Big Data Analytics as a Game Changer for Business Model Innovation in Small and Medium-Sized Enterprises in South Africa

Tlou Maggie Masenya, Durban University of Technology, South Africa*

ABSTRACT

Digital transformation has caused an abrupt change to business processes and practices whereby small and big businesses are developing business model innovation (BMI). Big data analytics is seen as one of the suitable technologies to offer business model innovation solutions and also as a strategy to improve business operations and performance in Small and Medium-sized Enterprises (SMEs). This study thus reviewed literature on the adoption of big data analytics, with a view to highlight how this technology can support the development of big data business model innovation applicable to SMEs. The study revealed that big data analytics has the potential to enhance SMEs' business processes, practices, performance, and to respond to their increasingly competitive environment. It is therefore recommended that SME owners and managers should adopt and implement technologies such as big data analytics to support business innovation processes as that could sustain organizational performance and improve their innovative and dynamic capabilities.

KEYWORDS

Big Data, Big Data Analytics, Business Model Innovation, Digital Technologies, Small and Medium-Sized Enterprises

INTRODUCTION

The possibility to exploit big data to pursue several innovative corporate strategies is increasingly disrupting business logics in many industries (Ciampi et al., 2020). Digital transformation is a period whereby small and big enterprises, worldwide are refocusing their business strategies by embracing the advanced emerging digital technologies to support and drive their business operations that yield substantial value and increased revenues. Increasing number of SMEs strive to obtain longer-lasting competitive advantages by utilising the newest digital technologies for innovating their business models rather than merely adapting their products, services and processes (Spieth et al., 2019). However, SMEs integrating and adopting emerging digital technologies in their business operations or digitalizing their business models innovation are considered as a threat by other competitive enterprises due to their open desire to be digitally inclined and their constant demonstration to optimally utilize these innovative technologies. Many scholars highlight the importance of examining the impact of digitalisation on business model innovation in small and big enterprises, and these enterprises can leverage big data

*Corresponding Author

to make their value creation processes evolve by enhancing business relations with customers and other stakeholders, to develop innovative value propositions where data plays either a supportive or a central role and by adding new sources of revenue or planning cost-cutting interventions (Woerner & Wixom, 2015; Sorescu, 2017; Lokshina et al., 2018; Bouwman et al., 2018). The adoption of big data to support decision-making processes has prompted many SMEs to undertake considerable efforts to develop business models and improve business practices.

However, SMEs were struggling to operate their businesses fully and make profit during COVID-19 crisis due to lock downs and restrictive measures, and social distancing policies that severely affected and disrupted their business operations that were put in place by the government in different parts of the world. SMEs were limited in digital marketing, e-commerce and online offerings due to their weak or poor technological infrastructure that also sabotages these enterprises' quest to embrace technological transformation. As a result, the majority of SMES faced severe losses in revenues and had to close operation due to a number of consumers attempting and making online purchases while employees were also laid off due to COVID-19 pandemic. Online sales helped to contain reductions in revenue for a number of small and big enterprises although the adoption of digital technologies is more difficult for SMEs. The results of a survey of over 5 800 small businesses in the United States by Bartik et al. (2020) shows that 43% of responding businesses were temporarily closed due to COVID-19 crisis, while on average, businesses reduced their employees by 40%.

Bartik et al (2020) further reported that three-quarters of respondents indicate that they have two months or less in cash in reserve. Similarly, the survey among SMEs in 132 countries by the International Trade Centre (ITC) (2020) reported that two-thirds of micro and small firms report that the crisis strongly affected their business operations and one-fifth indicate the risk of shutting down permanently within three months. The survey by McKinsey (2020) also indicates that between 25% and 36% of small businesses closed down permanently from the disruption in the first four months of the pandemic. The survey by the Canadian small businesses further revealed that the forty-four (44%) of SMEs were faced with a variety of technology and tech support challenges, such as in the areas of digital marketing, e-commerce and their other online offerings The Census Bureau in the United States, set up a specific weekly small business survey to measure the impact of COVID-19 on small business that indicated that almost 90% of small businesses experienced a strong (51%) or moderate (38%) negative impact from the pandemic; 45% of businesses experienced disruptions in supply chains; 25% of businesses has less than 1 to 2 months cash reserves (Buffington et al., 2020). SMEs and other businesses in South Africa are also faced with load shedding challenge that affects the full usage of technology by destabilizing internet connectivity which is heavily relied on when operating technologically. This challenge thus has a negative impact on e-commerce, digital marketing and it causes damage to electronics and loss of profit.

Big data analytics, also refers to as the tools for data analysis and visualisation of results to support the decision-making can support business innovation processes so as to sustain their business performance, improve their innovative and dynamic capabilities, in the new normal business environment. Business data analytics can also convert SMEs into a data-driven organisation capable of transforming data into actionable knowledge. However, small and big enterprises should be able to analyse the influence of big data analytics capabilities in developing and supporting business model innovation. Big data analytics capabilities refer to the company's abilities to leverage on technology and talent to exploit big data towards the generation of the insights that are necessary to overperform rivals (Mikalef et al., 2017). However, as noted by Ransbotham and Kiron (2017) there is still no empirical work or studies within the innovation management literature analysing the influence of big data analytics capabilities or usage on business model innovation. This study focuses on how SMEs integrate and utilize big data analytics for best decision making, business innovation processes, business growth and sustainability, with a view to develop Big Data Business Model Innovation (BDBMI).

PROBLEM STATEMENT

SMEs need to transform their business operation and processes by adopting innovative technologies such as big data analytics, artificial intelligence, Internet of Things, cloud computing technologies, just to name a few, as a way of supporting their business innovation models and to embrace digital transformation. However, most of SMEs in African countries including South Africa, are slow to integrate or adopt technologies such as big data analytics and artificial intelligence in developing their business innovation models as compared to large enterprises, despite the inclusive gains of adopting these advanced technologies. SMEs in South Africa are thus lagging behind in adopting digital technologies for their business innovations, and have not been able to make digital transformation of their business a high priority. As noted by Chesbrough (2010) business innovation models play a fundamental role in attempts to commercialize the technology and to achieve its objective economic value. Even big enterprises will fail if digital transformation is not a primary concern and digital technologies are not integrated into all areas of their businesses. SMEs are faced with financial constraints that limit them from implementing and adopting innovative technologies in transforming their businesses and they tend to be more invested on day-to-day operations and not focusing on long-term business strategies.

SMEs invested more on business survival mode than identifying long-term cost-effective business innovation strategies for successful integration of digital technologies in developing new business innovation models and transforming business operations and processes. Snodgrass and Biggs (1996) argued that SMEs are more innovative than larger firms probably due to the adoption of niche strategies such as high product quality, flexibility and responsibility to customer needs as a means of competing with large-scale businesses. However, these innovations often take time and only large enterprises may have more resources to adopt digital technologies and implement business model innovation. SMES are struggling to adopt data analytics as part of their data driven initiatives, and as stated by Reis, Bornschlegl and Hemmje (2021) a high number of those who adopt it effectively, fall short of moving from proof of concepts to implementing data analytics enabled environments. This can be due to various reasons, and among others are lack of right skills, not trusting data analytics technology or not having access to the required technology platforms (Reis, Bornschlegl & Hemmje, 2021)

Most of SMEs often attract unskilled labour due to their financial constraints, with the majority of skilled labour joining larger enterprises or employers that offer better jobs in terms of working conditions than these small enterprises. SMEs will thus continue to experience skills gap due to its inability to attract skilled labour especially in the field of Information Technology. However, Eze et al (2019) further noted that illiteracy, dearth of awareness of the implication of the adoption of technology and lack of knowledge limit the intentions of SMEs to be invested in technology. Traditional organisations failing to improve their data drivenness, will lose out on opportunities that can enable faster and largescale evidence based decision making, insight generation, and process optimisation (Manyika, et al., 2017). SMEs thus need to implement big data-driven business innovation models and strategies in order to benefit from advantages of digital technologies and to remain competitive in this digital business context. This study explored how SMEs can develop and support their business innovation models using big data analytics. Research objectives formulated for this study were to:

- Determine the applicability of big data analytics in developing and supporting business model innovation in SMEs in South Africa.
- Determine the factors enabling the effective adoption of big data analytics in SMEs in South Africa.
- Propose a Big Data Business Model Innovation applicable to SMEs in South Africa.

METHODOLOGY

This study provides a holistic understanding and insights on the adoption of big data analytics in supporting the development of big data business innovation models. The study adopted qualitative content analysis method and to carry out the literature review, the author searched the relevant articles on previous studies on the application of big data analytics for digital transformation of SMEs in South Africa. Roller and Lavrakas (2015) described content analysis method as the systematic reduction of content, analysed with special attention to the context in which it was created, to identify themes and extract meaningful interpretations of the data. It is a method designed to identify and interpret meaning in recorded forms of communication by isolating small pieces of the data that represent salient concepts and then applying or creating a framework to organize the pieces in a way that can be used to describe or explain a phenomenon. The process of literature review was guided by a protocol-driven approach that offers researchers a framework to select, analyse, and assess articles with the aim of ensuring robust and defensible results through reliability and repeatability (Massaro, Dumay & Guthrie, 2016). The literature review protocol was guided by Kitchenham (2004), using the following key elements:

Inclusion/Exclusion Criteria

The inclusion criteria aim to identify studies that provide direct evidence about the research question (Kitchenham, 2004). The review process thus begun with the researcher identifying and selecting documents on the basis of their usefulness and relevance to the study. Literature review on the application of innovative technologies such as Big data analytics in developing and supporting business innovation models in SMEs, were conducted in major databases such as EBSCOhost, ScienceDirect, Wiley, Springer, Sage and Google Scholar, to ensure inclusion of all relevant studies in content analysis. Databases such as EBSCOhost allows using complex search strings and filters which makes it easy to apply complex selection criteria and it is therefore, considered a suitable choice for systematic literature reviews (Wang & Noe, 2010). The types of studies considered for inclusion in literature review thus included all qualitative, quantitative and mixed methods studies. However, only peer-reviewed journal articles written in English were considered and included in the literature review as they represent a major mode of communication among researchers and they are therefore taken as unit of analysis. The editorials, theses, books and all other articles not focusing the application of Big data analytics in developing and supporting business innovation models in SMEs were thus excluded in this study.

Search Strategy

The search terms or keywords such as "Big data analytics and Small Medium-sized Enterprises", "business model innovation and Small Medium-sized Enterprises" and "digital transformation and business innovation models," appearing in the title, abstracts or subject terms, were used to collect data from related studies reporting on the application of Big data analytics in developing and supporting business innovation models in SMEs and in order to ensure the inclusion of all relevant studies in the content analysis. The retrieved articles were screened over two rounds for the study's selection. In the first round, the researchers reviewed the title and abstracts according to the inclusion and exclusion criteria whereas in the second round of the review, the full text of the selected articles were screened to determine if they met the outlined criteria and to ensure that the articles are in line with the research objectives of the study and to delete duplicates.

Study Selection

The selection criteria included the systematic literature reviews, empirical studies and other reviews published in the peer-reviewed journals focusing on the adoption of Big data analytics in developing and supporting business innovation models in SMEs. The articles relevant to the study were initially

identified after the second round of the search strategy, following an iterative process of manual screening. Although many articles related to the study were retrieved, however, some of the articles including all the duplicates were removed after thorough reading of all the articles, mainly because of their irrelevance to the topic of interest and research objectives or lack of quality, which considerably reduced the sample size.

Data Analysis and Synthesis

The thematic content analysis technique or process developed by (Green & Thorogood, 2004) was used to systematically analyse the qualitative data or text extracted directly from previous studies on the adoption of big data analytics in developing and supporting business innovation models in SMEs. The process of thematic content analysis is outlined below:

- **Familiarization With the Data:** It was developed by reading the papers selected for review using the "repeated reading" approach to search for meanings and patterns. To remove any ambiguity, the extracted data were connected to the source paper to develop contextual understanding helpful in data interpretation.
- **Generating Initial Codes and Themes:** The coding process was research objectives driven whereby the codes were developed through capturing aspects of application of big data analytics in supporting business innovation models in SMEs and factors enabling effective adoption of these innovative technologies, under investigation, which made it easier to assign relevant codes. After the completion of the coding process, all codes were reviewed and collated to generate potential themes relevant to the research objectives.
- **Reviewing Themes:** All of the themes were defined and common characteristics in the themes were outlined, as per the objectives of this study, and this led to the development of higher-level themes composed of many sub-themes. For example, the applicability of big data analytics in developing and supporting business model innovation in SMEs and the factors enabling the effective adoption of big data analytics in SMEs. The review of cloud-based big data analytics, business model canvas and factors driving business innovation thus enabled researcher in identifying various elements or variables that guided the study in developing Big Data Business Model Innovation applicable to SMEs.
- **Producing the Written Analysis:** The analysis process resulted in the identification of innovative technologies used in the development of business innovation models in SMEs explored in previous studies and the potential research gaps needing further investigation.

CONCEPTUAL FRAMEWORK

The conceptual framework was derived from various components of theories, models and concepts embedded in the extant literature. Cloud-based big data analytics and business canvas model have been adopted to guide this study. The study thus required the collaboration of different theories, models and enabling factors to give grounded coherence in order to develop Big Data Business Model Innovation (BDBMI) applicable to SMEs in South Africa.

Cloud-Based Big Data Analytics

Cloud-based big data analytics provides a low-end cost infrastructure and can foster organizations to stay competitive by providing the following benefits: cost-effectiveness, ease of management, rapid elasticity, on-demand service and resource pooling (Aneato, 2020). Cloud-based big data analytics can be delivered in five main service delivery models known as Data as a Service (DaaS), Analytics as a Service (AaaS), Software as a Service (SaaS) Platform as- a-service (PaaS) and Infrastructure-as-a-service (IaaS). These service models are useful way for SMEs managers to think about the

levels of service and the best solutions for their enterprises. These entities typically leverage common infrastructure and tools such as cloud, common data and analytics tool to provide high quality data and analytics services. Big data is gaining importance in business analytics, and as stated by Ghosh (2020) it is not only an organizational asset but also a distinct revenue opportunity via data-related services offered under DaaS.

As also noted by Naous, Schwarz and Legner (2017) the new ecosystem is now leveraging several new roles in the ecosystem, such as Data as a Service (DaaS) and Analytics as a Service (AaaS) providers, to aggregate, process and manage wide range of data sources while also providing wide range of analytics capabilities on top of the consolidated data. Data as a Service (DaaS) can leverage commonly managed cloud and web-based infrastructure and tools as well as hosted and web delivery models to offer rich set of data processing, management, and access services, in addition to in house implementations (Low, Chen & Wu, 2011). As stated by Ghosh (2020) DaaS service providers deliver value-added intelligence or information via a digital network which is most often cloud-based, and offer more value-addition to customers. The delivered data and analytics services are also highly customizable, consumable and easy to integrate with other enterprise applications or processes. Llave, Hustad and Olsen (2018) further noted that SMEs can create high value analytics services such as business intelligence reporting, text analytics, and advanced analytics such as predictive modelling, also referred to as Analytics as a Service (AaaS). All these analytics are made in composable forms to allow for direct consumption, integration and customizations and to boost productivity and create value for all, on top of DaaS. Software as a Service (SaaS) is one of the most common cloud computing service models used by businesses, where software is used remotely from the cloud. In this service model, the applications are accessible from various client devices through a thin client interface such as a web browser. The consumer is provided software to use but does not manage or control the underlying cloud infrastructure including network, servers, operating systems, storage or even individual application capabilities with the possible exception of limited user-specific application configuration settings (Mell & Grance, 2011).

Platform as a Service (PaaS) is the set of tools and services designed to make coding and deploying cloud-based applications quick and efficient (Rackspace Support, 2013). PaaS is one of the service models designed to make coding and deploying cloud-based applications quick and efficient. With PaaaS, the consumer does not manage or control the underlying cloud infrastructure including network, servers, operating systems, or storage but has control over the deployed applications and possibly application hosting environment configurations. SMEs with their own software developers may make use PaaS offerings such as Google App Engine, Heroku and Microsoft Azure Services. SMEs' Information Technology (IT) staff will thus develop software and load content onto an already-robust technology platform that is running in a specific computing environment. Infrastructure as a Service (IaaS) is a computing service model whereby a consumer rent cloud infrastructure such as servers, storage and networking on demand, in a pay-as-you-go model (IBM, 2015). However, with IaaS, it is not necessary to make a significant up-front investment in computing hardware, and instead consumers can provision infrastructure including computer processing and storage on-demand. All these service models are driving the development of new business models within small and big enterprises.

Business Model Canvas

A business model canvas describes the overall logic of a firm, including the three key components which enables small and large enterprises to explore alternative business models, namely: value proposition, value creation and value capture. Parida, Sjödin and Reim (2019) emphasized the need for business model alignment by arguing that firms need to evaluate and understand their shortcomings in each of these key components and recognize that a change applied to one of them should always consider the other components. The value proposition provides an answer as to "what" value is offered to the target customer and it is linked to the company's vision (Taran, Boer & Lindgren, 2015). It

focuses on analysing the target market and understanding customers' needs and producing products or services that satisfy the needs or the target customers while also providing security to the customers.

The value creation depicts "how" value is created for the target customer by identifying key activities, resources and building collaboration and partnerships with relevant stakeholders (Osterwalder & Pigneur, 2010). SMEs' key activities in creating value for the customers may be integrating digital assets in the core offering, virtual and augmented reality and actionable insights while its key resources include big data analytics tools, social media analytical tools, data exploration and visualization tools. The value capturing provides an answer to "how much" value creation and delivery costs, and it includes cost structures and revenue models that reflect the profit model for creating and delivering value to the target customer (Morris, Schindehutte & Allen, 2005). SMEs' cost structures include big data analytics hardware and software, human resources required to provide services, employees training, advertising revenue models and consultation and analytical services costs. The cost structure sums up the monetary values of creating and delivering value.

Digital transformation thus has a significant impact on all dimensions of business model canvas, value proposition, value creation and value capturing. Digitalized business models might use very novel or less novel digital technologies, but the necessary condition is that all dimensions use these technologies, not only for certain activities of the firm (Bouncken et al., 2019). For digital transformation of business models in SMEs, advanced technologies such as artificial intelligence and big data analytics are used to generate new applications or services (i.e. on-demand prediction). However, these technologies require skills that enable data collection and exchange, as well as the ability to analyse, calculate and evaluate options that are used to initiate new processes within the business model. The digital transformation of business models is based on an approach with a sequence of tasks and decisions that are related to one another in a logical and temporal context, and this affects four target dimensions: time, finance, space and quality, as noted by Schallmo et al. (2017). Li (2020) further described a continuum of how firms can enhance, extend and transform or redefine the value proposition through digitalization. El Sawy and Pereira (2013) propose the so-called VISOR framework, which encompasses a value proposition, interface, service platform, organizational model and revenue model. However, as compared to the business model canvas, the important differences to note in this framework are the interface and service platform categories which allow for a more in-depth analysis of the interaction a customer will have with the hardware and software as well as the infrastructure needed for big data analytics technology to be effectively implemented and used. The VISOR framework also allows for an analysis of strengths and weaknesses within an organization or SMEs in regards to big data analytics adoption.

The Applicability of Big Data Analytics in Developing and Supporting Business Model innovation in SMEs

As stated by Berente et al. (2021) the effective use of big data analytics and artificial intelligence is the most advanced level of data drivenness as it can enhance and automate decision making in organisations. Big data analytics is thus regarded as a key to achieving the pinnacle of data drivenness. With new technological advances and trends, SMEs are striving to keep up with the changes and leverage the benefits of useful information embedded within large volumes of data. Big data analytics is changing the face of business in a variety of ways, including improving online customer analysis, improving customer service and making financial transactions more conveniently and securely. Big data analytics technologies allow business leaders to make proactive knowledge-driven decisions on future trends. According to McAfee and Brynjolfsson (2012), productivity and profitability indicators of companies that inject big data analytics into their operations are reported to be 5% to 6% higher than those of their peers. Therefore, big data analytics solutions can be used by SMEs to research trends that will help them win more clients and streamline processes for success. SMEs using big data analytic solutions can thus create or improve new services and products as well as reduce organizational costs, execute innovations faster, and make better decisions (Bartosik-Purgat & Ratajczak-Mrożek, 2018). A

study conducted by Duan, Cao and Edwards (2017) among medium-sized and large United Kingdom (UK) manufacturing companies demonstrated that top-performing enterprises are 5.31 to 7.56 times more likely to make data-driven decisions than bottom-performing ones. Gupta and George (2016) described big data as the large and complex data assets that require cost-effective management and analysis for extraction of insights from them. Big data is characterized by four specific features also referred to as the 4Vs, as outlined by Kietzmann, Paschen and Treen (2018), namely:

- **Volume:** Refers to the large scale of big data, which requires innovative tools for their collection, storage, and analysis.
- **Velocity:** Refers to the rate at which the data are generated or updated, pointing to the real-time nature of big data.
- **Variety:** Refers to the variation in types of data. Big data can come in diverse and dissimilar forms from multiple sources, such as texts, spreadsheets, audios, videos, and sensors. Big data are usually unstructured (i.e. text, audio) and are not organized in a structured manner in a relational database (i.e. tables, spreadsheets).
- **Veracity:** Refers to the complex structures of big data assets that make them ambiguous, imprecise and inconsistent. For example, the data related to consumer opinions posted on social media can be biased, inaccurate and ambiguous.

As noted by Elgendy and Elragal (2016) the increasing availability of big data analytics helps SMES collect and analyse data in search of valuable business information and insights that can help improve their products, services and making faster and better decision-making strategies. The improved big data accessibility and analytics are providing opportunities for new and existing SMEs to find new ways to harness the power of the growing aggregation of digital data. These immense opportunities generated by capturing and analyzing data are transforming the business practices in small and big enterprises. Big data analytics can enable faster data analysis and decision-making through advanced data visualization (Elgendy & Elragal, 2016). Business leaders in various enterprises should thus be able to blend and analyse different kinds of data to gain the benefits from big data analytics and their platforms.

However, the application of big data analytics is not only limited to start-ups business but also apply to existing business models across various enterprises. SMEs which are not investing in big data projects may struggle to gain a competitive advantage and business insights to improve performance. SMEs are therefore not likely to benefit from using big data analytics if they do not recognize and leverage business patterns and trends to improve processes or reduce costs. SMEs thus make use of big data to help make informed decisions as it leads to operational improvements, and also influence strategy. Big data analytics can be used in the marketing domain, for evaluating business strategies by gathering deeper consumer insights, optimizing marketing objectives and getting a better return on investment. Finance personnel in SMEs can use big data analytics to gather the information needed to gain a clear view of key performance indicators such as revenue generated, net income, payroll costs, etc. Big data analytics also allows finance personnel to scrutinize and comprehend vital metrics and detect fraud in revenue turnover while also enabling an enterprise to measure the impact of a range of human resource metrics on overall business performance and make decisions based on big data. As stated by Bologa et al. (2014) business leaders in health organizations utilize big data analytics to detect abnormal claims quicker by automatically narrowing the segment with potentially fraudulent applications or detecting new patterns of fraud. SMEs can thus utilize big data analytics to maximize profits, reduce costs, introduce a new product, support decision-making processes, and for fraud detection and prevention as well as in-memory processing and cloud technology to lower their risk of making poor decisions (Bologa, et al., 2014). SMEs should also implement big data analytics to realize benefits such as understanding customer intelligence and unveil previously unseen patterns that support competitive advantage and sustainability. The new generation of big data analytics can

therefore affect and benefit SMEs in two ways: by altering their business environment, or by enabling them to change their business practices, and increase productivity and outreach. Data driven SMEs thus act on observed data and utilise data driven business models to achieve both financial and non financial benefits (Zolnowski, et al., 2017).

Balachandran and Prasad (2017) further identified four benefits of big data analytics, namely: faster and better decision-making, new products and services, product recommendations, and fraud detection. Big data analytics can therefore trigger a new production revolution, radically transforming business practices and conditions, and it has the potential to revolutionize the way companies set up their business models and build their competitive advantages to define their advantages over competitors. However, the implementation of big data analytics solutions can create challenges in SMEs despite the benefits and opportunities associated with these technologies. Firstly, data must be in digital form, be well arranged, be cleared of incorrect records and data gaps, be integrated in order to make efficient data-based decisions, and be provided to decision-makers at the right time and place without undue delay. Additionally, not all data is valuable, although volume of data in business are constantly increasing in SMEs.

Factors Enabling the Successful Development of Business Model Innovation in SMEs

Ensuring succeful and sustainable business innovation can be challenging and it is therefore appropriate to review and discuss various factors enabling the development of Business model innovation in SMEs. This study thus considers that the understanding of the factors or elements contributing to business model innovation sustainability can lead to the establishment of big data Business model innovation applicable to SMEs. Further understanding of the factors contributing to business innovation model sustainability was also premised on business innovation theories and models. An understanding of success factors may also assist SMEs to develop multiple-option, multiple-path strategies to achieve future goals and to progress in effective business innovation. However, the following items need to be considered before proceeding with big data business innovation (Tian, Zhang, Yu & Cao, 2019; Wang, Kung, Wang & Cegielski, 2018; Wang, Li, Lu & Cheng, 2022):

- Analyze the existing resources of the enterprises and technological infrsatrusture;
- Necessary manpower, organizational commitment and involvement of every staff member in SMEs;
- Technical staff to implement technologies such as big data analytics;
- Talented staff members who are capable of supporting business units independently;
- Budget provision by SMEs' management;
- Create cohesive business innovation platform and stable digital environment;
- Develop big data governance, data management strategy and business intelligence competency;
- Create knowledge repositories and knowledge sharing platforms;
- Selection of software (open source or commercial) and proper guidelines; and
- Selection of suitable file formats for big data analytics.

The study by Liu and Bell (2019) stressed the importance of the following factors in the business model innovation process in transition economies, namely: development of a strong and loyal customer base, active customer feedback to ensure the product meets customer needs and to avoid expensive mistakes going forward, extension of the value network to ensure finance is available to allow both product development and business model development and development of the network to take advantage of collaborative opportunities. Other enabling factors of the business model innovation in SMEs include culture and strategy, capability building and human resources as well as supporting and enabling business model innovation. Innovations in business model of SMEs can also be driven by various factors at different levels including organizational-related factors, technological related factors and environmental related- factors (Chesbrough & Crowther, 2006; Chesbrough, 2010; Wang,

Kung, Wang & Cegielski, 2018; Tian, Zhang, Yu & Cao, 2019). SMEs need to take all these elements or factors into account in achieving their long-term business innovation goal.

Organizational-Related Factors

Zimmermann and Pucihar (2015) believe that the innovativeness of enterprises and business environment can promote business model innovation. Organizational support and capabilities such as dynamic consistency or critical capabilities have been suggested as enabling small and big enterprises to transform their business models and to support value-creation processes (Achtenhagen, Melin & Naldi, 2013). Demil and Lacocg (2010) also emphasized the importance of developing dynamic consistency to renew business models. The sustainable business innovation thus requires not just technical solutions but also clear organizational commitment and willingness. Firstly, management in SMEs must recognize the importance and the benefits of innovative technologies such as Artificial Intelligence and big data analytics as that will enable them to prioritize business innovations initiatives. The study observed that lack of commitment and willingness by management hinders the effective implementation of business model innovation in SMEs. Management thus needs to commit themselves and have positive attitudes and interest towards business innovation initiatives.

However, South African SMEs need to align their business innovation initiatives with the organization's core mission, goals and vision. Literature also revealed that the majority of SMEs do not take great interest in their long-term business innovation as it is clear that many systems still do not take long-term business innovation strategies into account. In this regard, SMEs need to develop systems that take long-term business innovation into account and ensure that all staff with the responsibility for transforming and developing business model innovation enter the initiatives with a long-term vision. It is also essential to understand requirements and issues associated with the business innovation to ensure that business needs are identified and fed into the business innovation project as well as developing business innovation plan.

The business innovation plan should also take into account the policies, legal obligations, organizational and technical constraints, costs, requirements and goals. Additionally, corporate social capital, organizational learning, organizational inertia and organizational culture, have also been found to influence business model innovation (Zhao, Wang, Zhu & Ding, 2014). SMEs also need to be engaged in communications and outreach programmes that include training events, instructional videos, reports, seminars, workshops, conferences, etc., to clarify the necessity for business innovation and to keep everyone on the same page with regard to understanding the procedures and strategies regarding business models innovation. Management thus needs to understand the customers' needs or interests, business innovation needs and requirements, communicate requirements to the development team, communicate status of their business innovation to stakeholders, communicate priorities, monitor and assess business innovation tools and services. Management in SMEs also need a thorough systematic understanding of the barriers to effective business innovation in their own businesses and how they are influenced by organizational workflows and customers' needs. Management should therefore analyse business innovation environments and adequately address related challenges. With more and more SMEs transforming their businesses, policy concerns and procedures surrounding business innovation are becoming increasingly paramount. Implementation of policies and procedures, appropriate strategies and staffing of skilled and knowledgeable personnel are vital for effective development of business model innovation. Relevant policies, procedures and standards should be documented so that they may be sustained and understood over time.

SMEs also need to have a governance over their digital transformation and business innovation practices. Governance includes the processes, roles, standards and metrics that ensure the effective and efficient use of big data analytics in enabling an organization to achieve its goals. Effective governance framework is thus essential to deliver the diverse organizational components of the strategy. The governance framework enables the compliance of the business model innovation with applicable laws, regulations and standards. Business model innovation is regarded as a global issue

and there is therefore a need to collaborate on business innovation programmes so that they can be implemented effectively and to retain their relevance in the digital transformation era. Management in SMEs needs to seek appropriate opportunities to collaborate with other organizations or enterprises on business innovation initiatives so that they may benefit from shared resources available to address shared challenges. This will also enable them to exchange knowledge and expertise across the wider international business innovation communities. Effective and efficient collaboration, partnership and participation are thus the key to business innovation success. Other organizational-related factors include: implementing big data governance, creating corporate data-driven and knowledge sharing culture and training employees on effective utilization of big data analytics.

Implementing Big Data Governance

Big data analytics has the potential to equip organizations to harness the mountains of heterogeneous data, information and knowledge from a complex array of internal applications and enterprise' network, with appropriate big data governance (Wang, Kung, Wang & Cegielski, 2018). Big data governance is the process and management of data availability, usability, integrity, and security of data used in an enterprise (Gaur, 2022). It improves data quality, helps in understanding the data and shows the data lineage, helps in adopting regulatory compliance and improve the capabilities of decision-making by data. Big data governance is an extension of Information Technology (IT) governance that focuses on leveraging enterprise-wide data resources to create business value. However, as noted by Wang, Kung, Wang and Cegielski (2018) successful big data governance requires a series of organizational changes in business processes since all the data has to be well understood, trusted, accessible and secure in a data driven setting. A strong big data governance protocol should thus be defined to provide clear guidelines for data availability, criticality, authenticity, sharing, and retention that enable SMEs to harness data effectively from the time it is acquired, stored, analysed and finally used. This allows SMEs to ensure the appropriate use of big data and build sustainable competitive advantages.

SMEs should also review the data they gather within all their units and realize their value. Managers can make decisions on which datasets to be integrated in their big data analytics framework, thereby minimizing cost and complexity, once the value of these data has been defined. Big data integration is the key to success in big data analytics implementation, because the challenges involved in integrating data across systems and data sources within the enterprise remain problematic in many instances (Mikalef et al., 2017). In particular, most SMEs encounter difficulties in integrating data from legacy systems into big data analytics frameworks. Managers need to develop robust data governance before introducing big data analytics in their organization.

Creating Corporate Data-Driven and Knowledge-Sharing Culture

SMEs managers should foster information or knowledge sharing culture, for successful implementation of big data analytics. This is critical for reducing any resistance to new information management systems from employees in SMEs. Wang (2018) noted that without an information sharing culture, data collection and delivery will be limited, with consequent adverse impacts on the effectiveness of the big data analytical and predictive capabilities SMEs should therefore engage data providers from the earliest stage of the big data transition process and develop policies that encourage and reward them for collecting data and meeting standards for data delivery (Wang, 2018). This will significantly improve the quality of data and the accuracy of analysis and prediction.

Training Employees on Effective Utilization of Big Data Analytics

The skills in e-resources management, e-services development, and digitization are lacking in African SMEs, particularly in South Africa. There is thus an increased demand for personnel with skills needed for business innovation initiatives, in SMEs in South Africa and other developing countries. Therefore, for effective utilization of the outputs from big data analytics, SMEs should equip managers and employees with relevant skills such as critical thinking and the skills of making an appropriate

interpretation of the results (Wang, 2018). It is thus important that SMEs provide analytical training courses in areas such as data mining, basic statistics and business intelligence to those employees who will play a critical role of implementing and utilization of big data analytics solutions. As noted by the American Management Association (AMA) (2013) mentoring, cross-functional team-based training and self-study are beneficial training approaches to help employees develop the big data analytical skills they will need. SMEs should adjust their job selection criteria to recruit prospective employees who already have the necessary critical and analytical skills. However, lack of management support for training of staff was identified as one of major problems impeding business innovation in SMEs in South Africa. SMEs managers need to provide training to ensure that staff are able to maintain and enhance their technical expertise.

Technological-Related Factors

Digital transformation has led to the innovation of business models through the application or diffusion of digital technologies. Technological innovation is emphasized in all aspects of small and big enterprises. Innovative technologies such as big data analytics can help small and big enterprises to continually change their business operations and processes. Tian, Zhang, Yu and Cao (2019) noted that the advent of advanced technologies quickly integrates industrial normalization, locating customer needs accurately and optimizing the business processes. As stated by Assmann and Engels (2008) these technologies are considered as the core force for SMEs to transform into service-oriented enterprises. The integration of big data analytics into SMEs' business operations has transformed their business models innovation and has also raised its level of intelligent manufacturing and flexible production, and accelerated its restructuring and optimization of organizational structure and business processes. Business innovation models are thus dependent on big data analytics to render them intelligible and, as a result, more big data analytics technologies need to be adopted by SMEs. Big data analytics tools, modern governance technologies, data integration and visualization systems and business intelligence systems need to be in place for effective business innovation. SMEs managers or owners need to record the technical requirements so that best decisions on appropriate business innovation systems and strategies may be made.

A viable innovation capability also requires SMEs to have sufficient staff with technical expertise to support all of the technology infrastructure and requisite key processes for business innovation, and this will inevitably guarantee the sustainable business innovation. Technical expertise may exist within internal or contracted staff or may be provided by external service providers. Management also needs to appreciate the fact that the exponential changes and emergence of digital technologies has drastically changed the way small and big enterprises operate, and they therefore need to adopt a culture of willingness to change and to consider the mentality and understanding of the customer's needs.

Environmental-Related Factors

The threat of new emerging technologies and the competition in the market environment are increasing, which has forced enterprises to transform their business processes and models. Market pressure also drives enterprises to continuously seek market gaps, expand research and development efforts and develop new products. Market pressure is compelling SMEs to rethink its business model, thereby identifying new opportunities such as developing new products, lowering costs and providing additional services, and to improve firm competitiveness and performance. Market pressure is thus seen to play a key role in transforming SMEs, and this is because if the enterprise can identify relevant development in its environment, it is highly likely to innovate its business model to respond to the market pressure (Tian, Zhang, Yu & Cao, 2019). Digital transformation drives SMEs to perceive future trends in the environment, identify and meet customer needs, and boldly implement new business models. Dynamic capabilities allow SMEs to be able to sense the development of internal and external environment and seize market opportunities by reconfiguring its resources in response to changes in the market, which could lead to the development of new business model innovation.

On the other hand, SMEs innovation capability, developed from employees' innovative experiments, mutual learning and knowledge sharing could generate new ideas about product, technology, process etc., which could also lead to the development of new business model innovation.

Proposed Business Model Innovation Based on Big Data Analytics

Small and big enterprises need to develop data-driven business models in this era of digital transformation. This study thus proposed Big Data Business Model Innovation applicable to SMEs in South Africa, guided by cloud based business data analytics, business model innovation framework by Ramdani, Binsaif and Boukrami (2019) and enabling factors identified from literature review. The study found it appropriate to use business model innovation framework and business model canvas as they highlights the areas of innovation which enables SMEs to explore alternative business models. Figure 1 depicts the proposed Big Data Business Model Innovation (BDBMI).

The proposed Big Data Business Model Innovation was therefore drawn from the principal capability factors from cloud-based busisness data analytics, business model innovation framework in SMEs depends and enabling factors identified from literature review. The BDBMI was developed after investigating the business innovation needs and requirements that are vital to effective data-driven business innovation. It is argued that all these models, business components and enabling factors are key to understanding and guiding business innovation practices and are appropriate for implementing the sustainable big data business model innovation in SMEs in South Africa. The study thus suggests that these three connecting arears are very dependent on each other and their combination is therefore central to the future and success of big data business innovation practices within SMEs in South Africa. However, the proposed model should be guided by what SMEs can accomplish within their existing human and financial resources, technology infrastructure and funding capabilities, including understanding current technological innovation challenges.

Figure 1. Proposed Big Data Business Model Innovation (BDBMI) for SMEs
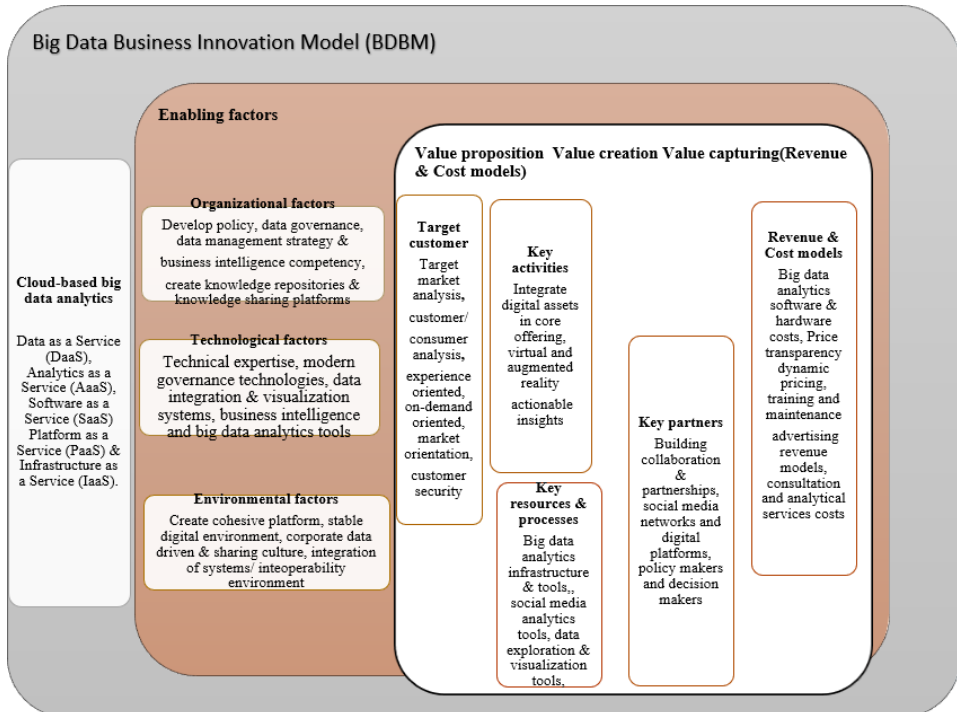
CONCLUSION AND RECOMMENDATIONS

The aim of this study was to explore how SMEs can develop or support their business model innovation using big data analytics, in this era of digital transformation. The study discusses the enabling factors for successful and sustainable business model innovation in SMEs. Although some of SMEs have embraced the digital transformation era, they are however, too slow to adopt technologies such as big data analytics in developing and supporting their business models innovation. However, the adoption of big data analytics technologies can pose challenges if employees within SMEs are not well equipped with technical knowledge and skills necessary to understand and use advanced technologies in transforming their businesses.

Several recommendations to effective adoption of big data analytics were also documented and these include enactment of policies, collaborative and partnership opportunities and improving technology infrastructure. Sufficient funds should also be made available by SMEs for implementation and adoption of innovative technologies such as artificial intelligence, big data analytics and Internet of Things. However, realising the benefits of utilising technologies such as artificial intelligence and big data analytics to support decision making whilst having the required skills with no available technology platforms, forms part of what is referred to as the Knowledge Attitude Practice gap (KAPgap). SMEs will fail to leverage the potential that these advanced technologies can offer if they fail to address the technical aspects of the KAPgap.

It is also necessary for management to reshape the original internal business processes, business structure, and change employee's behaviour, thinking and awareness. SMEs should implement a high investment in many aspects such as resource integration, system integration, process reengineering, organizational learning and innovation policies to enhance brand image, realize economic benefits, and meet the needs of transformation. Service-oriented transformation is rooted in the cultivation of innovative talent and the fusion of innovative awareness and therefore by introducing middle and high-end talents, SMEs managers need to set up a sound training and compensation system, but also increase its investment in research and development including training professionals in innovation and applying core technology into service. The study further proposed Big Data Business Model Innovation that serves as a guide for employees and managers who are interested in improving their business innovation models in SMEs.

REFERENCES

Achtenhagen, L., Melin, L., & Naldi, L. (2013). Dynamics of business models-strategizing, critical capabilities and activities for sustained value creation. *Long Range Planning*, *46*(6), 427–442. doi:10.1016/j.lrp.2013.04.002

American Management Association (AMA). (2013). *Conquering Big Data: Building Analytical Skills in Your Organization*. American Management Association Press.

Assmann, M., & Engels, G. (2008). Transition to Service-Oriented Enterprise Architecture. In R. Morrison, D. Balasubramaniam, & K. Falkner (Eds.), Lecture Notes in Computer Science: Vol. 5292. *Software Architecture. ECSA 2008*. Springer. doi:10.1007/978-3-540-88030-1_34

Balachandran, B. M., & Prasad, S. (2017). Challenges and Benefits of Deploying Big Data Analytics in the Cloud for Business Intelligence. *International Conference on Knowledge Based and Intelligent Information and Engineering Systems*. doi:10.1016/j.procs.2017.08.138

Bartik, A. W., Bertrand, M., Cullen, Z., Glaeser, E. L., Luca, M., & Stanton, C. (2020). The impact of COVID-19 on small business outcomes and expectations. *Proceedings of the National Academy of Sciences of the United States of America*, *117*(30), 17656–17666. doi:10.1073/pnas.2006991117 PMID:32651281

Bartosik-Purgat, M., & Ratajczak-Mrożek, M. (2018). Big Data Analysis as a Source of Companies' Competitive Advantage: A Review. *Entrepreneurial Business and Economics Review*, *6*(4), 197–215. doi:10.15678/EBER.2018.060411

Berente, . (2021). Santhanam Managing artificial intelligence. *Management Information Systems Quarterly*, *45*(3), 1433–1450.

Bologa, A. (2014). Big Data and Specific Analysis Methods for Insurance Fraud Detection. *Database System Journal*, 31-39.

Bouncken, R. B., Kraus, S., & Roig-Tierno, N. (2019). Knowledge and innovation-based business models for future growth: Digitalized business models and portfolio considerations. *Review of Managerial Science*, 1–14.

Bouwman, H., Nikou, S., Molina-Castillo, F. J., & de Reuver, M. (2018). The impact of digitalization on business models. *Digital Policy*. *Regulation & Governance*, *20*(2), 105–124. doi:10.1108/DPRG-07-2017-0039

Buffington, C. (2020). *Measuring the effect of COVID-19 on U.S. small businesses: The Small Business Pulse Survey.* U.S. Census Bureau, Center for Economic Studies Discussion paper, CES 20-16. https://www2.census.gov/ces/wp/2020/CES-WP-20-16.pdf

Casadesus-Masanell, R., & Zhu, F. (2013). Business model innovation and competitive imitation: The case of sponsor-based business models. *Strategic Management Journal*, *34*(4), 464–482. doi:10.1002/smj.2022

Chesbrough, H. (2010). Business Model Innovation: Opportunities and Barriers. *Long Range Planning*, *43*(2–3), 354–363. doi:10.1016/j.lrp.2009.07.010

Chesbrough, H., & Crowther, A. K. (2006). Beyond high tech: Early adoliters of olien innovation in other industries. *R & D Management*, *36*(3), 229–236. doi:10.1111/j.1467-9310.2006.00428.x

Ciampi, F. (2020). Exploring the impact of big data analytics capabilities on business model innovation: The mediating role of entrepreneurial orientation. *Journal of Business Research*.

Demil, B., & Lecocq, X. (2010). Business model evolution. In search of dynamic consistency. *Long Range Planning*, *43*(2–3), 227–246. doi:10.1016/j.lrp.2010.02.004

Duan, Y., Cao, G., & Edwards, J. S. (2018). Understanding the impact of business analytics on innovation. *European Journal of Operational Research*, *281*(3), 673–686. doi:10.1016/j.ejor.2018.06.021

El Sawy, O. A., & Pereira, F. (2013). *Business modelling in the dynamic digital space: an ecosystem approach*. Springer. doi:10.1007/978-3-642-31765-1

Elgendy, N., & Elragal, A. (2016). Big data analytics in support of the decision-making process. *Procedia Computer Science*, *100*, 1071–1084. doi:10.1016/j.procs.2016.09.251

Eze, S. C., Chinedu-Eze, V. C., Bello, A. O., Inegbedion, H., Nwanji, T., & Asamu, F. (2019). Mobile marketing technology adoption in service SMEs: A multi-perspective framework. *Journal of Science and Technology Policy Management*, *10*(3), 569–596. Advance online publication. doi:10.1108/JSTPM-11-2018-0105

Gosh, P. (2020). *Data-as-a-Service (DaaS): An Overview*. Dataversity.

Green, J., & Thorogood, N. (2004). Analysing qualitative data. In D Silverman (Ed.), Qualitative Methods for Health Research. Sage Publications.

Gupta, M., & George, J. F. (2016). Toward the development of a big data analytics capability. *Information & Management*, *53*(8), 1049–1064. doi:10.1016/j.im.2016.07.004

Kietzmann, J., Paschen, J., & Treen, E. (2018). Artificial Intelligence in Advertising How Marketers Can Leverage Artificial Intelligence Along the Consumer Journey. *Journal of Advertising Research*, *58*(3), 263–267. doi:10.2501/JAR-2018-035

Kitchenham, B. (2004). Procedures for Performing Systematic Reviews. Keele University.

Li, F. (2020). The digital transformation of business models in the creative industries: A holistic framework and emerging trends. *Technovation*, *92-93*, 102012. doi:10.1016/j.technovation.2017.12.004

Liu, P. & Bell, R. (2019). Exploration of the initiation and process of business model innovation of successful Chinese ICT enterprises. *Journal of Entrepreneurship in Emerging Economies*. .10.1108/JEEE-09-2018-0094

Llave, M. R., Hustad, E., & Olsen, D. H. (2018). Creating Value from Business Intelligence and Analytics in SMEs: Insights from Experts. *Twenty-fourth Americas Conference on Information Systems*.

Lokshina, I. V., Lanting, C. J. M., & Durkin, B. J. (2018). IoT-and big data-driven data analysis services for third parties, strategic implications and business opportunities. *International Journal of Social Ecology and Sustainable Development*, *9*(3), 34–52. doi:10.4018/IJSESD.2018070103

Low, C., Chen, Y., & Wu, M. (2011). Understanding the determinants of cloud computing adoption. *Industrial Management & Data Systems*, *111*(7), 1006–1023. Advance online publication. doi:10.1108/02635571111161262

Manyika, J. (2017). *A future that works: AI automation employment and productivity.* McKinsey Global Institute Research, Tech. Rep.

Massaro, M., Dumay, J., & Guthrie, J. (2016). On the shoulders of giants: Undertaking a structured literature review in accounting. *Accounting, Auditing & Accountability Journal*, *29*(5), 767–801. doi:10.1108/AAAJ-01-2015-1939

McAfee, A., & Brynjolfsson, E. (2012). Big Data: The Management Revolution. *Harvard Business Review*. PMID:23074865

Mell, P., & Grance, T. (2011). The NIST Definition of Cloud Computing (Draft): Recommendations of the National Institute of Standards and Technology. *NIST Special Publication*, *800*, 7.

Mikalef, P. (2017). Big Data Analytics Capability: Antecedents and Business Value. *Pacific Asia Conference on Information Systems PACIS 2017 Proceedings, 136.* https://aisel.aisnet.org/pacis2017/136

Morris, M. H., Schindehutte, M., & Allen, J. (2005). The Entrepreneur's Business Model: Toward a Unified Perspective. *Journal of Business Research*, *58*(6), 726–735. doi:10.1016/j.jbusres.2003.11.001

Naous, D., Schwarz, J., & Legner, C. (2017). Analytics as a Service: Cloud computing and the transformation of business analytics business models and ecosystems. *Proceedings of the 25th European Conference on Information Systems (ECIS).*

Osterwalder, A., & Pigneur, Y. (2010). *Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers*. Wiley.

Parida, V., Sjödin, D., & Reim, W. (2019). Reviewing literature on digitalization, business model innovation, and sustainable industry: Past achievements and future promises. *Sustainability*, *11*(2), 391. doi:10.3390/su11020391

Ramdani, B., Binsaif, A., & Boukrami, E. (2019). Business model innovation: A review and research agenda. *New England Journal of Entrepreneurship*, *22*(2), 89–108. doi:10.1108/NEJE-06-2019-0030

Ransbothan, S., & Kiron, D. (2017). Analytics as a Source of Business Innovation. *MIT Sloan Management Review*, *58*(3).

Reis, T., Bornschlegl, M. X., & Hemmje, M. L. (2021). Toward a Reference Model for Artificial Intelligence Supporting Big Data Analysis. In R. Stahlbock, G. M. Weiss, M. Abou-Nasr, C. Y. Yang, H. R. Arabnia, & L. Deligiannidis (Eds.), *Advances in Data Science and Information Engineering. Transactions on Computational Science and Computational Intelligence*. Springer. doi:10.1007/978-3-030-71704-9_38

Roller, M. R., & Lavrakas, P. J. (2015). *Applied qualitative research design: A total quality framework approach*. Guilford Press.

Schallmo, D., Williams, C. A., & Boardman, L. (2017). Digital transformation of business models—Best practice, enablers, and roadmap. *International Journal of Innovation Management*, *21*(8), 1740014. doi:10.1142/S136391961740014X

Snodgrass, D. R. & Biggs, T. (1996). *Industrialization and the Small Firm: Patterns and Policies.* Academic Press.

Sorescu, A. (2017). Data-Driven Business Model Innovation. *Journal of Product Innovation Management*, *34*(5), 691–696. doi:10.1111/jpim.12398

Spieth, P., Roeth, T., & Meissner, S. (2019). Reinventing a business model in industrial networks: Implications for customers' brand perceptions. *Industrial Marketing Management*, *83*, 275–287. doi:10.1016/j.indmarman.2019.04.013

Taran, Y., Boer, H., & Lindgren, P. (2015). A Business Model Innovation Typology. *Decision Sciences*, *46*(2), 301–333. doi:10.1111/deci.12128

Tian, Q., Zhang, S., Yu, H., & Cao, G. (2019). Exploring the Factors Influencing Business Model Innovation Using Grounded Theory: The Case of a Chinese High-End Equipment Manufacturer. *Sustainability (Basel)*, *11*(5), 1455. doi:10.3390/su11051455

Wang, Y., Kung, L., Wang, W. Y. C., & Cegielski, C. G. (2018). An Integrated Big Data Analytics-Enabled Transformation Model: Application to Health Care. *Information & Management*, *55*(1), 64–79. doi:10.1016/j.im.2017.04.001

Wang, Z., Li, M., Lu, J., & Cheng, X. (2022). Business Innovation based on artificial intelligence and Blockchain technology. *Information Processing & Management*, *59*(1), 5. doi:10.1016/j.ipm.2021.102759

Woerner, S. L., & Wixom, B. H. (2015). Big Data: Extending the Business Strategy Toolbox. *Journal of Information Technology*, *30*(1), 60–62. doi:10.1057/jit.2014.31

Zhao, J., Wang, M., Zhu, L., & Ding, J. (2014). Corporate social capital and business model innovation: The mediating role of organizational learning. *Frontiers of Business Research in China*, *8*(4), 500–528.

Zimmermann, H., & Pucihar, A. (2015). Open innovation, open data and new business models. *Proceedings of IDIMT 2015 -23rd Interdisciplinary Information and Management Talks,* 449-45. doi:10.2139/ssrn.2660692

Zolnowski, A., Anke, J., & Gudat, J. (2017). Towards a Cost-Benefit-Analysis of Data-Driven Business Models. *International Conference on Wirtschaftsinformatik*, 181-195.

Tlou Maggie Masenya holds a PhD in Information Science from University of South Africa and completed Masters in Information Technology at the University of Pretoria. She has eight years of work experience in academia, in the field of Information Science, Information Systems and Technology. She is currently a Senior Lecturer in the Department of Information Systems at Durban University of Technology. She also worked as a Senior Lecturer at University of South Africa and University of Zululand. She supervises Masters and PhD students and also serves as an external examiner for postgraduate studies. She published book chapters and articles in peer-reviewed accredited journals. She is currently reviewing articles for South African Journal of Information management, South African Journal of Library and Information Science, Mousaion, Research Metrics and Analytics Journal, Journal of South African Society of Archivists and IGI-Global book chapters. Her areas of expertise encompass ICT4D, Digital Preservation, Records management, Technopreneurship, Digital entrepreneurship, Knowledge Management, Indigenous Knowledge System, Disruptive Technologies and Digital transformation. She edited a book entitled " Innovative technologies for enhaning knowledge access in academic libraries" published by IGI-Global. She is currently editing a book entitled " Digital preservation and documentation of global indigenous knowlede systems, to be plushed by IGI-Global in June 2023.