective usage of these resources is where the organisational capabilities reside. (Dubey et al., 2020; Horng, et al., 2022). Some researchers criticise RBV for not considering the external environment related to the business and failing to explain the lack of business performance during volatile times. E-commerce SMMEs existing in a highly dynamic environment where technology is constantly evolving therefore being required to operate in a dynamic manner to stay ahead of the competition (Almazmomi et al., 2022).

Due to the RBV criticism, DCV was birthed as an extension. It refers to the business' "ability to integrate, build, and reconfigure internal and external resources/competencies to address, and possibly shape, rapidly changing business environments" (Dubey et al, 2020, p.3). Resources and capabilities are seen as the foundation of DCV with resources including technology, knowledge and human resource and capabilities indicating productivity and performance Dubey et al, (2020). Almazmomi et al., (2022) explain that DCV is better at explaining high-tech SMMEs business than RBV given the dynamic nature of their businesses with the high rate of technological innovation.

Entrepreneurial Orientation (EO) refers to the organisation's processes, practices and decision-making capabilities that enable the organisation to explore new market opportunities and create a competitive advantage (Lomberg et al., 2017; Dubey et al., 2020). EO is a demonstration of risk-taking, innovativeness and proactiveness capabilities. With contextualisation through research, the three dimensions: risk-taking, innovativeness and proactiveness are set to be independent and have their own effect on business performance, however, some studies have contextualised the three dimensions as dependent and all contributing to business performance. Studies employing the three dimensions as dependent may hide or inaccurately attribute effects from variation in one dimension of EO while the dependent dimensional view may hide the effects of covariation between two or all dimensions (Lomberg et al., 2017). This paper considers the three dimensions as independent and each contributing towards business performance.

82

Shan et al., (2019) highlight in their study the importance of IT technology capabilities such as IT infrastructure, IT human resources and financial resources through the adaptation of DCV and RBV theories, and their implications for managers that leverage BDA to achieve competitive advantages in business. Financial resources are also highlighted as the key resources that enable the adoption of BDA. Batistič & van der Laken (2019) also reiterate that BDA can only add value if the right IT infrastructure and IT human resources (skills) are in place. Lomberg et al., (2017) highlight the EO dimensions of risk-taking, innovativeness and proactiveness as influences on business performance. Dubey et al., (2020) also discuss the EO dimensions and their impact on the adoption of BDA and operational performance.

3.1   IT Infrastructure Resources

IT infrastructure refers to the infrastructural component which enables the business to perform its daily activities digitally (Li & Chan, 2019). The correct infrastructure is important in developing any IT capabilities. This infrastructure must be able to integrate internal and external data sources, store data, and allow the processing and visualisation of insights (Shan et al., (2019). Integration with external partners gives opportunities to mutually benefit from the insights found in the data. Due to the everyday change in technology and data volumes, IT infrastructure needs to be flexible to accommodate the dynamic environment to meet the business objectives and technology requirements (Li & Chan, 2019). For e-commerce businesses, the correct IT infrastructure is a key component of running the business.

3.2   IT Human Resources

IT human resources emphasises the need for employees to gain the necessary knowledge and skills to address problems associated with BDA and to fully utilise its capabilities to achieve high business performance. IT knowledge resources are considered the key resources of any organisation and they are unique to every business (Shan et al., 2019). The IT skills needed include managerial and technical skills relating to the collection, analysis, and presentation of BDA (Batistič & der Laken, 2019). Literature shows that IT skills are difficult to find, compensate and retain especially for SMMEs due to the high demand for the skills in the market, this is no different in the South African context. The available human resource may possess the theoretical knowledge of IT but lack practical experience, this is a challenge for SMMEs while searching for talent given that success is dependent on the correct technical and business knowledge (Behl, 2020). SMMEs often outsource external parties and vendors if they do not have sufficient technical skills to adopt an innovation such as BDA (Maroufkhani et al., 2020).

3.3   Financial Resources

In South Africa where an SME's success can be influenced by financial resources, it is important to also consider this resource and its influence on business performance. To stay ahead of the competition and remain sustainable, enough financial investment is needed to aid the process of innovation and continuous adaptation to change in the market. Financial resources are also key in ensuring that the correct talent is found and retained. Time needs to be invested in areas of innovation, especially in BDA, and continuous learning (Shan et al., 2019).

3.4   Business Performance

A business is always judged by its profitability by the market as an indicator of growth. Studies highlight the importance of productivity in operations as a key indicator of business performance. SMMEs need to understand their market share as they do not only compete with other SMMEs but also compete with large enterprises. The ability for businesses to invest in valuable resources and capabilities gives them a market differentiator and a competitive advantage. E-commerce businesses face higher challenges that affect business performance such as the volatility of customer needs and existing competitors in the market. While e-commerce SMMEs need to be innovative, they also need to have a competitive spirit to drive business performance (Behl, 2020). Having the right IT infrastructure, IT human resources, financial resources and BDA capabilities has been proven to positively impact business performance (Akter & Wamba,2016; Ferraris et al., 2019).

4   Conceptual Framework

A review of previous studies has revealed a research gap in the role that organisational resources play in the adoption of BDA and its impact on business performance for South African e-commerce SMMEs. The adaptation of RBV, DCV and EO theories from previous studies has revealed the importance of IT infrastructure, IT human resources, financial resources, risk-taking, innovativeness and proactiveness in the adoption of BDA. Through the exploration of literature and theoretical frameworks, the below conceptual model is proposed as the lens through which future studies can test with empirical data. Its constructs are defined in Table 2.
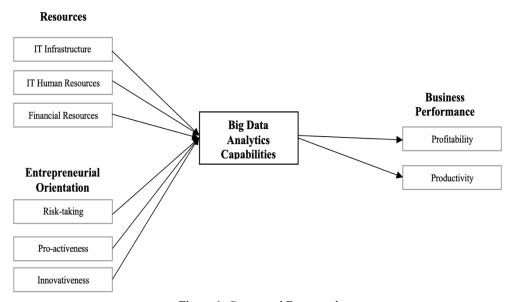

Figure 1: Conceptual Framework

Construct	Definition	Source
IT Infrastructure	Infrastructural components enable the business to perform daily activities digitally and enable IT capabilities. Infrastructure must be able to integrate internal and external data sources, store data, and allow the processing and visualisation of insights while being flexible to the increasing data volume.	Shan et al.,(2019) Li & Chan (2019)
IT Human Resources	IT skills and knowledge needed include managerial and technical skills relating to the collection, analysis and presentation of Big Data Analytics. These are needed to address problems associated with Big Data Analytics and to fully utilise its capabilities to achieve high business performance.	Shan et al.,(2019) Batistič & der Laken (2019) Behl (2020)
IT Infrastructure	Infrastructural components enable the business to perform daily activities digitally and enable IT capabilities. Infrastructure must be able to integrate internal and external data sources, store data, and allow the processing and visualisation of insights while being flexible to the increasing data volume.	Shan et al.,(2019) Li & Chan (2019)
IT Human Resources	IT skills and knowledge needed include managerial and technical skills relating to the collection, analysis and presentation of Big Data Analytics. These are needed to address problems associated with Big Data Analytics and to fully utilise its capabilities to achieve high business performance.	Shan et al.,(2019) Batistič & der Laken (2019) Behl (2020)
Financial Resources	Financial resources are needed to aid the process of innovation and continuous adaptation to change in the market to stay ahead of the competition and remain sustainable.	Shan et al.,(2019)
Entrepreneurial Orientation (EO): risk-taking, innovativeness and proactiveness	Entrepreneurial orientation (EO) defines the ability to take risks, be innovative and proactive. These dimensions affect the organisations' processes, practices and decision-making capabilities that enable competitive advantage. The three dimensions (risk-taking, innovativeness and proactiveness) are independent and contribute to business performance.	Lomberg et al., (2017) Dubey et al., (2020)

Big Data Analytics Capabilities	Enable the creation of market insights by obtaining internal and external knowledge. These can influence strategy, processes, productivity and profitability. This capability is dependent on tangible and intangible resources.	Akter & Wamba (2016) Mikalef et al., (2017) Batistič & der Laken (2019)
Business Performance	The degree to which a company is successful in accomplishing its goals and objectives. This comprises non-financial performance indicators like productivity in operations as well as financial performance indicators like profitability, revenue growth, and return on investment. These aim at increasing shareholder value.	Behl (2020) Maroufkhani et al., (2020)

Table 2: Definitions of Constructs

4.1   Research Propositions

Drawing from RBV, DCV and existing literature, IT infrastructure, IT human resources and financial resources have been identified as key enablers for BDA capabilities as found through the analysis of the selected papers. The researcher, therefore, proposes that:

- o   Proposition 1a: IT infrastructure has a positive impact on the usage of BDA capabilities.
- o   Proposition 1b: IT Human Resources have a positive impact on the usage of BDA capabilities.
- o   Proposition 1c: Financial Resources have a positive impact on the usage of BDA capabilities.

Drawing from EO and its dimensions as identified through the analysis of the selected papers, the researcher proposes that:

- o   Proposition 2a: EO's risk-taking has a positive impact on the usage of BDA capabilities.
- o   Proposition 2b: EO's proactiveness has a positive impact on the usage of BDA capabilities.
- o   Proposition 2c: EO's innovativeness has a positive impact on the usage of BDA capabilities.

Akter & Wamba (2016) highlights that BDA plays a role in improving business performance while Ferraris et al., (2019) highlight the importance of organisational resources such as IT human resources, which positively impacts business performance, Lomberg et al., (2017) also highlights the impact of EO dimension on business performance. Therefore, the researcher proposes that:

- o   Proposition 3a: Organisational Resources (IT infrastructure, IT human resources and financial resources) under the mediative effect of BDA capabilities positively impact business performance (productivity, profitability)
- o   Proposition 3b: Entrepreneurial Orientation dimensions (Risk-taking, Pro-activeness, Innovativeness) under the mediative effect of BDA capabilities positively impact business performance (productivity, profitability)

Drawing from existing literature from various researchers including Akter & Wamba (2016), Batistič & van der Laken (2019), Ferraris et al., (2019), Behl (2020), it has been proven that BDA capabilities impact the business performance in the form of profitability and productivity. It is for this reason that the researcher proposes:

- o Proposition 4a: BDA capabilities have a positive impact on Productivity.
- o Proposition 4b: BDA capabilities have a positive impact on Profitability.

5 Conclusion and Recommendations

This paper intended to explore current literature to gain an understanding of the role that organisational resources and entrepreneurial dimensions play in the adoption of BDA and its impact on business performance for South African e-commerce SMMEs and develop a conceptual framework. These constructs emerged through the adoption of RBV, DCV and EO theories creating a new lens through which they can be viewed and form the basis of the conceptual framework which can be tested with empirical data in future. This review highlighted BDA as a key element of high-performing e-commerce businesses as it gives them an opportunity to understand their customer needs and the ability to make data-driven decisions. It is also revealed that the right IT infrastructure and IT human resources are key to enabling the adoption of BDA, with the support of financial resources. The influence of risk-taking, innovativeness and proactiveness is also vital as it has a direct impact on business performance. Further research is required to test the conceptual framework with empirical data that is expected to reveal the key organisational resources that influence the usage of BDA capabilities and the influence on business performance in South African SMMEs.

References

Akter, S., & Wamba, S. F. (2016). Big data analytics in E-commerce: a systematic review and agenda for future research. *Electronic Markets*, *26*(2), 173–194. https://doi.org/10.1007/s12525-016-0219-0

Almazmomi, N., Ilmudeen, A., & Qaffas, A. A. (2022). The impact of business analytics capability on data-driven culture and exploration: achieving a competitive advantage. *Benchmarking: An International Journal*, *29*(4), 1264–1283. https://doi.org/10.1108/bij-01-2021-0021

Batistič, S., & der Laken, P. (2019). History, Evolution and Future of Big Data and Analytics: A Bibliometric Analysis of Its Relationship to Performance in Organizations. *British Journal of Management*, *30*(2), 229–251. https://doi.org/10.1111/1467-8551.12340

Behl, A. (2020). Antecedents to firm performance and competitiveness using the lens of big data analytics: a cross-cultural study. *Management Decision*, *60*(2), 368–398. https://doi.org/10.1108/md-01-2020-0121

Bhatti, A., Akram, H., Basit, M., Khan, A., Mahwish, S., Naqvi, R., & Bilal, M. (2020). E-commerce trends during COVID-19 Pandemic. *International Journal of Future Generation Communication and Networking*. 13(2), 1449-1452. https://www.researchgate.net/publication/342736799

Dubey, R., Gunasekaran, A., Childe, S. J., Bryde, D. J., Giannakis, M., Foropon, C., Roubaud, D., & Hazen, B. T. (2020). Big data analytics and artificial intelligence pathway to operational performance under the effects of entrepreneurial orientation and environmental dynamism: A study of manufacturing organisations. *International Journal of Production Economics*, *226*, 107599. https://doi.org/10.1016/j.ijpe.2019.107599

Ferraris, A., Mazzoleni, A., Devalle, A., & Couturier, J. (2019). Big data analytics capabilities and knowledge management: impact on firm performance. *Management Decision*, *57*(8), 1923–1936. https://doi.org/10.1108/md-07-2018-0825

Horng, J. S., Liu, C. H., Chou, S. F., Yu, T. Y., & Hu, D. C. (2022). Role of big data capabilities in enhancing competitive advantage and performance in the hospitality sector: Knowledge-based dynamic capabilities view. *Journal of Hospitality and Tourism Management*, *51*, 22–38. https://doi.org/10.1016/j.jhtm.2022.02.026

Hussain, A. B., Jasim, O. M., & Mahdi, A. A. (2020). Usability Evaluation of Mobile Tracking Applications: A Systematic Review. *International Journal of Interactive Mobile Technologies (iJIM)*, *14*(05), 119 https://doi.org/10.3991/ijim.v14i05.13353

Li, T. C., & Chan, Y. E. (2019). Dynamic information technology capability: Concept definition and framework development. *The Journal of Strategic Information Systems*, *28*(4), 101575. https://doi.org/10.1016/j.jsis.2019.101575

Lomberg, C., Urbig, D., Stöckmann, C., Marino, L. D., & Dickson, P. H. (2017). Entrepreneurial Orientation: The Dimensions' Shared Effects in Explaining Firm Performance. *Entrepreneurship Theory and Practice*, *41*(6), 973–998. https://doi.org/10.1111/etap.12237

Maroufkhani, P., Tseng, M. L., Iranmanesh, M., Ismail, W. K. W., & Khalid, H. (2020). Big data analytics adoption: Determinants and performances among small to medium-sized enterprises. *International Journal of Information Management*, *54*, 102190. https://doi.org/10.1016/j.ijinfomgt.2020.102190

Mikalef, P., Pappas, I. O., Krogstie, J., & Giannakos, M. (2017). Big data analytics capabilities: a systematic literature review and research agenda. *Information Systems and E-Business Management*, *16*(3), 547–578. https://doi.org/10.1007/s10257-017-0362-y

Ncube, T.R., & Zondo, D. (2022). Entrepreneurial Attributes responsible for Small and Medium Enterprise Growth in South Africa: Small and Medium Enterprise Owners' perspectives. *International Journal of Special Education* 37(3), 2022-8223. https://www.researchgate.net/publication/359314373

Rahman, K. (2018). A Narrative Literature Review and E-Commerce Website Research. *ICST Transactions on Scalable Information Systems*, *5*(17), 154806. https://doi.org/10.4108/eai.29-5-2018.154806

Seseni, L. & Mbohwa, C.(2021). The Significance of Big Data in the Success of SMEs in Emerging Markets: A Case of South Africa. *Proceedings of the 11th Annual International Conference on Industrial Engineering and Operations Management, Singapore*, 1986-1996. http://www.ieomsociety.org/singapore2021/papers/376.pdf

Shan, S., Luo, Y., Zhou, Y., & Wei, Y. (2018). Big data analysis adaptation and enterprises' competitive advantages: the perspective of dynamic capability and resource-based theories. *Technology Analysis & Strategic Management*, *31*(4), 406–420. https://doi.org/10.1080/09537325.2018.1516866