

The effects of using Big Data in Furniture Manufacturing SMEs

Lawrance Seseni

Department of Quality and Operations
University of Johannesburg
Auckland Park, RSA
sesenilawrance@icloud.com

Charles Mbohwa

Department of Quality and Operations
University of Johannesburg
Auckland Park, RSA
cmbohwa@uj.ac.za

Abstract

The aim of this paper is to examine if furniture manufacturing SMEs are using or ready using Big Data analysis. This study reviewed the benefits of using Big Data in SMEs, particularly the furniture manufacturing enterprises, the challenges that are faced by enterprises when operating their enterprises and dealing with Big Data. This study adopted a mixed method where two methods have been used (quantitative and quantitative) by means of issuing 117 participants where each person per enterprise was given each questionnaire to fill out. To check if the results are reliable, SPSS was used to analyse the data and Cronbach's Alpha that is sitting on .849 and Cronbach's Alpha Based on Standardized Items is .865. The study also used observations. This study found that it is possible for furniture manufacturing SMEs to use Big Data in their enterprises, however, it is very expensive and requires the technical expertise of using techniques that mine, store and analyse data. Furthermore, enterprises will be able to make decisions that are guided by evidence. This will help the enterprise to be pro-active, gain competitive urge over their customers and they will improve their profitability. This study contributes to the field of Big Data in furniture manufacturing SMEs as it is the first study to be conducted in South Africa that tackles this problem. Future study will include other manufacturing SMEs from other major cities within South Africa. This will strengthen the findings. This will help identify if enterprises face the same problem when dealing with Big Data in their enterprises.

Keywords

SMEs, Big Data, Gross Domestic Product, Furniture manufacturing

1. INTRODUCTION AND BACKGROUND

Big Data is not a discipline; it has received an attention since the beginning of the 21st century. This does not mean that the concept (Big Data) has not been studied prior to the 21st century. It was in the 21st century when the industry and government urged the academic sector to conduct research. It is worth noting that there are big organisations such as Facebook, Google and IBM that have established research centres that focus on data collection, data analysing and big data utilisation (Jun, et al., 2017). This concept of using Big Data is mostly followed by the big organisation. The concept of using Big Data analysis can help the enterprise to improve their competitiveness and help entities with their marketing activities. Sadly, most SMEs are immune to the application of Big Data analysis because it (Big Data) requires unique resources to can collect, analyse and use such Big Data. When they make decisions, they rely mainly on gut feeling (David & William, 2017; Lamba & Singh, 2018). It is stated that since the beginning of 2010, the world created 90% of the data that we have now (Khaldoun & Larissa, 2017). Furthermore, it has been estimated that by 2020 the world will have created 15-20 zettabyte. Moreover, it is believed that zettabyte data will be created every two years moving forward from 2020 (Jun, et al., 2017). The big question is, are enterprises ready to use Big Data in their enterprises.

SMEs are celebrated contributing significantly to the economies of the countries they operate in by means of creating jobs and contributing to the Gross Domestic Product (GDP). In South Africa, SMEs employ more than 60% of the total workforce and they contribute to more than 45% to the Gross Domestic Product (GDP). However, these SMEs face numerous challenges that hinder them from reaching their maximum potential. The challenges that they face are as follows: having limited finances, trouble with attracting highly skilled personnel

because they do not find SMEs attractive due to limited technological infrastructure, finances and low level of job security. They also face a challenge of crime in the places they operate in and bureaucracy. The above-mentioned challenges may be the contributing factors to the high rate of SMEs failing as research states that 8 out of 10 SMEs fail in the first year of existence (Seseni & Mbohwa, 2017).

Similar studies

(Ahmed, et al., 2017), did a study titled “*The future of Big Data in facilities management: opportunities and challenges.*” This study explored the current situation of Big Data together with the barriers, opportunities etc. in the construction, engineering, and architecture. The study had a literature review that is comprehensive. They found that Big Data has potential to improve the profitability of the entity and creating value for the customers and the entity itself.

Problem statement

Furniture manufacturing SMEs face a big challenge of marketing their products to their enterprises. There is no a technique that they use to collect information from their customers who are satisfied, those who have suggestions and those who are not satisfied. This poses a serious concern, as they do not know what their customers, potential customers need and what their concerns are. This study has 6 (six) sections name: 1. Introduction, 2. Literature, 3. Research Methods, 4. Results and analysis, 5. Discussions, recommendations and implications and 6. Conclusion.

Research objectives

As it is stated in the introduction that Big Data helps organisations to improve their competitiveness. With that said, this study aims at exploring the challenges and benefits faced by furniture manufacturing SMEs collecting, analysing and utilising data (Big Data).

Research questions

This study has two research questions and they are as follows:

RQ1: How can Big Data be applied in furniture manufacturing SMEs?

RQ2: What are the challenges and benefits of using Big Data in furniture manufacturing SMEs?

2. Literature review

SMEs

SME is an acronym for Small Medium and Enterprises. In South Africa, a second M to make it SMME is added because of the economic conditions. It is defined as Small Medium and Micro Enterprises. This study focuses on the Until today, there is no a single SME definition that is universally accepted. This terminology is defined according to the economic stability of the country. This means that SMEs in South Africa are not defined the same way they defined in the United States of America and China and so on. The metrics for defining is based on three things and they are as follows: 1. The number of employees in the enterprise, 2. the turnover of the enterprise makes per year and lastly, 3. the assets the enterprise has. The metrics are not standard. However, SMEs have to be acknowledged for contributing significantly to the economy and the creation of jobs. These SMEs face numerous challenges as they operate. The challenges that are faced by SMEs are as follows: 1). lack of human resources. SMEs fail to attract highly skilled personnel. They do not find working for SMEs attractive. 2). Labour legislation. It has been said repeatedly that the labour legislation makes it difficult for enterprises to operate. 3). Banking services/access to finance. It is difficult for SMEs to secure funding. They are not trusted, financial institutions require collateral that SMEs cannot produce. 4). Crime and theft. The crime rate is very alarming in South Africa; SMEs are exposed to burglary and other criminal activities. 5). Fraud and corruption. Small businesses do not get tenders that they were supposed to get simply some corrupt activity took place and lastly, 6). Government bureaucracy. It takes forever to be compliant. They have to have many things so that they can commercialise or be regarded as compliant (Ahmed, et al., 2017).



Figure 1 Challenges face by SMEs in South Africa

Furniture Manufacturing

The furniture-manufacturing sector has been acknowledged for contributing 1.1% to the GDP of the country. However, this industry has faced a severe drop by means of retrenching many people in the year 2014. Before 2014 the sector had 38 267 employees and now the total labour force in the sector is 26 000. In contrary to that, this sector is believed that it has many opportunities in terms of growing and contributing to curbing unemployment. The government saw the need for introducing a new policy called Preferential Procurement Regulatory Policy Framework Act (PPRFA) that stipulates that the government commit to supporting locally manufactured goods. The government will make sure that they buy 100% furniture from local manufacturers and 85% of office furniture in all government institutions. Gauteng Province is known for being the number one producers of furniture (Seseni & Mbohwa, 2017).

Big Data

According to Jun, et al., 2017, there is no universal definition for the term Big Data as researchers define it based on their concerns about the concept it. However, there are elements that repeat themselves in their definitions. The elements are as follows: the volume of data, the variety of data and the velocity of the data (David & William, 2017; Ahmed, et al., 2017). This clearly means that Big Data is the high number of data that is created at a high speed. This data must be used immediately so that the organisation can reap the benefits of utilising it. It is believed that if the retail industry can utilise big data it will improve their profitability by 60%. Utilising Big Data comes with challenges. Amongst other challenges are as follows: the management of such data and analysis (David & William, 2017). This belief of improving profitability was supported by (Lamba & Singh, 2018) although they also identified other benefits such as improving the operations and supply chain of entities, producing products or services at a shorter cycle time, being able to satisfy customers, making decisions and resolutions on customers very quickly. However, organisations use techniques that analyse data and they are as follows: Apache Hadoop, NoSQL Database, Big Query, MapReduce, Hadoop, WibiData and Skytree (Lamba & Singh, 2018; David & William, 2017). It is worth noting that these techniques and tools for Big Data Analytics are not for every enterprise. They (enterprises) must identify the right technique(s) and tools that will best suit their entity (Lamba & Singh, 2018). Using such techniques requires data collection skills, reducing data and comprehension skills and data analysis skills and technological advancement. The data gathered will be help with decision-making based on valid data collected rather making decisions based on gut feeling. However, using big data analysis does not remove the human insight and vision (Lamba & Singh, 2018). It is pivotal for entities to understand that they are security features that need to be considered when dealing with big databases. Customers' and entities' sensitive information may be exposed to cyber hackers. Enterprises must see to it that that information is treated with the highest confidentiality and have the best security systems in place (Lamba & Singh, 2018). According to Smeda, 2017, Big Data is a very beneficial strategy if enterprises/organisations use it well because it will increase the value they provide to their customers, they will make better predictions, they will be able to adapt to changes quickly and be able to handle the data they have in their storages. (David & William, 2017) asserts that when entities implement Big Data they become exposed to a number of barriers. The barriers are presented in the following figure:

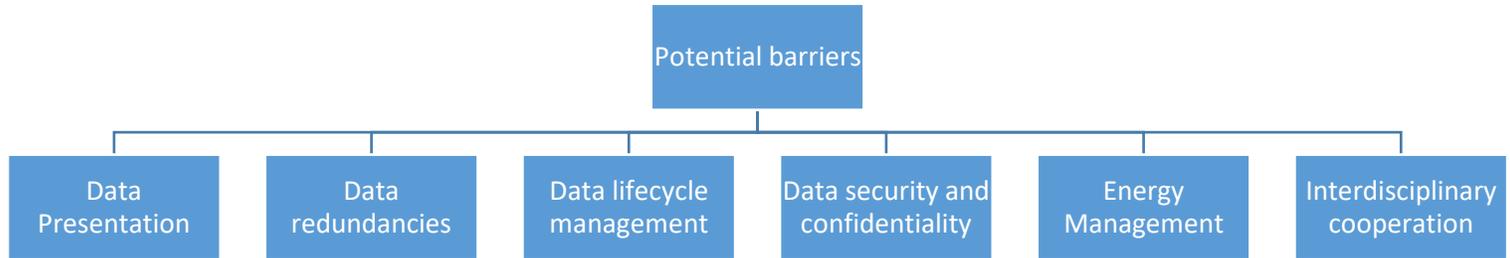


Figure 2 Ahmed, et al, 2017

Framework

With the above mentioned, this study will propose the following framework for applying Big Data in furniture manufacturing SMEs:

1. Human Resource
2. Financial Resource
3. Technology Support
4. Using Big Data

Human Resource

Human resource is classified in two ways. The first one is the skills of the people who are working in the enterprise and the second one is people who work for the entity/organisation (Nieman & Nieuwenhuizen, 2014). David & William, 2017, asserts that those who are using Big Data or plan to use it must have skills that correspond with tools and techniques used for collecting, storing and analysing Big Data as it is not an easy job to do (Jun, et al., 2017). Unfortunately, SMEs struggle to attract and retain great employees who are highly skilled. In addition to that

Financial Resource

A financial resource is defined as anything that can take a form of or easily be converted into cash. This type of resource is very crucial as it is the one that acquires other resources in the enterprise. For instance, when enterprises have money they will be able to pay employees, they will be able to buy the material that is required, be able to pay rentals etc. (Nieman & Nieuwenhuizen, 2014). It has been said many times that SMEs have limited resources, particularly finance. This means it is difficult for them to acquire other resources (Seseni & Mbohwa, 2017). It has been stated that the Big Data techniques are very expensive and furniture manufacturing SMEs may not be able to purchase them (O'Connor & Kelly, 2017).

Technology Support

Furniture manufacturing SMEs have limited technological resources in their enterprises. Majority of their enterprises even rent equipment from their competitors or institutions that only deal with renting out manufacturing equipment. This will make it difficult for enterprises to use techniques and tools such as Apache Hadoop, NoSQL Database, Big Query, MapReduce, Hadoop, WibiData and Skytree (Seseni & Mbohwa, 2017).

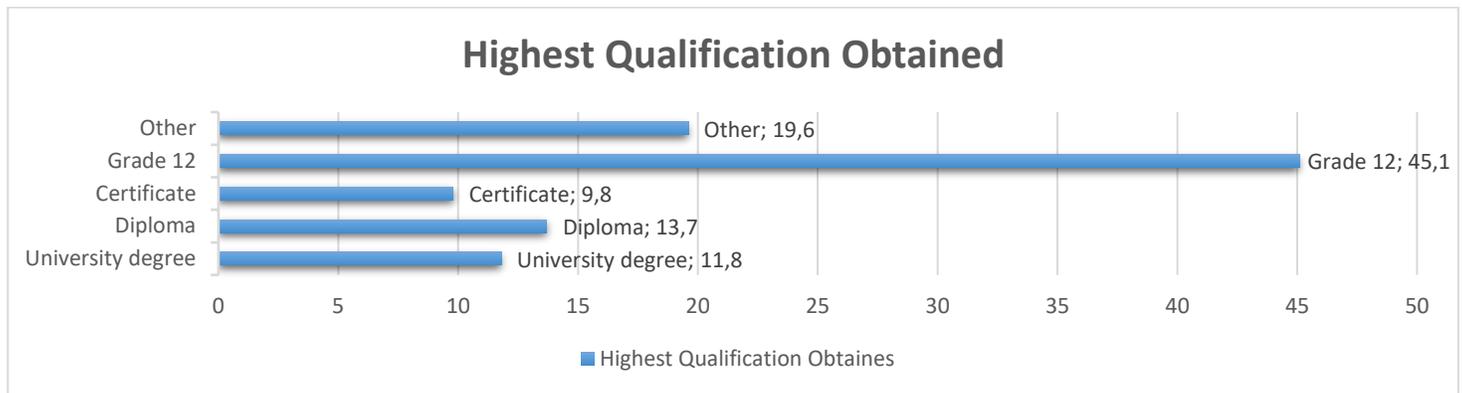
Using Big Data

Using big data requires employees or employers who have the expertise of using the techniques that are required. However, these enterprises must have financial resources to be able to get the required skills and to be able to purchase everything that will be used in the enterprise. However, these techniques are very expensive (David & William, 2017).

3. Research Method

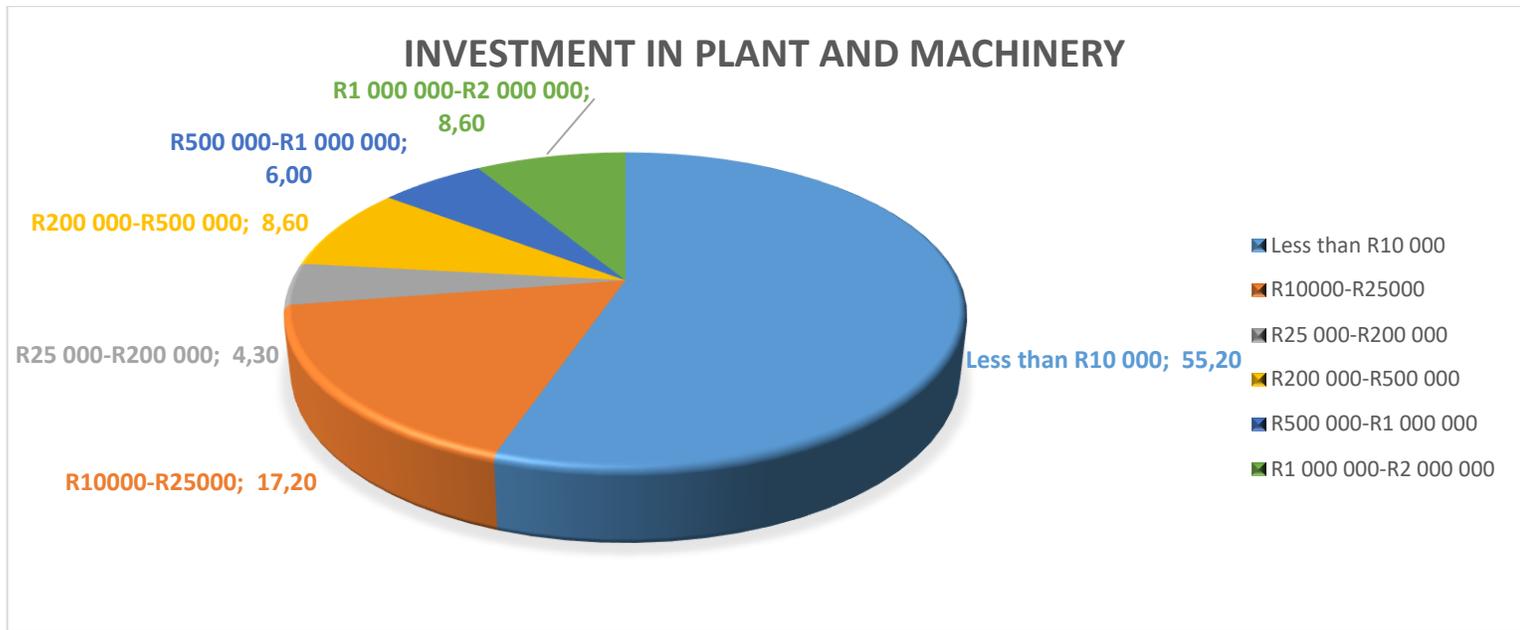
This research adopted a mixed method. It has been discussed that a mixed method provides a better understanding of the problem, provides evidence and it provides better results by means of providing very strong results (Mohamed, et al., 2017). Moreover, this method has been criticised for being too costly, time-consuming and extremely challenging if one does not understand it (Seseni & Mbohwa, 2017). This means that qualitative and quantitative was made as well in one study, whereby observations were made and questionnaires were given to the identified specimen. In this study, 117 furniture-manufacturing representatives were given surveys to complete. The questionnaire had close-ended questions and nominal scale. SPSS was used to analyse the data. Concerning the qualitative element, this study observation was made. The researcher observed the way they (enterprises) operate things, their resources, the way they (employees) interact with each other and the way they treat customers. To check if the study findings are reliable, the Cronbach's Alpha of .849 and Cronbach's Alpha Based on Standardized Items is .865. The above proves the findings of this study is reliable.

4. Results and analysis



(Seseni & Mbohwa, 2017)

As it has been stated earlier in the previous chapter, this study interacted with 117 furniture-manufacturing enterprises. Government through the Department of Trade and Industry (dti) are also doing an important role in training these enterprises. This will actually reduce the number of people who do not have the technical skills. Data representations for this question is as follows: those with higher education is 35,3% while those grade 12 which is the highest grade and lower grades account for 64,7. The level of education determines the quality of work they



(Seseni & Mbohwa, 2017)

Concerning investment in plant and machinery, 55,20% represents entities that have plant and investment that is less than R10 000. This is followed by enterprises that stated that their machinery is R10 000-R25 000 is represented by 17,20%. This makes it evident that majority of the entities have fewer physical resources. The lack of financial resources can possess a serious problem because entities will find it hard to purchase other resources such as attracting quality employees who have exceptional skills.

Observations

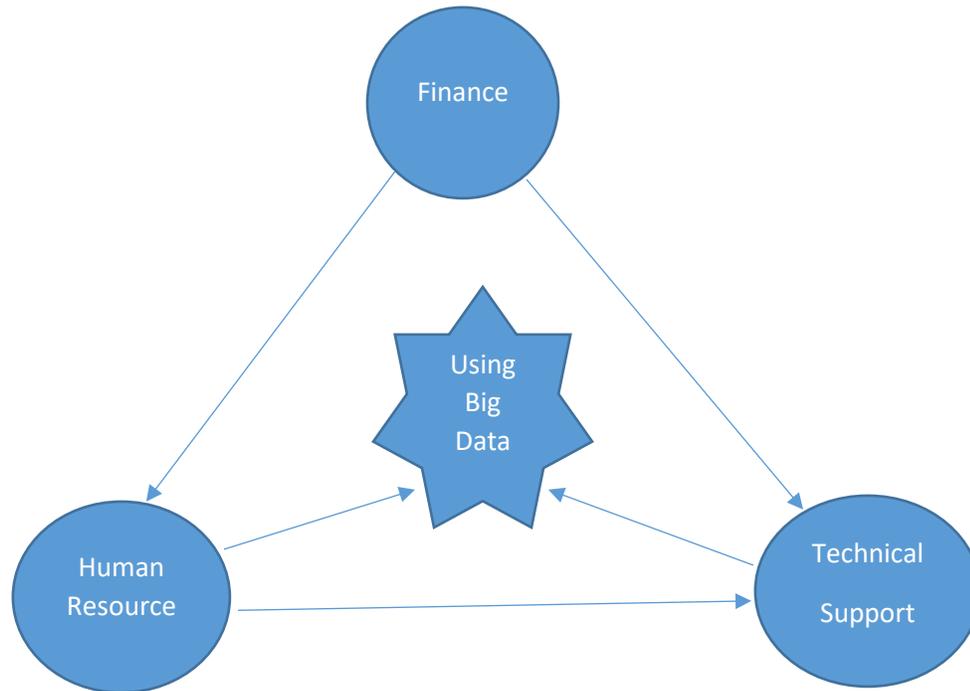
During observation, it was evident that enterprises did not have proper workstation; the working relationship between those people was not proper as employees looked like they felt that they had a boss instead of having a team leader. Employees did not look too happy about working in the enterprise. Even employees themselves did not look like they get along very well. With regards to technical support and physical resources, the majority of the studied enterprises did not have them, even their place of work the faced space constraints. Them getting machinery would mean that the enterprise would not have a place to do their normal day to day operations of the business.

5. Discussions, Recommendations, and implications

SMEs, particularly furniture manufacturers face many challenges when they want to start or grow their enterprises. They are faced with a challenge of lack of finance, lack of competent workforce, lack technical support etc. in this study it was discussed over and over again that SMEs should have the technical expertise of using the techniques that are used for mining, storing and using that type of data. This means that their human resource must be strong enough. They need to employ people who are knowledgeable so that their enterprises may have educated people who will be eager to learn about the application of Big Data in furniture manufacturing. With regards to finances, it is stipulated in the paper that enterprises do not have sufficient financial resource hence they find it very hard to recruit and retain knowledgeable staff, to buy their own machinery hence their total assets are lower than R10 000. Moreover, it is very difficult to get funding from financial providers because they are labeled as high risk and they often require collateral that SMEs do not have. This makes it very difficult for the enterprise to move forward due to limited finances. The last one is technical support. It is hard for furniture manufacturing SMEs because of limited financial resources. They cannot be able to purchase that are needed to analyse data because that machinery is very expensive.

This study recommends that the government must train these enterprise owners and their staff members about this Big Data, how it works so that they can capitalise on it and get massive profits. Massive profits mean that people will get jobs and positive contribution to the Gross Domestic Product. Due to the Big Data Analytics techniques being very expensive, the government through incubation houses must buy these techniques and allow those who want to use techniques to analyse data to do that freely. This will be a relief to those who would want to analyse whatever data they may have.

The following diagram illustrates the relationship between the finance, human (skills & workforce) and the technical support that is needed in order for Big Data to be used in furniture-manufacturing SMEs. The diagram illustrate that in order for human resource to take place, the must be finance, the very same finance also contribute positively to the acquiring of the technical support. While technical support contributes directly to using Big Data in the enterprise. Knowledgeable Human resource contributes directly to technical support and to using Big Data in the enterprise.



6. Conclusions

It has been said that when management of entities/organisations are well informed about something they make the best decisions that will benefit the enterprise/organisation positively (Lamba & Singh, 2018). It has alluded that majority of SMEs make decisions based on their gut feeling, which is sometimes problematic because they are not made based on evidence and accurate data. This may lead the SME that made that decision to regret the decision that they have made as they may provide the product or service that is not required by the customer/client (David & William, 2017). Answering research question number 1 “can Big Data be applied in furniture manufacturing SMEs?” the answer is yes, however, It is discussed in this study that enterprises should have the right resources such as the right skills and technical infrastructure so that they may be able to use Big Data properly. Enterprises must also know that not all of the techniques and tools can be used in all the enterprises. They must have an in-depth knowledge of techniques and tools and the way they (tools and techniques) function so that they can choose the ones that will best suit their enterprises. In answering research question number 2 “what are the challenges and benefits of using Big Data in furniture manufacturing SMEs?” well, They (furniture manufacturing SMEs) must be careful of the quality of data that they use as poor quality data may cost the enterprise in a sense that they make poor decisions that will eventually cost the entity. In contrary, if enterprises use the right techniques, tools, and the right data they will improve their profitability and operations of their entity. This study is limited to furniture manufacturing SMEs that are based in Soweto. The findings of this study cannot be generalised because they are based on one industry (furniture manufacturing). Future study will include other manufacturing SMEs from other major cities within South Africa. This will strengthen the findings. This will help the researcher to understand if other industries are using Big Data and their challenges when using it.

Biographies

Mr. Lawrance Seseni is a Ph.D. Candidate in Operations Management at the University of Johannesburg. He is currently working at the same University at the faculty/college of Business and Economics where he serves as an Assistant Lecturer in the Department of Business Management and a contract lecturer in the same institution but at the Centre of Small Business Development (CSBD). His master's study was on Quality Management in Furniture manufacturing SMEs (Small Medium Enterprises). He serves in different boards as a board of director, one of the boards he serves is IBASA YC (Institution of Business Advisers South Africa Youth Chapter). He is now serving as a board of director with a portfolio of co-secretary of the IBASA YC (Institution of Business Advisers South Africa Youth Charter). He is also serving as a Co-Faculty Adviser in the student organization called ENACT University of Johannesburg. He served at Enactus University of Johannesburg since 2012 holding different portfolios. His interest in research is Knowledge Management in SMEs, Service and Product Quality within SMMEs. In the year 2017, he became a member of the University of Johannesburg IEOM student chapter where he currently serves as a Director of Finance.

Charles Mbohwa Professor Charles Mbohwa is the Acting Executive Dean at University of Johannesburg's (UJ) Faculty of Engineering and the Built Environment (FEBE). As an established researcher and professor in the field of sustainability engineering and energy, his specializations include sustainable engineering, energy systems, life cycle assessment and bio-energy/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, 6 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 Masters in Operations Management and Manufacturing Systems from University of Nottingham and completed his doctoral studies at 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 collaborator 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, German, France, the USA, Brazil, Sweden, Ghana, Nigeria, Kenya, Tanzania, Malawi, Mauritius, Austria, the Netherlands, Uganda, Namibia and Australia.

Bibliography

- Ahmed, V., Tezel, A., Aziz, Z. & Sibley, M., 2017. The future of Big Data in facilities management: opportunities and challenges. *Facilities*, 35(13/14), pp. 725-745.
- David, P. J. & William, W. Y., 2017. Does big data mean big knowledge? KM perspectives on big data and analytics. *Journal of Knowledge Management*, 21(1), pp. 1-6.
- Jun, L., Ming, L., Guowei, D. & Shanyong, W., 2017. Big data application framework and its feasibility analysis in library. *Information Discovery and Delivery*, 45(4), pp. 161-168.
- Khaldoon, A.-H. & Larissa, v. A.-A., 2017. Big Data and corporate reporting: impacts and paradoxes. *Accounting, Auditing & Accountability Journal*, 30(4), pp. 850-873.
- Lamba, K. & Singh, S. P., 2018. Modeling big data enablers for operations and supply chain management. *The International Journal of Logistics Management*, 29(2), pp. 629-658.
- Mohamed, M., Pärn, E. A. & Edwards, D. J., 2017. Brexit: measuring the impact upon skilled labour in the UK construction industry. *International Journal of Building Pathology and Adaptation*, 35(3), pp. 264-279.
- Nieman, G. & Nieuwenhuizen, C., 2014. *Entrepreneurship: A South African perspective*. Third ed. Pretoria: Van Schaik.
- O'Connor, C. & Kelly, S., 2017. Facilitating knowledge management through filtered big data: SME competitiveness in agri-food sector. *Journal of Knowledge Management*, 21(1), pp. 156-179.
- Seseni, L. & Mbohwa, C., 2017. *Occupational Health and Safety of furniture manufacturing SMMEs in SOWeto, South Africa*. Bristol, IEOM Society.
- Seseni, L. & Mbohwa, C., 2017. *The impact of poor service quality on Gauteng furniture manufacturing SMMEs*, Johannesburg: University of Johannesburg Databases.
- Smeda, J., 2017. Distinctive organisational imperatives of Big Data: a literature review. *The Electronic Library*, 35(6), pp. 1087-1097.