

The Role of Big Data Analytics in Supply Chain Management for Small Scale Poultry Producers Using Power BI

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Abstract

Small scale poultry producers play a significant role in South Africa to fight unemployment and to address the problem of food insecurities. This study focuses on the use of Power BI by small-scale poultry producers in South Africa. The purpose of this study is to explore if Power BI can be used to do big data analytics to address supply chain management issues. This study addressed the research question and two objectives. This study followed the Design Science Research to address the research question. Ten people were interviewed to confirm the usability of the dashboarding tool. The dashboard was created and this led to the analysis of the data and predictions of data. All that data can be used for supply chain management in a small-scale poultry producer. It was found that the Power BI tool works and it is easy to use. It is recommended that there is a collaboration between institutions of higher learning and government departments that support small businesses. These two can collaborate to provide financial and non-financial support to small-scale poultry producers. Further study will focus on the use of Power BI to mine and analyse social media data for small-scale poultry producers.

Keywords

Big Data Analytics, Supply Chain Management, Decision Making, Power BI

1. Introduction

Although there are different types of literature concerning supply chain management, there is no sufficient literature and research regarding big data analytics in the context of supply chain management (Kache and Seuring 2015). Businesses that want to use supply chain intelligence for decision-making must build their capacity in three areas: data management, analytical supply chain processes, and supply chain performance management (Ho et al. 2019). The management of Small to Medium Sized Enterprises (SMEs) must take into account the performance of the supply chain and determine if the targeted corporate goals can be accomplished solely through the efficient application of IT-based BI frameworks (Denton et al. 2007). The South African poultry sector is made up of two main industries: the Small-Scale Poultry Producers and Commercial Poultry Producers (CPP). The problem is the SSPP are operating on a small scale and within the informal markets. The supply chain of SSPP is working in isolation with a non-integration value chain. Business intelligence (BI) may give decision-makers, who are typically owners or managers in SMEs, access to data that helps them to decide wisely how to use scarce resources (Ponelis 2011). Although better cooperation with trading partners is needed, SMEs are not very active in collaborative and performance-driven approaches to integrated SCM, and simple-to-implement methodology and solutions appear to be uncommon (Denton et al. 2007). The SSPP due to its non-integrated value chain, are faced with several challenges such as operating in the informal market, expensive poultry inputs (Ike and Ugwumba 2011) and (Rodić et al. 2010), poultry disease given the current outbreak of high pathogenic avian influenza (Mack et al. 2005), working in isolation as SSPP and CPP. Supply chain analytics are the results of the complex nature of the poultry business where data needs to be analysed in the area of inventory management, predictions, and forecasting, and in some cases, the results may not be accurate. Supply chain analytics is the application of qualitative and quantitative techniques to solve pertinent problems and predict outcomes based on the data's quality (Anitha and Patil 2018). the successful implementation of power BI requires a buy-in of human capital involvement and implementation of process development are proven advantageous (Tozin and Amaro 2022).

Similar studies

This study is a buildup on the following studies:

Study 1

Kache and Seuring (2015) conducted research looking at challenges and opportunities in big data analytics in the context of supply chain management. This study was conducted and found that there are a total of 43 challenges and opportunities associated with the infusion of big data analytics in supply chain management. In breaking them down they are as follows:

- 9 challenges associated with corporate level and 11 challenges associated with supply chain management level.
- 11 opportunities associated with corporate level and 12 opportunities associated with supply chain management level.

This study adopted a Dolphin technique. The authors are based in Germany.

Study 2

Tseng et al. (2019) conducted a study on data-driven sustainable supply chain management supply chain. In their study, they focused on the textile industry that is based in Taiwan, of which the sector is generating massive amounts of products that are meant to serve customers.

Study 3

The study by (Mohamed and Weber 2020) on the use of big data by SMEs. Their study is based in the United Kingdom. Their study discussed four types of data analytics and they are as follows: descriptive analytics diagnostic analysis, predictive analytics, and prescriptive analytics. They argue that data analytics can serve as a highlight, insight, and foresight and help the organisation to make informed decisions. In their study, they found that SMEs in the United Kingdom do collect data but not many of them do not use it. This is due to a lack of training on how to do data analytics and knowledge on data management.

Study 4

The study by (Liu and Chen 2022) explores the use of Power BI for Big Data Analytics purposes. They argue that Power BI helps with providing a multi-display of data and helps with making quick decision-making. In their study,

they explored the different uses of Power BI for big data analytics such as sales predictions and actual sales figures. The authors and the study was based in China.

The studies by (Kache and Seuring 2015; Tseleng et al. 2019; Mohamed and Weber 2020) review and argue the importance of big data in SMEs, however, they do not recommend the use of Power BI. The current study focused on the implementation of data analytics for a small-scale farmer in South Africa using the Power BI software which is the same as the study by Liu and Chen 2022 and that of Mohamed and Weber 2020 which recommended that SMEs should use the Power BI as a big data analytics. However, all these studies agree that big data analytics is imperative for SMEs and they will benefit immensely.

1.1 Objectives

This study aims to answer the following research question: How can a small-scale poultry farmer use the Power BI software for data-driven decision-making in supply chain management? In responding to this question, the following research objectives were developed:

- 1.1.1. To identify challenges and opportunities faced by small-scale poultry farmers when adopting and implementing big data analytics for supply chain management.
- 1.1.2. To create a dashboarding tool using Power BI for big data analytics.

2. Literature Review

This section reviews the relevant literature that was consulted in this study. This starts from exploring the state of poultry farming globally and in South Africa, challenges faced by small-scale poultry farmers, followed by a review on), supply chain management, data analytics, and the use of Power BI by SMEs.

2.1. The State of Small-Scale Poultry Producers

Chickens account for 91% of the world's total poultry population and contribute approximately 89% of poultry flesh and 92% of poultry eggs (Erdaw and Beyene 2022). Poultry meat is the most rapidly expanding component of global meat production, consumption, and commerce, with developing and transition economies taking the lead (Mack et al. 2005). The poultry industry is the fastest-growing agricultural sub-sector (Mottet and Tempio 2017; Aslam et al. 2020), and it has been providing a significant portion of daily protein within emerging economies (Hussain et al. 2015). The poultry sector plays a significant role in the economic development of emerging nations by generating employment opportunities and improving nutritional and food security conditions (Butler 2016).

The biggest challenges faced by the emerging market poultry sector are competition with human and other animal food sources, high production costs, new disease challenges, low technical efficiency, a lack of genetic improvement of economically valuable traits of local breeds, unfavorable climatic conditions due to climate change, and an unstable market for eggs and meat, and these are potential threats of sustainability facing the small-scale poultry sector (Acharyan and Krishna 2015). The prevalence of disease and predation poses a significant challenge to extensive small-scale poultry production systems, while small-scale intensive systems are plagued by feed price fluctuations and inadequate biosecurity measures.

Within the livestock industry on a global scale, the sub-sector that is expanding at the fastest rate is the poultry business (Augustine and Shukla 2015). Future expansion of the poultry business in developing nations will depend on integrated production and a shift in the market from live poultry to frozen goods (Landes and Persaud 2004). In developing economies, the poultry industry is vital to economic development and also generates a large number of employment opportunities (Das et al. 2008).

SSPP operates at a small scale, using less capital and conventional technology, resulting in a low production volume per unit (Vetrivel and Chandrakumarmangalam 2013). Microenterprises in the poultry farming industry are unable to generate maximum profits, thereby impeding the development of other associated farms (Khaleda 2013). Challenges faced by farmers include insufficient financial resources, high costs of feed and equipment, prevalence of diseases, and adverse weather patterns (Butler 2016). The SSPP is faced with excessively high costs of animal feed, in particular for corn and soybeans (Bingsheng and Yijun 2007). Fluctuations in feed costs can have a substantial impact on the economic feasibility and long-term viability of production (Rodić et al. 2010). The challenges faced by poultry farmers include inadequate availability of high-quality poultry, exorbitant feed prices, marketing difficulties, insufficient

access to bank loans, inadequate availability of quality vaccines, high vaccine costs, and the threat of avian influenza (Khairu et al. 2014).

Poultry, as living and sentient animals, have the potential to be effectively integrated into diverse urban and rural farming systems (Vaarst Steinfeldt et al. 2015). Integrated systems primarily cater to high-income customers and made use of formal infrastructure (Aslam et al. 2020) which are mostly suitable for commercial poultry farmers. The small-scale poultry industry is encountering challenges related to inadequate levels of concentration, specialization, vertical integration, and efficiency (Rodić et al. 2010). The identified factors hindering the growth of the poultry industry include ineffective marketing channels, subsistence farming practices, inadequate access to specialized feed, limited availability of day-old chicks, and high mortality rates among chicks (Redoy et al. 2017). The small-scale poultry industry exhibits structural inadequacies, characterized by poor farm management, inadequate regulatory frameworks to enforce sound farming practices, and the manipulation of product pricing (Aslam et al. 2020). The emerging poultry industry has the potential to attain multi-dimensionality and enhanced stability in the foreseeable future, provided that it establishes adequate backward and forward linkages to input and output supplies (Rahman et al. 2017). The lack of transparency among stakeholders in the Supply Chain model results in elevated yield losses, price hikes, and ambiguity in supply and demand analysis (Saputra and Zulhair 2018).

The significance of poultry production in South Africa has increased due to the nation's acceptance, consumption, and demand for poultry (Idowu et al. 2021). The South African poultry industry is dominated by a small number of fully integrated large CPP and a large number of SSPP, either contract cultivators or solely informal market suppliers (Nkukwana 2018). The poultry industry in Southern Africa has been dominated by CPP, vertically integrated South African companies (Ncube et al. 2017). The majority of SSPP in South Africa originate from historically disadvantaged communities and have substantially lower enterprise growth rates than CPP (Wynne and Lyne 2003).

2.2. Supply Chain Management in Poultry Sector

Supply chain management (SCM) is a strategic tool companies utilize to gain a competitive advantage by addressing logistical challenges to outperform their rivals (Saputra and Zulhair 2018). Supply chain management in the poultry industry places significant emphasis on market demand and customer requirements, as well as the business's performance, effectiveness, and overall operational efficiency (Ronaldo 2020).

Poultry farmers receive inadequate compensation for their goods, while consumers pay a substantial premium for the same products (Saputra and Zulhair 2018). Additionally, a dearth of technological and financial resources is available to support poultry producers (Saputra and Zulhair 2018). SCM can facilitate the consolidation and evolution of multinational corporations, whether through vertical or horizontal integration, as well as the formation of business clusters (Manning and Baines 2004).

The implementation of a Supply Chain Model for Poultry-Based Products can promote transparency and integration among stakeholders involved in the supply chain (Saputra and Zulhair 2018). Increased per capita income, population growth, and improved communication are the primary forces behind improvements in poultry production in Sub-Saharan African nations (Erdaw and Beyene 2022). The supply chain model can cater to market demand by eliminating intermediaries (Saputra and Zulhair 2018). The utilization of big data applications has the potential to enhance supply chain management in various domains, including procurement, transportation, warehouse operations, marketing, and smart logistics (Anitha and Patil 2018).

2.3. The importance of Supply Chain Management and Data Analytics in Enterprises of SSPP

Poultry contributes to the alleviation of poverty, household food security, and employment opportunities, and is an asset that can be quickly converted into income. It is possible to solve models for the supply chain problems faced by small farmers and to contemplate their future applications (Jang and Klein 2011). Data integration and analysis of poultry data facilitates simple prediction, analysis, and decision-making in this sector, thereby increasing the sector's profits (Shankar and Thangam 2019). It is essential for companies in the supply chain to have access to timely, accurate, and relevant data through the adoption of big data and analytics (Kache and Seuring 2017). The term "Big Data Analytics" was coined to reflect the volume, velocity, and variety surge of digital data that increasingly poses a challenge to businesses, as it complicates the identification and extraction of the most pertinent and valuable information required for managing the business and, ultimately, the supply chain (Kache 2015). Big data is applicable

to the supply chain because it offers analytical tools for decision-making and corporate intelligence (Narwane et al. 2021). Data analytics in the supply chain improves process-level performance, firm-level performance visibility, competitiveness, and return management (Narwane et al. 2021; Ali and Ahmed 2022).

2.3.1. Challenges and opportunities

Kache and Seuring (2015) posit that there are opportunities and challenges associated with the adoption of big data analytics for supply chain management at the corporate level and supply chain management level. Table 1 below outlines the different opportunities and challenges associated with the adoption of big data analytics in supply chain management.

Table 1. Opportunities and Challenges

Opportunities	Challenges
Opportunities on corporate level	Challenges on corporate level
Customer behavior	IT capabilities and infrastructure
Supply chain visibility and transparency	Business strategy and objective
Operations efficiency and maintenance	Information management
Information management	Talent management and HR
Responsiveness	Cultural change
Product and market strategy	Transformational change
Innovation and product design	Information and cyber security
New business models	Financial implications
Demand management and production planning	Ethical and managerial implications
Financial implications	
Talent management and HR	
Opportunities on supply chain management level	Challenges on Supply Chain level
Logistics	Governance and compliance
Supply chain visibility and transparency	Integration and collaboration
Operations efficiency and maintenance	Business strategy and objective
Integration and collaboration	IT capabilities and infrastructure
Innovation and product design	Talent management and HR
Inventory	Financial implications
Responsiveness	Transformational change

Opportunities	Challenges
Product and market strategy	Information and cyber security
Risk management	Information management
Demand management and production planning	Cultural change
Financial implications	Ethical and managerial implications
Information management	

Source: Kache and Seuring (2015)

Businesses are deploying business intelligence (BI) systems to facilitate the analysis of data assets for the formation of management decisions (Mathrani 2014). Power BI is regarded as the best Power BI tool for doing data analytics (IntelSelect 2023). However, Mohamed and Weber (2020); and Liu and Chen (2022) can be used as a tool for doing big data analytics by SMEs owing to it being easy to use and freely available on the Microsoft business software.

3. Methods

This is a sequential mixed methodology whereby the development of the artifact using the Power BI dashboard and interviews to confirm the artifact is adopted. The sequential is as follows:

1. Step One: The development of the artifact using the Power BI dashboard.
2. Step Two: Confirmation of the artifact through interviews with the ten people who were selected.

This study followed Design Science Research (DSR) as it had to adopt Information Management software. Design Science Research is common in the IS discipline. This method is relevant when the outcome of the research is meant to be practical in nature and is supposed to be used. In the context of this study, it is the adoption and implementation of data analytics for decision-making using Power BI. This will be achieved through the creation of a dashboarding tool artifact using the Power BI software.

A case study was developed using an SSPP that is based in Johannesburg, South Africa. This SSPP agreed that the business be used for the purposes of testing if data analytics can be achieved within the supply chain of small-scale poultry. Ten people were used to confirm the artifact (Power BI dashboarding tool). People who were interviewed credentials are as follows:

- Three entrepreneurs - from different sectors (one is in a property business, one is a business consultant and another is in an agricultural sector).
- Four enterprise development managers from the governmental department that support small businesses in and around Johannesburg.
- One regional manager from an international organisation that supports student entrepreneurs.
- Two staff members from the University Department that support entrepreneurs at the University and in communities.

4. Data Collection

Data was obtained from the small-scale poultry farmer who volunteered the data that was used for the experiments on the Power BI dashboarding tool. The second data was obtained from structured interviews. The interview process was as follows:

- The interviewees were invited over the phone call to request them to participate in the study. Convenience sampling was used to choose participants.
- Interviewees were first introduced and trained on how to use the Power BI dashboard.
- After the training the participants were interviewed to confirm the usability of the dashboard for data analytics by SMEs. The whole process was recorded at the Teams meeting as that's where the interviews were taking place.
- The interviews were transcribed and analysed using Atlas. ti software.

5. Results and Discussion

It was found in this study that the application of big data analytics for supply chain management using the Power BI software can increase the chances of decision-making.

During the interview process, interviewees all showed interest in the Power BI dashboard. Of the ten that participated in the study by confirming the ease of use of the Power BI dashboard and whether it will help SMEs in general including small-scale poultry producers, only one of them had information about the tool. While the researcher was giving background on the problems faced by small-scale poultry producers regarding data, he immediately proposed the use of Power BI. He had strong faith that it would work. Other research participants had not seen Power BI in their lives and they were moved by what can be done using it.

Regarding the question of whether the Power BI dashboard can work to do Big Data Analytics for small-scale farmers, they all agreed that it would work but they cited that a majority of small businesses do not have resources such as laptops to be able to create dashboards and do analytics. Concerning the question of whether Power BI is easy to navigate they said it may be easy if they can be offered training. However, they believe it does not look difficult. One participant raised a concern about data protection from external people who may steal this data. Two participants said they will consider using it for business advisory to SMEs as it gives a clear picture of what is happening in the business. The general feeling from all of the participants was that the dashboard from Power BI would help a great deal to small businesses and they would know how to manage their enterprises much better and be able to make data-driven decisions.

5.1 Numerical Results

Figure 1 below depicts the Power BI dashboarding tool that was created to analyse the data collected from a small-scale poultry farmer that is based in Johannesburg, South Africa. It is clear that Power BI can be used to create a dashboarding tool and can help to make supply chain management decisions.

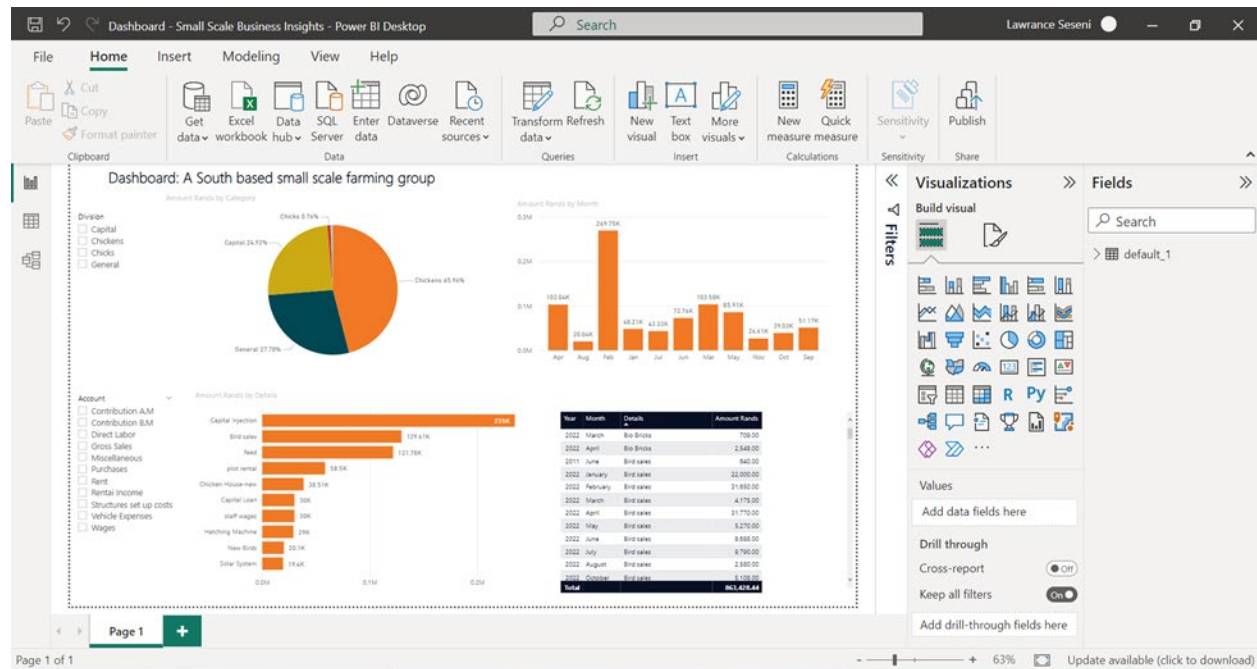


Figure 1. Dashboarding Tool For Small-Scale Poultry Producers
Source: Power BI Dashboard

On the dashboard, as depicted in Figure 1 above, data related to poultry farms is clearly depicted in three different charts and a table. The dashboards depict the contribution of members to the small-scale farmer, direct labour related to poultry farming, gross sales of chicks and chicken, purchases of food and vaccines, paying of rent of the plot for farming, building of a chicken structure, vehicle expenses and paying of wages for employees in the farm. The distribution of funds are outlined per month on different charts and a table. This type of data on the dashboard can help the small scale poultry producer to make supply chain management decisions.

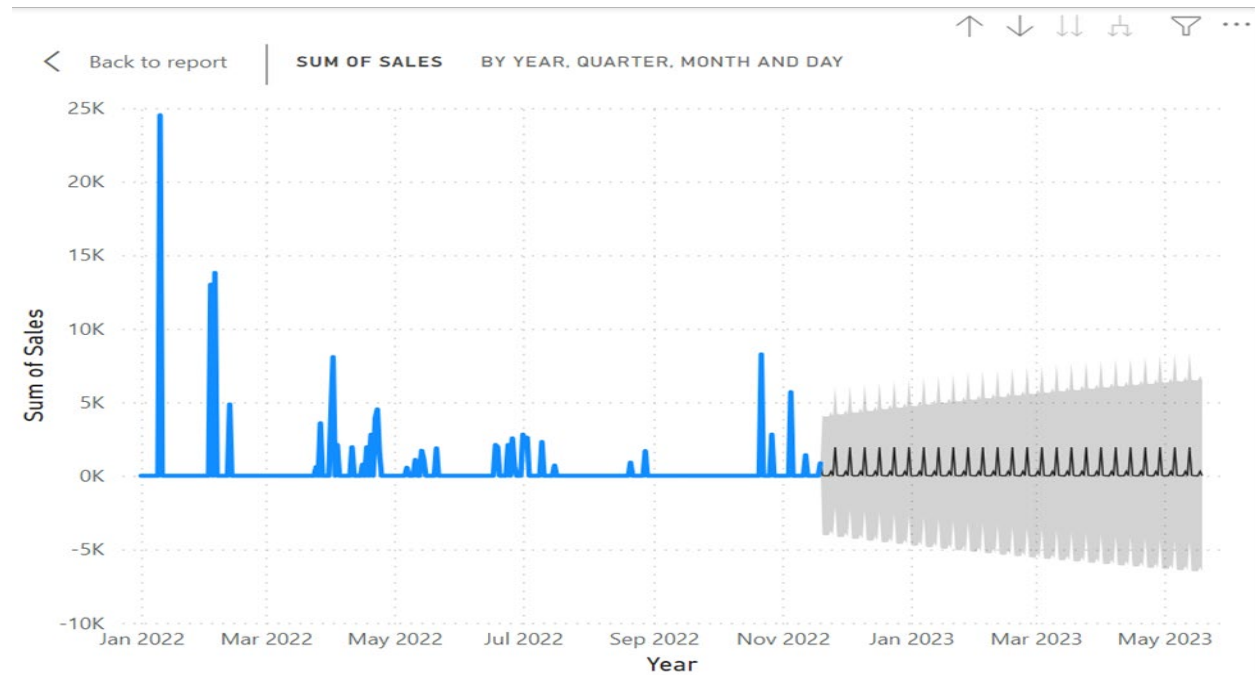


Figure 2. Sales Predictions
Source: Power BI Dashboard

Figure 2 depicts both the historical data and sales predictions for two quarters. January has recorded more sales, which has been declining since then until it increased again in November. However, the November sales remain lower than the January chicken sales in the small-scale poultry producer. It should be noted that Figure 2 depicted sales on a daily rather than monthly basis. The shaded part is the sales forecasting at the small-scale poultry producer. This is evident that the farmer or employees can use this tool to plan supply chain management for the poultry farm using their historical data to predict future supply chain management activities. However, for the dashboard to be more accurate in the predictions it requires massive amounts of data. Unfortunately, the data obtained from the small-scale poultry producer was only limited to 11 months.



Figure 3. Total Sales
Source: Power BI

As depicted in Figure 3, sales are depicted on a monthly basis. This shows which months had more sales compared to the ones with fewer sales or no sales at all. Figure 3 depicts that April had more sales of chicken and chicks. This is followed by February, January, October, July, June, November, May, March, August, and September respectively. It is worth noting that in September there were no chicken sales that took place. This data is crucial for planning and preparing for supply chain management of a small-scale poultry producer to avoid wastage and business failure.

5.2 Proposed Improvements

This study proposes that small-scale poultry producers should use Power BI to make financial decision-making for supply chain management. As Power BI has been proven to work, the governmental departments through the Ministry of Small Business Development should provide financial and non-financial support to small-scale poultry producers so that they may be able to adapt and implement big data analytics in their businesses. Concerning non-financial support, the Ministry of Small Business Development through their departments should collaborate with institutions of higher learning so that institutions since they are experts in teaching and curriculum design will be in a better position to design a short learning programme or continuous education programme that is tailored for small scale poultry farm producers. Institutions of higher learning can treat this as part of their community engagement. Small-scale poultry producers should have access to university computer centres where they can walk in and do their analytics and get assistance from academics and students who are doing the programme. This can be done professionally where they make an appointment so that there are people who will be available to help them. Concerning financial support, the ministry through its departments should make funding available to small-scale producers. The money should be meant to buy computers for small-scale poultry producers. This will come in handy as small-scale poultry producers do not have sufficient finances like established poultry producers.

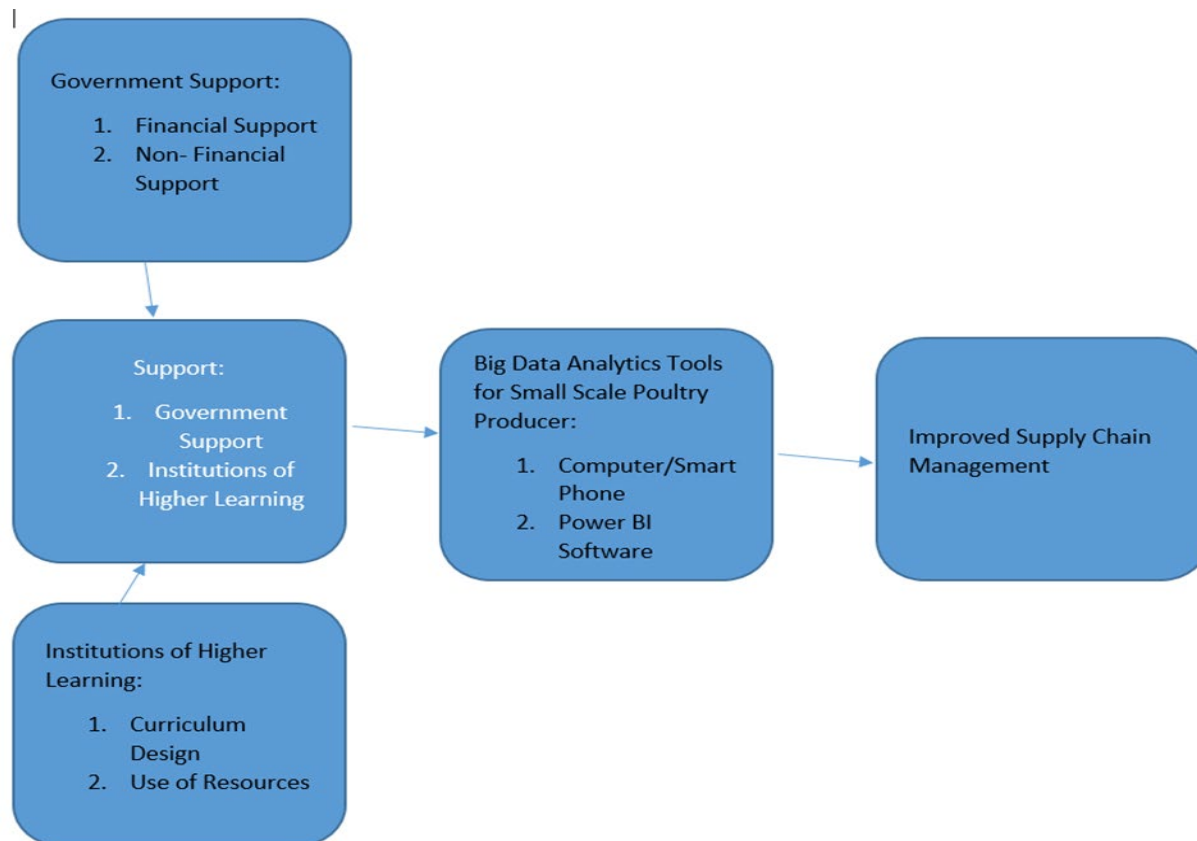


Figure 4. Framework for the Adoption of Big Data Analytics to Improve Supply Chain Management
Source: Authors' compilation

Figure 4 above gives a clear depiction of the proposed improvements and how they can help improve the supply chain management of a small-scale poultry producer. Small-scale poultry producers require financial and non-financial support from the government and they also need support from institutions of higher learning. This will help them to get Power BI and be able to create and navigate the dashboard. This will ultimately lead to the improved supply chain management of the small-scale poultry producer. They will make data-driven decisions that will lead to efficiency and effectiveness.

5.3 Validation

Since this study is DSR in nature. The study confirmed the usability of the dashboarding artifact by interviewing 10 respondents. Three are entrepreneurs and seven are managers who manage and offer support to SMEs from different sectors. The results were then triangulated with the findings from the literature review. The two studies stated that Power BI can be used for Big Data Analytics and that it is easy. This study affirms those of (Mohamed and Weber 2020; Lui and Chen 2022) who recommended the use of Power BI due to it being free and easy to use. The Power BI dashboarding tool has proven to work and the research participants have stated that the tool is easy to use.

6. Conclusion

This study aimed to explore if Power BI software can be employed by a small-scale poultry producer to be able to do big data analytics for decision-making. To understand if Power BI can be used for supply chain management of small-scale poultry producers. The objectives of this study were as follows: 1. to identify challenges and opportunities of implementing the Power BI tool in supply chain management, 2. to create a dashboarding tool for data analytics using the Power BI. These were achieved in this study. It has been found that Power BI can be used to create a dashboard and be able to make big data analytics. In this study, it is recommended that there must be collaboration between government departments that support small businesses with institutions of higher learning. These two can work together to provide financial and non-financial support to small-scale poultry producers. This can help small-scale

poultry producers to be able to make supply chain management decisions. Further study will focus on the use of Power BI to mine and analyse social media data for small scale poultry producers.

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Biography

Lawrance Seseni is an Entrepreneurship Lecturer who teaches undergraduates and supervises honours and master's students at the University of Johannesburg. As part of his work in disadvantaged communities, he has initiated several developmental projects, such as conducting career exhibitions in those communities. He currently serves as the Primary Faculty Advisor of the Enactus University of Johannesburg, an international student organisation dedicated to solving societal problems through social entrepreneurship. In addition, he launched the Business Clinic at the University, as he believes that teaching students to take part in community service projects will create citizens of value. This initiative aims to help struggling SMEs in and around Johannesburg. Furthermore, he is the editor of the Department's newsletter and a houseparent in a mixed residence on campus. Among his commitments, he is the lab manager for the European Union's and Erasmus+'s Common Good First Digital Storytelling project. Participants in the Digital Storytelling Project are universities from Iceland, Norway, Denmark, Scotland, Spain, and South Africa. A major goal of this project is to showcase community-generated innovative content. As a researcher, he has had a number of his articles published in international conference procedures that are indexed by Scopus. His recent experience includes serving as a Session Chair at international conferences, reviewing conference papers, and serving as a Track Chair as well as presenting as a distinguished speaker at conferences. A Golden Key member, Lawrance Seseni is in the process of achieving his Ph.D. in Operations Management.

Sebonkile Thaba is currently a lecturer at the University of Johannesburg. She is a cited author in google scholar and Scopus. As the best paper award winner, she published more than 30 academic articles presented locally and internationally. Some of her duties in the University is to serve in Teaching and Learning, Community Engagement and Decolonization committees. She serves these committees with pride because she is passionate about contributing in enhancing the quality of tertiary education in South Africa. Her teaching and learning philosophy informs her curriculum to include decolonization, 4IR and community engagement. Her students participate in socio-economic driven community projects. Their involvement resulted in more than 500 students being awarded 100 hours community services certificates from Enactus University of Johannesburg. During her spare time she mentors young people who aspire to be academics of which some of them are now lecturers and cited authors. With regard to her contribution of body of knowledge internationally; she serves as a track and session chair, reviewer, distinguished speaker in supply chain and served as panelist in inclusion and diversity in academia. Sebonkile Thaba is awarded Academic Doctorate Advancement Project towards Transformation (ADAPTT) Scholarship, which is a collaboration of University of

Florida (USA) and South African Higher Education (SA-HE) Network (UJ) and is currently finalizing her doctoral studies.

Professor Charles Mbohwa is the former Pro-Vice Chancellor of the University of Zimbabwe. As an established researcher and professor in the field of sustainability engineering and energy, his specialisations include sustainable engineering, energy systems, life cycle assessment, and bioenergy/fuel feasibility and sustainability, with general research interests in renewable energies and sustainability issues. Professor Mbohwa has presented at numerous conferences and published more than 150 papers in peer-reviewed journals and conferences, six book chapters, and one book. Upon graduating with his B.Sc. Honors in Mechanical Engineering from the University of Zimbabwe in 1986, he was employed as a mechanical engineer by the National Railways of Zimbabwe. He holds a Master's degree in Operations Management and Manufacturing Systems from the University of Nottingham and completed his doctoral studies at the Tokyo Metropolitan Institute of Technology in Japan. Prof. Mbohwa was a Fulbright Scholar visiting the Supply Chain and Logistics Institute at the School of Industrial and Systems Engineering, Georgia Institute of Technology; is a fellow of the Zimbabwean Institution of Engineers; and is a registered mechanical engineer with the Engineering Council of Zimbabwe. He has been a contributor to the United Nations Environment Programme and Visiting Exchange Professor at Universidade Tecnológica Federal do Paraná. He has also visited many countries on research and training engagements, including the United Kingdom, Japan, Germany, France, the USA, Brazil, Sweden, Ghana, Nigeria, Kenya, Tanzania, Malawi, Mauritius, Austria, the Netherlands, Uganda, Namibia, and Australia.

Dr Nelson Sizwe Madonsela (ND: IT, BTech, MTech, Ph.D). Business Intelligence Analyst, Senior Lecturer, and Acting Head: Department of Quality and Operations Management, University of Johannesburg (UJ). He holds a doctoral degree (Ph.D. in Engineering Management) from UJ and obtained his Master of Technology degree in Operations Management from UJ. He received a Bachelor of Technology degree in Quality from the University of South Africa (UNISA) and a National Diploma in Information Technology (Software Development) from Tshwane University of Technology (TUT). His research focuses on Business Artificial Intelligence and operation management, focusing on operational excellence. He also focuses on areas such as quality management systems, digital transformation, and project management. He has presented at local and international conferences and authored book chapters. Dr. Madonsela has helped provide high-level strategic and technical guidance in quality management and advanced project management to upskill the workforce among industries within South Africa. Additionally, he serves as a National Advisor on curriculum development, teaching and learning methods, and best practices in quality and operations management in several South African universities.

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