

Predictors Of Effective Decision Making In Small, Micro And Medium-Sized Business Enterprises

By

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Abstract

The purpose of study was to determine the extent of utilisation of innovative business intelligence (BI) processes and applications for taking business decisions in small, micro and medium-sized enterprises (SMMEs) operating in Gauteng Province. The study was conducted by collecting data from a stratified random sample of size 309 SMMEs operating in the information communication and technology (ICT) sector. Efficiency in the utilisation of BI systems and applications was assessed by using a composite index developed by Papachristodoulou, Koutsaki and Kirkos (2017). The study found that about 22% of SMMEs used business intelligence methods and applications for taking business decisions on a regular basis. About 23% of SMMEs possessed adequate skills in the use of business intelligence methods and applications by the standards of Papachristodoulou, Koutsaki and Kirkos (2017). The results showed that utilisation of business intelligence methods and applications was influenced by level of BI skills, past training on BI methods and applications, level of entrepreneurial skills, level of education and awareness about BI methods and applications.

Key words: Gauteng Province, Business Intelligence, ICT, Structural Equations Modelling

JEL Classifications: D20; D51; E20

Introduction and background

The survey was carried out in an attempt to explore and determine the extent to which business intelligence (BI) methods were used for business decision-making in small, micro and medium-sized enterprises (SMMEs) operating in Gauteng Province, South Africa. According to Statistics South Africa (2019), Gauteng Province has a total annual GDP of R811 Billion. The province accounts for about 10% of South Africa's GDP although it's land area is only 1.4% of South Africa's land area. The province is home to SMMEs that make a valuable contribution to the economy by creating employment opportunities, paying tax and alleviating poverty among the masses. Gauteng Province is home to about 250, 000 formally registered SMMEs (Statistics South Africa, 2019). The annual report published by the Gauteng Provincial Government (2019) for the financial year 2017/2018 shows that the reliance on SMMEs operating in the province as a vehicle for the creation of employment opportunities and the alleviation of poverty among the masses is a key strategic priority. The 2019 annual report published by the South African Small Enterprise Development Agency (SEDA, 2020) provides a variety of technical, administrative and financial assistance to novice entrepreneurs in an attempt to reduce the failure rate in SMMEs. Booyens and Rogerson (2019) have found that training programmes that are provided to novice entrepreneurs are often poorly attended by owners and operators of SMMEs. The authors have identified shortcomings such as inability to network with potential customers and established businesses, failure to use appropriate marketing and promotional strategies, inability to draw up business plans, poor presentation skills, and inability to use innovative methods such as electronic commerce and business intelligence routinely lead to failure in start-up SMMEs.

Banerjee and Mishra (2017) have shown that the effective utilisation of BI methods and applications is vital for remaining viable. Tunowski (2020) has shown that BI methods are essential for predicting future demands for goods and services, taking evidence-based business decisions fast enough, enhancing the quality and efficiency of communication and exchange of ideas with customers and clients alike, for assessing and evaluating the performance of business functions critically, and for identifying factors that affect the degree of satisfaction of customers. Park, El Sawy and Fiss (2017) have shown that BI methods are essential for ensuring agility and long-term profitability in SMMEs. The authors have shown that BI methods are vital for mitigating potential risk to business activities, ensuring sound financial planning, forecasting changes in the practical and immediate operational needs and strategic priorities of businesses. The quality of business intelligence tools is dependent upon the quality of empirical evidence gathered from the marketplace by using appropriate statistical data collection techniques and procedures. Ali, Miah and Khan (2017) have pointed out that business intelligence methods are essential for following up business activities and decisions taken in the marketplace by business rivals and competitors.

Balan and Rege (2017) have shown how effectively business intelligence methods and applications can be used in conjunction with social media platforms for effectively marketing goods and services to customers and clients. Business intelligence methods are quite helpful for enhancing business and marketing related communication with potential customers locally and globally. The world's most popular social media platforms are supported by advanced business intelligence methods and applications (Choi, Yoon, Chung, Coh & Lee, 2020; Kiani Mavi & Standing, 2018). The failure rate among start-up SMMEs in Gauteng Province is significantly higher in comparison with the failure rate in SMMEs that have survived for periods of 5 years or longer (Worku & Muchie, 2019). The authors have found that lack of entrepreneurial skills, difficulty in securing business loans from commercial banks and stiff competition from well-established businesses hamper viability in start-up SMMEs.

Objective of study

The objective of study was to determine the extent to which business intelligence (BI) methods were used for business decision-making in small, micro and medium-sized enterprises (SMMEs) operating in Gauteng Province, South Africa.

Literature review

Denton (2020) and Sarangi (2016) have shown that business intelligence (BI) methods, applications and processes are highly valuable for enhancing sustained profitability in SMMEs by identifying aspects of poor performance. Stackhouse (2020) has pointed out that the proper use of BI methods entails empirical research and data collection from the marketplace, the identification of the operational needs and strategic priorities of customers, a critical assessment of strategies and technologies that are used by SMMEs for marketing and promotion, as well as a critical assessment of factors that affect the degree of customer satisfaction on a regular basis. BI technologies are ideal for obtaining reliable data on past, current and future demands for goods and services. The key aspects of BI functions include the documentation of business processes, data collection, data storage and transfer, the analyses of data sets, forecasting future demands, scenario analysis, the assessment of customer satisfaction, the assessment of business activities carried out by business rivals and competitors, benchmarking, text mining and scenario analysis for potential future events in the marketplace.

Antonietti and Gambarotto (2020) have shown that competitive business intelligence entails the ability of entrepreneurs to discover new business opportunities and customers by assessing demands for goods and services in the market, the ability to understand the operational needs and priorities of potential customers, the ability to effectively promote awareness about innovative products, goods and services to potential customers by using

appropriate technology and social media platforms, the ability to understand and abide by legislative requirements in the course of marketing and providing goods and services to customers, the ability to understand business activities that are carried out by business rivals and competitors in the marketplace. Accurate empirical data is a requirement for actionable business intelligence and competitive advantage (Papachristodoulou, Koutsaki & Kirkos, 2017).

Caseiro and Coelho (2019) have shown the numerous benefits of business intelligence processes for sound business planning, networking, and commercialising goods and services. Bozic, and Dimovski (2019) have constructed a framework that could be used by nascent SMMEs for value creation. Guo, Liu, Ouyang, Zheng, Zhang and Yu (2019) have constructed a framework based on business intelligence processes that is suitable for harnessing valuable market-related information from business rivals and competitors operating in local and global markets. Garcia-Vidal, Sanchez-Rodriguez, Perez-Campdesuner and Martinez-Vivar (2020) and Agovino, Matricano and Garofalo (2020) have proposed business intelligence processes that are appropriate for start-up SMMEs in developing nations. The authors have argued that local municipalities and national governments must promote awareness about the potential benefits of electronic commerce and business intelligence processes in order for SMMEs to benefit meaningfully.

Porter (2011) defines competitive advantage as value that is created by a business enterprise for customers at a cost that is greater than the cost of creating the value produced for customers by the business enterprise. The author, as one of the pioneers of business intelligence, has pointed out that SMMEs must be able to acquire credible, actionable information by using standard BI methods and techniques in order to be able to minimise the cost of producing goods and services for customers. Adler (2020) defines business decision making as a process of identifying and selecting from among possible solutions to a problem according to the demands of the situation at hand. The ability of SMMEs to identify and choose from available business solutions requires the ability to gather accurate data, perform analyses and arrive at an optimal business decision. Tripathi, Bagga and Aggarwal (2020) have pointed out that BI methods, applications and processes are valuable for ascertaining fundamental product and demand-related facts in the marketplace from the point of view of customers, activities and choices made by business rivals and competitors, the minimum cost of fulfilling expectations of customers, the evaluation of alternative business decisions, and the efficient implementation of business decisions.

Studies conducted by Llave (2017), Balachandran and Prasad (2017) and Owusu, Agbemabiasie, Abdurrahman and Soladoye (2017) in developing nations in various African countries have found that African SMMEs often fail to utilise modern and innovative BI methods and applications due to lack of technical and entrepreneurial skills, poor infrastructure and lack of good corporate governance. Onken, Miklos, Dorsey, Aragon and Calcagno (2019) have identified obstacles such as failure to conduct sound business planning and evaluation, inefficient municipal services, difficulty in obtaining business licenses from local municipalities, the absence of enabling socioeconomic and political environments, and lack of awareness about the potential benefits of electronic commerce as key obstacles in SMMEs.

The failure rate among start-up SMMEs in Gauteng Province is significantly higher in comparison with the failure rate in SMMEs that have survived for periods of 5 years or longer (Worku & Muchie, 2019). The study conducted by Wang, Fang, Zheng, Xu and Li (2020) has shown that Chinese SMMEs have overwhelmed the global retail and manufacturing sector by utilising innovative business intelligence methods and processes. In this regard, Wu, Li, Hao, Ren and Zhang (2020) have provided a detailed account of various macroeconomic policies implemented by successive Chinese governments for promoting the widespread use of business intelligence methods, processes and applications in Chinese SMMEs since the 1970s.

Fakhfekh and Jeribi (2020) have shown that business intelligence processes are quite valuable for the effective management of currency volatility and market-related uncertainties. According to the authors, SMMEs must develop the capacity to effectively utilise and benefit from electronic commerce and business intelligence processes in order to remain relevant to future local and global markets. According to Guidon, Wicki, Bernauer and Axhausen (2020), due to the global nature of the world economy, the ability of SMMEs to master and internalise electronic commerce and business intelligence processes has become a requirement for relevance, profitability and long-term survival in SMMEs in all parts of the world.

Methods and materials of study

An exploratory, cross-sectional study design was used for conducting the survey. The sample size of study was calculated by using the Raosoft online sample size calculator software (Raosoft Online Sample Size Calculator, 2020). According to Statistics South Africa (2019), the number of formally registered and tax-paying small, micro and medium-sized enterprises (SMMEs) in Gauteng Province is estimated at 250, 000. Thus, the population size of study was 250, 000. The level of significance of study was set at the 5% level. The percentage of SMMEs utilising business intelligence methods for decision-making was set at 50% as there were no prior studies in this area of research at the time of study. By using these estimates, the sample size of study became 384. Although an attempt was made to collect data from all 384 eligible SMMEs, data was actually collected only from 309 of the 384 eligible SMMEs. Thus, the sample size of study was 309. Stratified random sampling (Levy and Lemeshow, 2013) was used for selecting SMMEs into the study. Stratification was done by size of business (small, micro and medium-sized).

A structured questionnaire was used for collecting quantitative data from SMMEs. Categorical data analysis (Agresti, 2018), confirmatory factor analysis (Byrne, 2013) and structural equations modelling (Kline, 2015) were used for performing statistical data analyses. Content validity was ensured by using the Cronbach Alpha test, whereas reliability and internal consistency in measurement tools were ensured by using the Cronbach Alpha test (Ritchie, Lewis, Nicholls & Ormston, 2013). The dependent variable of study (Y) was the utilisation of business intelligence methods for business decision-making. The dependent variable of study (Y) had two possible values (Yes, No).

$$Y = \begin{cases} 1 & \text{if BI methods are used for decision making} \\ 2 & \text{if BI methods are not used for decision making} \end{cases}$$

Twenty-three independent variables of study were used in the study. Examples of such variables were awareness about the benefit of using BI methods for business decision making, adequacy of BI skills by the standards of Torres, Sidorova and Jones (2018), adequacy of entrepreneurial skills by the standards of Torres, Sidorova and Jones (2018), duration of business operation, level of education of respondents, gender of respondents, ages of respondents, attendance of at least one training session on BI methods in the past, use of BI methods for ensuring service quality, use of BI methods for fostering innovative methods, use of BI methods for ordering merchandise, use of BI methods for sourcing merchandise, use of BI methods for taking inventory of stock, use of BI methods for marketing goods and services, use of BI methods for sales promotion, and use of BI methods for ensuring data safety.

Table 1 shows frequency tables for the assessment of BI and entrepreneurial skills of respondents. About 21% of respondents used BI methods for business decision making on a regular basis. Just under 32% of respondents were aware of the potential benefit of BI methods for operating businesses profitably. About 23% of respondents possessed adequate BI skills by the standards of Torres, Sidorova and Jones (2018) for SMMEs operating in developing nations. About 17% of respondents possessed adequate entrepreneurial skills by the same standards. About 78% of businesses had been in operation for 5 years or longer at the time of the study.

Table 1: Assessment of BI utilisation and entrepreneurial skills (n=309)

Variable of study	Number (Percentage)
Use of BI methods for business decision making on a regular basis	Yes: 66 (21.36%) No: 243 (78.64%)
Awareness about the benefit of using BI methods for business decision making	Yes: 98 (31.72%) No: 211 (68.28%)
Adequacy of BI skills by the standards of Torres, Sidorova and Jones (2018)	Adequate: 72 (23.30%) Inadequate: 237 (76.70%)
Adequacy of entrepreneurial skills by the standards of Torres, Sidorova and Jones (2018)	Adequate: 51 (16.50%) Inadequate: 258 (83.50%)
Duration of business operation	2 years or less: 44 (14.24%) 3 to 4 years: 23 (7.44%)

	5 years or longer: 242 (78.32%)
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Table 2 shows frequency counts and percentages for the gender, age, level of education and the attendance of at least one training session on BI methods in the past. About 78% of entrepreneurs were male. This indicates that male entrepreneurs are much more familiar with BI methods in comparison with female entrepreneurs. About 66% of respondents had ages of 18 to 35 years. This shows that the majority of entrepreneurs who are familiar with BI methods are young. About 40% of respondents had Bachelor’s degrees. About 19% of respondents had Master’s degrees. Only about 16% of respondents had attended at least one training session on BI methods. This shows that valuable BI methods and applications were poorly utilised by entrepreneurs who could have benefited enormously from the methods.

Table 2: General characteristics of respondents (n=309)

Variable of study	Frequency count (Percentage)
Gender of respondents	Male: 240 (77.67%) Female: 69 (22.33%)
Age category of respondents	18 to 35 years: 205 (66.34%) 36 to 50 years: 85 (27.51%) 51 years or more: 19 (6.15%)
Highest level of education	Bachelor’s degree or above: 49 (15.86%) Diploma or less: 260 (84.14%)
Attendance of at least one training session on BI methods in the past	Yes: 54 (17.48%) No: 255 (82.52%)

Table 3 shows frequency counts and percentages for the use of BI methods for ensuring service quality, fostering innovative methods, ordering merchandise, sourcing merchandise, taking inventory of stock, marketing goods and services, sales promotion and for ensuring data safety. The table shows that valuable BI methods and applications are underutilised by SMMEs.

Table 3: Use of BI methods for ensuring service quality (n=309)

Variable of study	Number (Percentage)
Use of BI methods for ensuring service quality	Yes: 18 (5.83%) No: 291 (94.17%)
Use of BI methods for fostering innovative methods	Yes: 4 (1.29%) No: 305 (98.71%)

Use of BI methods for ordering merchandise	Yes: 13 (4.21%) No: 296 (95.79%)
Use of BI methods for sourcing merchandise	Yes: 17 (5.50%) No: 292 (94.50%)
Use of BI methods for taking inventory of stock	Yes: 156 (50.49%) No: 153 (49.51%)
Use of BI methods for marketing goods and services	Yes: 28 (9.06%) No: 281 (90.94%)
Use of BI methods for sales promotion	Yes: 16 (5.18%) No: 293 (94.82%)
Use of BI methods for ensuring data safety	Yes: 10 (3.24%) No: 299 (96.76%)

Table 4 shows frequency counts and percentages for the use of BI methods for ensuring data accuracy, resolving queries from customers, procurement, looking for business opportunities, identifying inefficient business processes, networking with business partners and customers, and for watching activities by business rivals and competitors. The table shows that valuable BI methods and applications are underutilised by SMMEs.

Table 4: Use of BI methods for ensuring data accuracy (n=309)

Variable of study	Number (Percentage)
Use of BI methods for ensuring data accuracy	Yes: 66 (21.36%) No: 243 (78.64%)
Use of BI methods for resolving queries from customers	Yes: 98 (31.72%) No: 211 (68.28%)
Use of BI methods for procurement	Yes: 25 (8.09%) No: 284 (91.91%)
Use of BI methods for looking for business opportunities	Yes: 13 (4.21%) No: 296 (95.79%)
Use of BI methods for identifying inefficient business processes	Yes: 12 (3.88%) No: 297 (96.12%)
Use of BI methods for networking with business partners and customers	Yes: 11 (3.56%) No: 297 (96.12%)
Use of BI methods for watching activities by business rivals	Yes: 24 (7.77%) No: 285 (92.23%)

Table 5 shows observed chi-square values and P-values obtained from two-by-two crosstab tests. At the 5% level of significance, all variables shown in the table are highly significant. The results shown in the table provide a preliminary list of variables that are influential predictors of utilisation of BI methods and applications in SMMEs. The table shows that the top 5 influential predictors of utilisation of BI methods and applications are level of BI skills, past training on BI methods and applications, level of entrepreneurial skills, level of education and awareness about BI methods and applications.

Table 5: Variables significantly associated with use of BI methods (n=309)

Variables significantly associated with use of BI methods	Observed chi-square value	Probability value
Level of BI skills	276.2562	0.000
Past training on BI methods and applications	240.9209	0.000
Level of entrepreneurial skills	224.8906	0.000
Level of education	214.4093	0.000
Awareness about BI methods and applications	180.6977	0.000
Use of BI methods for marketing goods and services	113.3633	0.000
Use of BI methods for procurement	100.1480	0.000

Use of BI methods for watching rivals	95.8048	0.000
Use of BI methods for ensuring service quality	70.3721	0.000
Use of BI methods for sourcing merchandise	66.2349	0.000

Table 6 shows estimates obtained from Structural Equations Modelling (Byrne, 2013). Exploratory and confirmatory factor analyses (Cohen, West and Aiken, 2013) were used for identifying significant predictors of utilisation of BI methods and applications for business decision-making in SMMEs. The theoretical reliability of the fitted model was assessed by using standard diagnostic procedures such as the Adjusted Goodness of Fit Index (AGFI) statistic, the Tucker Lewis Index (TLI), the comparative Fit Index (CFI), the Standardised Root Mean Square Error of Approximation (SRMSEA), and the Coefficient of Determination (CD).

Maximum Likelihood Estimators (MLE) were used for estimating regression coefficients. An MLE estimator uses an Observed Information Matrix (OIM) for quantifying the magnitude of error arising from the estimation of regression coefficients. OIM values of 0.05 or less indicate that the fitted model is theoretically reliable. The Akaike Information Criterion (AIC) and Bayesian Information Criterion (BIC) were used for assessing the discrepancy between fitted and true models (Aho, Derryberry & Peterson, 2014). Low values of the AIC and BIC statistics indicate that the fitted model is theoretically reliable.

Regression coefficients, P-values and standard error estimates were obtained for the conceptual model as shown in Table 6 below. Residual terms did not vary in the process of estimating regression coefficients. The value of CFI was equal to 0.9608 = 96.08%. The value of TLI was equal to 0.9611 = 96.11%. These estimates indicate that about 96% of the covariation in the data could be accounted for by the hypothesised model used in the study. Further, AIC = 31.8782 (Small); BIC = 30.4055 (Small); SRMSEA = 0.0112 (SRMSEA value is smaller than 0.05). CD = 0.8116 = 81.16% (Percentage of variation explained by the fitted model).

Table 6: Results from Structural Equations Modelling (n=309)

Predictor variable	Coefficient	Z-statistic	P-value	Std. Err.
Business intelligence (BI) skills	3.34	6.72	0.0000	0.0116
Past training on BI methods	2.82	5.84	0.0000	0.0128
Entrepreneurial skills	2.74	5.59	0.0000	0.0207
Constant term	1.58	2.09	0.0102	1.1004

Results obtained from structural equations modelling (SEM) suggest that the framework shown below in Figure 1 is appropriate for the promotion of the use of BI methods and applications in SMMEs operating in Gauteng Province. The framework entails 3 steps of intervention. In Step 1, an awareness campaign should be launched so that owners and operators of SMMEs can be introduced to the numerous benefits of BI methods and applications. The awareness campaign should be accompanied by practical training sessions and incentives. In Step 2, support should be provided to owners and operators of SMMEs who attend training sessions. In Step 3, monitoring and evaluation techniques should be used for ensuring the continued use of BI methods and applications in SMMEs.

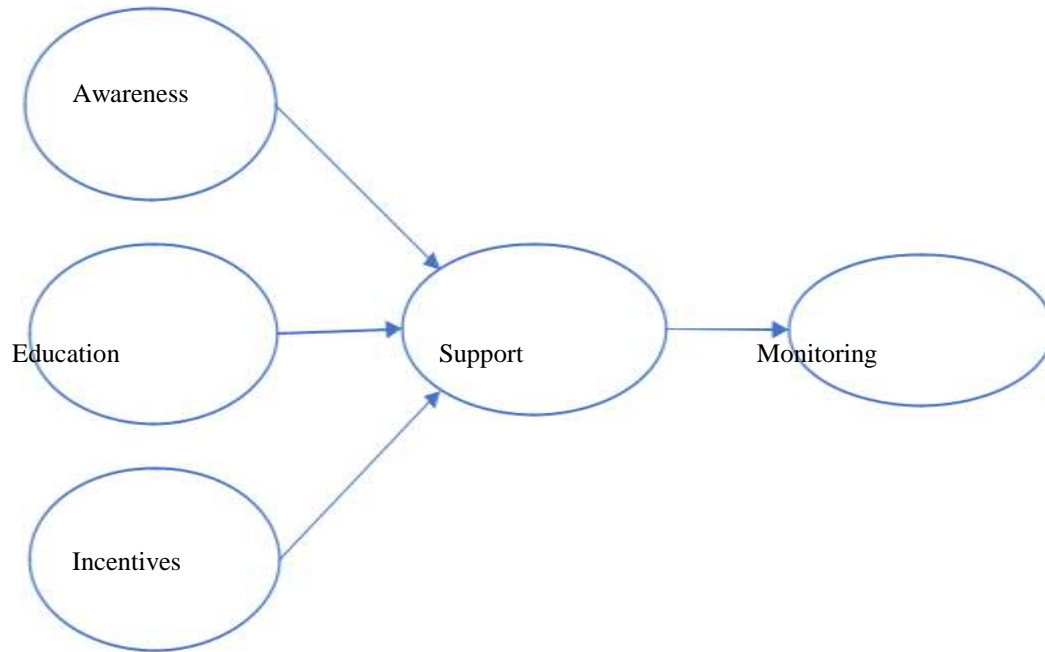


Figure 1: Framework for promoting the use of BI methods in SMMEs

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