A Cross-Sectional Pilot Study on Quality Management System in the Small and Medium Enterprise (SME) in South Africa

A.Y Magodi*[1], I. A. Daniyan[1], K. Mpofu[1]
[1]Department of Industrial Engineering,
Tshwane University of Technology, South Africa.
*yrambau@gmail.com
DaniyanIA@tut.ac.za
MpofuK@tut.ac.za

Abstract

The small and medium enterprises in South Africa face survival and sustainability challenges. Prominent among the factors mitigating the SMEs' survival is the lack of financial resources, and lack of implementation of internal control systems is also an identified factor. Hence a pilot study was carried out to provide an insight into the Quality Management System awareness and implementation feasibility in South African SMEs using an online survey. The findings indicate that SMEs in South Africa are aware of QMS methodologies, and QMS incorporation to SMEs is feasible. The literature results indicate that QMS implementation has some positive effects on SMEs for most of the articles reviewed. The reported positive effects are improved process efficiency, customer satisfaction, improvement in organizational performance, etc. It is envisaged that this work's findings will help improve the SME's effective delivery, sustainability, and profitability in South Africa.

Keywords
ISO 9001, QMS, SMEs, Sustainability,

1. Introduction

Small and medium enterprises (SMEs) in South Africa (SA) contribute significantly to the country's economy, (Ismail *et al*. 2011 and SEDA 2017). The Small Enterprise Development Agency (SEDA) reported in 2019 that SA has 2 550 540 SMEs, with most of the SMEs concentrated in the Gauteng province at 903 220 (35.4%). SMEs face the challenge of survival, SME South Africa (2018) reported that in 2016 most small businesses in SA including micro-businesses, did not survive beyond five years. SME challenges vary including lack of funding, limited access to loan facility, lack of Quality Management System (QMS) framework, government regulations and policies, market competition and dynamics, lack of a sustainable approach to retain customers and other sustainability-related issues. SMEs contributes positively to the country's economy, notable among their contribution is the generation of employment opportunities, reduction in the poverty level, effective utilization of natural and human resources, contribution to the Gross Domestic Products (GDP), development of local products, contents, and capacity. SMEs' employment, including the owners, increased to 10.8 million in 2019, accounting for 66% of economy-wide work (SEDA, 2019). An efficient and effective business management system is critical to the survival chances of SMEs. According to the International Organization for Standardization (ISO) 9001:2015, businesses can use a quality management system as a business growth and business management tool. ISO 9001:2015 is a quality management standard; the standard specifies the requirements to be fulfilled to achieve an internationally recognized quality management system. The QMS provides regulation relating to product design, control of non-conforming products, purchasing, handling, storage, packing, delivery, product identification, and traceability, process control, inspection and testing, quality control, corrective action, documentation, training, auditing, and servicing amongst others (ISO 9001, 2015).

A consensus about QMS is that it increases product and service quality and customer satisfaction, while reducing waste and contributing positively to organizational performance (Solomon *et al.,* 2017). Although ISO 9001:2015 is known as a QMS standard, it is better seen as a business development opportunity. SMEs can utilize effective QMS as a tool to achieve global competitiveness. SME SA (2018) highlights that SMEs are often neglected as an essential component of the economy. This gives rise to challenges in financial support, market share, increasing competitiveness, and lack of growth strategies. Financial aid is identified as the main obstacle to SME survival, according to the SME SA report in 2018. Only six percent of SME owners showed that they had received funding from the government in that year-2018. The top three sources of government funding were government grants (21%), the Department of Trade and Industry (17%), and the National Youth Development Agency (16%). Fifty percent of SME owners who indicated that they received non-government funding said they had sourced funding from friends and family members, followed by business incubators (24%) and big banks (20%). This study aims to provide an insight into the QMS awareness in SMEs in SA. To investigate the effect of QMS in SMEs that have implemented QMS compared to SMEs that have not implemented any QMS.

2. Literature Review

2.1. Introduction

The literature review focused on defining QMS, the benefits, and the challenges faced by SMEs when implementing QMS.

2.1. Quality Management System

A Quality Management System (QMS) is a defined way of routine business operations and achieving business goals. QMS can be used to manage the internal control system. Kain (2011) suggests that a QMS like International Organization for Standardization (ISO) 9001:2015 can be a powerful tool for business survival and growth as global competition rises. An effective QMS aids in sustainable cost reduction and enables the delivery of quality products and enhanced customer satisfaction, (Demartini and Tonelli, 2018). Every QMS has fundamental modules that have to be covered, such as document control, change control, enterprise, and operational risk management, supplier management, equipment and asset management, corrective and preventive action management, policy management, internal audit, training records management, customer complaints management system, accident and incident reporting management (ORD, 2018). A popularly used quality management system is the ISO 9001:2015. ISO 9001:2015 is a standard within the ISO 9000 series of quality management standards. Tracy (2015) states that in many cases, quality problems are more a result of shortcomings in the QMS itself than of the people running it. QMS is designed to better processes and operations in a business, ensuring consistency in product and service quality. The main idea behind a QMS is to develop business processes and continually improve business operations. Quality management is comprehensive, and many quality methodologies can be used in response to different business dynamics. ISO 900:2015 remains the commonly used yardstick for quality measurement. SMEs are not limited to a specific quality management tool (Tater, 2018; Weedmark, 2019; Smith, Bester & Moll, 2014).

2.2. The core objective of QMS in a business

A management system is how an organization manages the interrelated parts of its business to achieve its objectives, (SEDA, 2019 and ISO store, 2020). These objectives can relate to several different topics, including product or service quality, operational efficiency, environmental performance, health, and safety in the workplace, and many more. In smaller organizations, QMS may mean having strong leadership from the business owner, providing a clear definition of each employee's expectations, and contributing to the organization's overall objectives, without the need for extensive documentation (Alič, and Rusjan, 2010).

ISO 9001 is a popular QMS, and it is recognized internationally. The standard is for all business sizes, and the 2015 version makes it more adoptable by small businesses. Standards are a tried and tested way to work more efficiently and effectively. They help organizations improve their performance, reduce their risk, and help them be more sustainable (Smith, Bester and Moll, 2014). Alič and Rusjan (2010) suggests that SMEs should not view ISO 9001 as daunting or irrelevant because it directly builds into the business. Pearson (2018) further found that implementing a QMS can be cost-effective, requiring a low maintenance level, with little documentation needed, depending on a business's current system and that adoption is not complicated. QMS is based on a business's current operating systems.
ISO 9001 identified the benefits of an effective management system to an organization as follow:

- More efficient use of resources and improved financial performance
- Improved risk management and protection of people and the environment
- Increased capability to deliver consistent and improved services and products, thereby increasing value to customers and all other stakeholders (ISO store, 2020).

2.3. Constraints of QMS implementation in small businesses

Financial constraint is prevalent in SA SMEs, inevitably affecting the costs to implement QMS in SMEs (SME SA, 2018). SA SME reported that 70% of SME owners are first-time business owners who showed a need for support in business growth strategies (SME SA, 2018). QMS can be implemented as a business growth strategy tool; however, SMEs encounter challenges in implementing ISO 9001:2015. Ndlovu and Makgetla (2017) found that the most cited obstacles to implementing ISO 9001:2015 were bureaucracy, lack of guidance by top management demands on time and resources, and employees' reaction. Other businesses view ISO 9001 as a tedious exercise that requires a lot of documentation. Sousa-Poza *et al.* (2009) agreed on the identified challenges as reported that some of the challenges SMEs may face include a lack of financial and human resources, inadequate technical knowledge of quality management, and a lack of expertise formalized systems, and a lack of experience in internal auditing. Mahlatji (2012) found in a case study that ISO 9001:2015 was not implemented as a paper exercise but perceived as helping the organization as a whole and enhancing the opening of new markets in Africa.

2.4. Implementation of QMS

Ilkay and Aslan (2012) found no statistically significant difference between ISO 9001 certified and non-certified companies in terms of performance. Certification showed no direct effect on performance. However, there is a solid consensus from other studies that support the implementation of QMS in SMEs to enhance business performance (Muiruri, 2016; Sakka, 2013; Neena *et al.* 2016; Bewoor & Pawar ,2010).

Emphasis is made on leadership's active involvement in the implementation of a QMS in the business. QMS applies to any business and a company of any size. Companies cannot effectively implement QMS without the participation of the employees (Mahlatji, 2020). According to Muiruri (2016) the adoption of quality management systems has resulted in prompt delivery of services, improved product quality in terms of reduced customer complaints, and a product's ability to meet the local and international standards. Muiruri (2016) argues that successful implementation of total quality management (TQM) in a company produces better products and services, reduces costs, has satisfied customers and employees, and has better financial performance. Furthermore, Muiruri (2016) explains that QMS implementation positively affects overall organizational performance, and implementing it pays off. The benefits gained include improved quality, employee satisfaction, productivity, employee participation, teamwork, communication, profitability, and a more significant market share. Sakka (2013) found that the application of QMS improved customer satisfaction by 33.9%, improved employee satisfaction by 42.9%, and improved market share by 35.2%. The study's findings provide empirical evidence that the quality of the management system significantly influences organizational performance. Neena *et al.* (2016) study provide evidence that Total Quality Management (TQM) principles such as process approach, mutually beneficial supplier relationship, and objective approach to decision-making positively influenced Indian auto component SMEs' performance. Pavel and Roxana (2014) concluded that the integration of Six Sigma with ISO 9000 proves to be compatible and could succeed in an organization's quality culture. The revised ISO 9001:2015 takes on a risk-based approach to manage quality. ISO 9001 guides businesses to identify potential risks and apply preventive measures to eliminate or control the risk when companies cannot completely avoid the risk. The risks could be financial, operational, environmental, or legal. ISO 9001 helps small businesses protect against risk, improve quality, and promote growth simultaneously (BSI, 2020). Kain (2011) identified a positive perception towards ISO 9001 QMS contributing to SMEs' growth and survival in the Durban metropolitan area of KwaZulu-Natal. QMS adoption enables SMEs to compete in the global market confidently. Quality has become unanimous with customer satisfaction, and customers are willing to spend a bit more for quality products and services. QMS also enables SMEs to compete with larger companies and assures their clients that their products and services maintain consistent quality (Connectamericas, 2014).

SMEs can adopt many other quality management methodologies, and Lean Six Sigma (LSS) is one of them. Lean Six Sigma is a quality management methodology used to help businesses improve current processes, products, or services by discovering and eliminating defects (White, 2018). The goal of LSS is to streamline quality control in manufacturing or business processes, so there is little or no variance throughout. Skhmot (2017) explains that organizations that consistently practice Lean are more innovative and competitive, which allows them to be more profitable and sustainable. Takao *et al.* (2017) confirm the use of improvement programs within organizations to be

a global trend and affirms that the methodology implementation is the same as SMEs' cases, even in a large company. Barros *et al.* (2014) argues that there is a significant and positive relationship between the implementation of quality management principles and practices and their impact on the companies' quality performance. Sousa-Poza *et al.* (2009) concluded that a fully functional QMS leads to increased customer satisfaction and continuous business results improvement.

2.5. Summary

The literature showed that quality management is positively perceived as a business strategy, which focuses on the clients' satisfaction. Even though there are c challenges in implementing QMS in various businesses, a well-implemented QMS can yield positive results in any SME.

3. Methodology

A case study approach was selected for this study using a quantitative method.

3.1 Research design

This study's research design was a cross-sectional study, which is a type of observational study design. In a cross-sectional study, the researcher measures the outcome and the study participants' exposures at the same time. This kind of research can usually be conducted relatively faster and is inexpensive (Setia, 2016).

3.2 Sample size

The sample size for this pilot study was fifty participants. A random sampling strategy was used to select the participants. A sample size of fifty participants is acceptable as it is above the rule of thumb sample size of thirty participants for a trial study (Whitehead *et al.* 2015). Out of the fifty participants engaged with to get the data (twenty four were SME owners of which sixteen were male and eight were females; seventeen SME employees, of which twelve were male and five females; nine of the participants were clients/suppliers, five males, and four females).

3.2.1. Inclusion and exclusion criteria

The survey included only SME owners, managers, employees, clients, and suppliers directly involved in SMEs' work process. The survey was inclusive to SMEs in the Gauteng province and excluding those who do not reside in the said province and businesses that do not fall under SME. SMEs in S.A. are any enterprises that have less than 250 full time paid employees and a maximum annual turnover of less than R220 million (De Wet, 2019).

4. Data Collection

A questionnaire was used for data collection, through an online survey. The online method was selected to reduce the risk of exposure to COVID-19 between the researcher and the participants. Furthermore, it assisted in ensuring less interruptions to business operations. However, a second method was put in place to cater to the participants that are not internet or web-savvy, by having printed copies available upon request and delivered at their workplaces during breaks or lunchtime. The questionnaire was designed to take a responding tone with a maximum of 15 minutes.

4.1 Questionnaire reliability

The survey questions were based on the ISO 9001:2015 quality management standard for validity and reliability. The following questions were derived from ISO 9001:2015: question 5 based on clause 4.3, determining the scope of the quality management system; question 8 is from clause 6.2.1, quality objectives and planning to achieve them; question 9 relates to clause 7.5.3 control of documented information, question 10 is based on clause 9.1.2 customer satisfaction, question 11 is based on clause 9.2 internal audit, question 12 is based on clause 7.2 competence, question 13 is based on clause 8.5.6 control of changes, question 15 is based on clause 9.3 management review.

5. Results and Discussion

5.1 Statistical Analysis

The study employed the statistical package for the social sciences software 26 (SPSS) for the descriptive and inferential analysis of the data collected. The descriptive analysis provides information about the measure of central tendency, mean, and standard deviation to determine the nature of the data set's distribution; the inferential analysis was used to test the hypotheses. The descriptive statistics were used to summarize the large data sets of quantitative information, and then the results were further displayed on tables and charts. The characteristics of the descriptive and inferential analysis considered for the study include the mean difference, the standard deviation, number of data values, and the p-value. The Kolmogorov-Smirnov (K-S Z) test, a non-parametric test, was employed as a hypothesis testing tool, which allows testing an assumption applicable to a population. Hypotheses testing was implemented to test the null hypothesis and the alternative hypothesis, after which the null hypothesis will be rejected or fail to be rejected.

H0a- The implementation of QMS has no effect on SMEs' organizational performance in the Gauteng province.

The Kolmogorov-Smirnov (K-S Z) non-parametric test was employed to test the formulated hypotheses. This is because the K-S Z test is suitable for a categorical set of data, which characterizes most of this survey's outcome (Improta *et al.,* 2019).

Table 5.1: Kolmogorov-Smirnov test for organizational performance review, change management implementation, employee training, corporate objectives, and document control system.

	organizational performance review	change management implementation	Employee trained offered	Organizational objectives determined	Document control system
Statistical parameter	Value	Value	Value	Value	Value
Most extreme differences (absolute)	0.369	0.491	0.469	0.414	0.380
Most extreme differences (positive)	0.369	0.491	0.469	0.414	0.380
Most extreme differences (negative)	-0.231	-0.329	-0.311	-0.266	-0.240
Test statistics	0.369	0.491	0.469	0.414	0.380
Asymp. Sig. (2 tailed) (p-value)	0.000	0.000	0.000	0.000	0.000

Table 5.1. The P-value for the study is less than 0.05, demonstrating statistical significance at 95% confidence level. These results indicate robust evidence against the null hypothesis, as there is less than a 5% probability the null is correct. The null hypothesis H0d, which states that the implementation of QMS has no effect on SMEs' organizational performance in the Gauteng province, is to be rejected. Therefore, the alternative hypothesis is to be accepted that QMS implementation influences SMEs' organizational performance in the Gauteng province. Ismail et al. (2011), confirms that the use of information and communication technology adds value to SMEs by helping them to improve their levels of services and improve their customer satisfaction levels.

5.2. Graphical Results

A graphic representation of the survey results is shown in the bar graphs presented in Figures 1-3. Figure 1 show out of the 50 SMEs that participated in the study, only 62% have implemented QMS, and that 38% have not. 88% of the respondents opined that the implementation of QMS was beneficial to SMEs (Figure 2). ASQ (2020) supported implementing quality systems, stating that implementing a Six Sigma program or initiative can present unique challenges. Because these projects are often created at a low level within the organization, they may not have buy-in from upper management, leading to resistance from other groups affected by the initiative. The benefits of QMS have been reflected in many businesses. Several have successfully leveraged these proven process improvement methodologies to raise productivity, increase the bottom line, and improve quality and the customer experience (Quality Magazine, 2020).

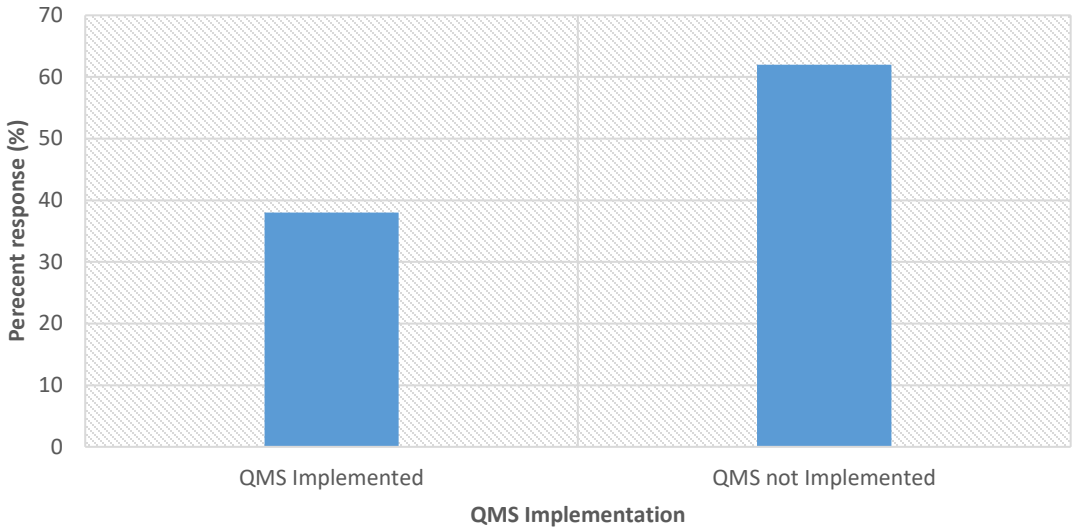

Figure 1: Implementation of QMS by SMEs

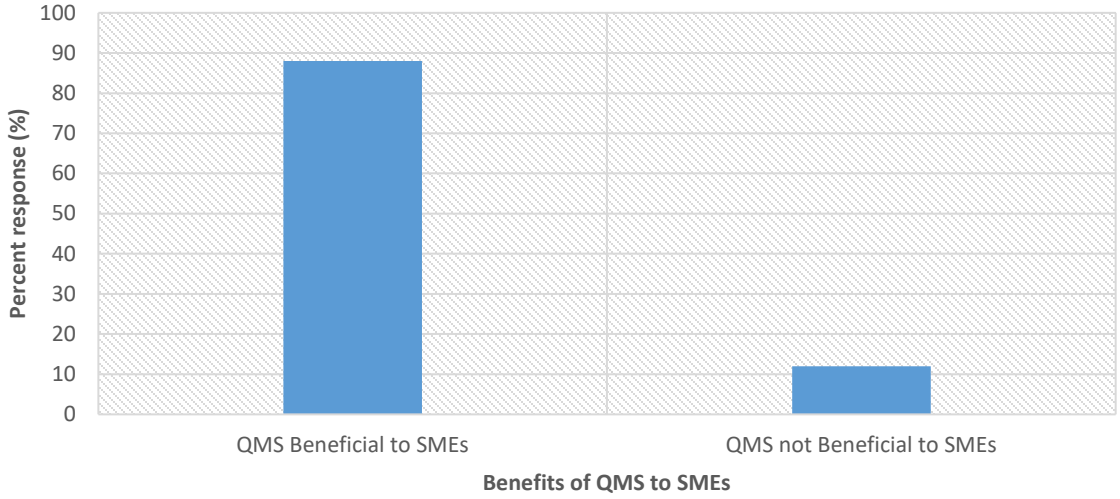

Figure 2: QMS benefit to SMEs

Figure 3 shows that the responses on the effectiveness of QMS on the working processes showed a total positive response of 50% (19% were positive, and 41% were very positive). The lowest rate was found on very negative responses on the effectiveness of the QMS on working processes 4%. The rest of the responses were distributed between those who do not see any positive or negative effect, somewhat negative, and not applicable. The answer to the benefits and effectiveness of QMS is a true reflection supported by the Small Enterprise Development Agency (SEDA). SEDA (2019) concluded in an empirical study that a small enterprise experienced highly improved business performance after implementing and obtaining ISO 9001. The customer complaints and customer returns reduced to almost zero and achieved noticeable improvement in the business's overall systems.

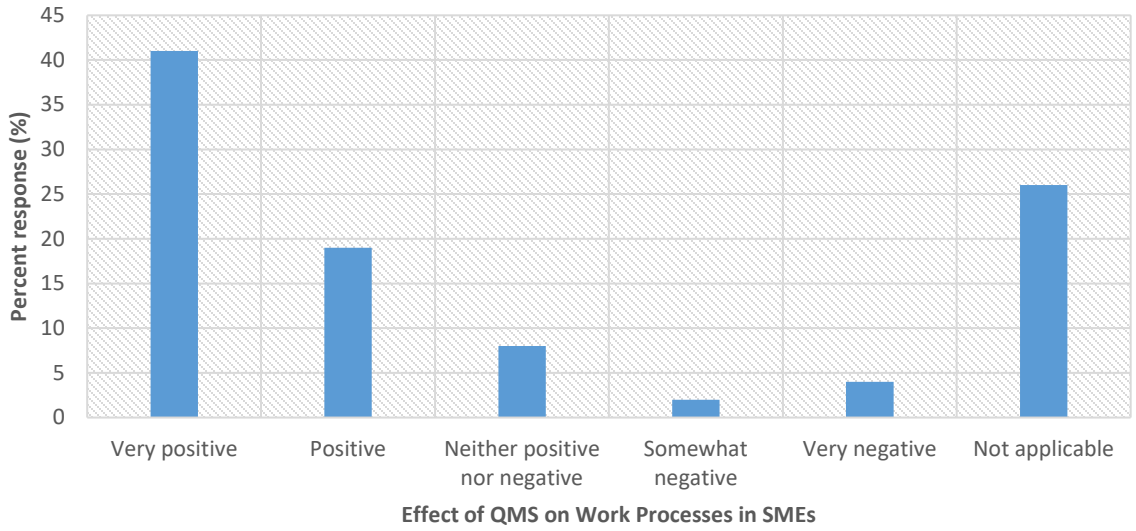

Figure 3: Effect of QMS on work process in SME

The results showed that more participants are aware of ISO 9001: 2015 and LSS (figure 4 and 5). The highest awareness was on ISO 9001: 2015 at 64% when compared to Lean six sigma at 54%. Even though this study showed the 10% difference in awareness of ISO 9001 and LSS, there are still concerns with ISO 9001 being higher. Al- Najjal and Kamel (2011) argued that despite the widespread use of ISO 9001, only five Iraqi organizations were ISO certified at the end of 2008. There is existing literature that argues the results of many SMEs not being aware of LSS. Quality Magazine (2020) concluded that many manufacturers and businesses, in general, have still not discovered the value of Lean Six Sigma. Etiene (2020) concluded in his study that the culture of service that predominates in most companies, coupled with the distinctive characteristics of services and the unique requirements of the six-sigma process, creates strong barriers to implementing the six-sigma strategy. Implementing a Six Sigma program or initiative can present unique challenges. Because these projects are often created at a low level within the organization, they may not have buy-in from upper management, leading to resistance from other groups affected by the initiative (ASQ, 2020).

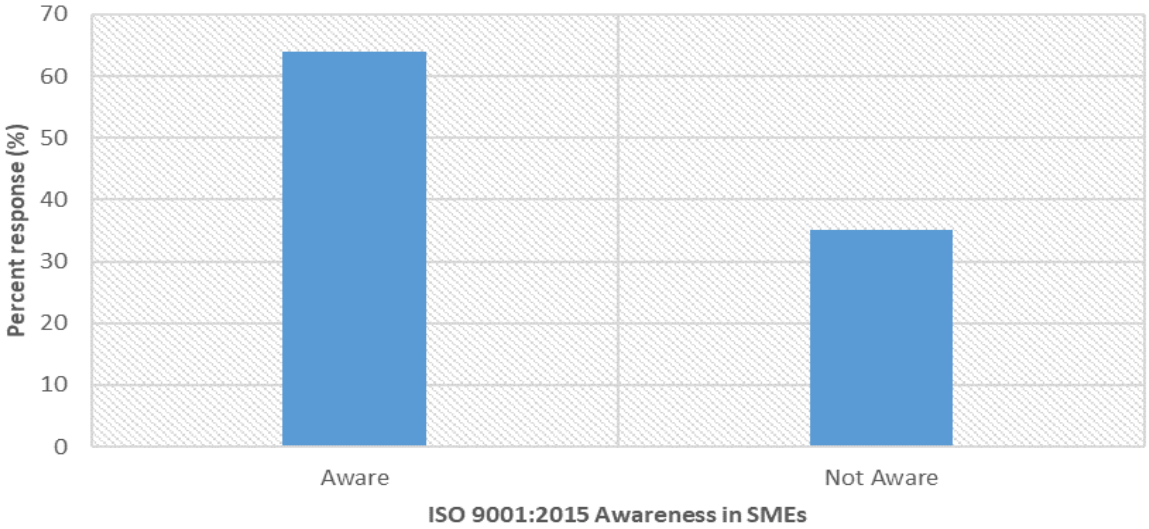

Figure 4: ISO 9001:2015 Awareness in SMEs

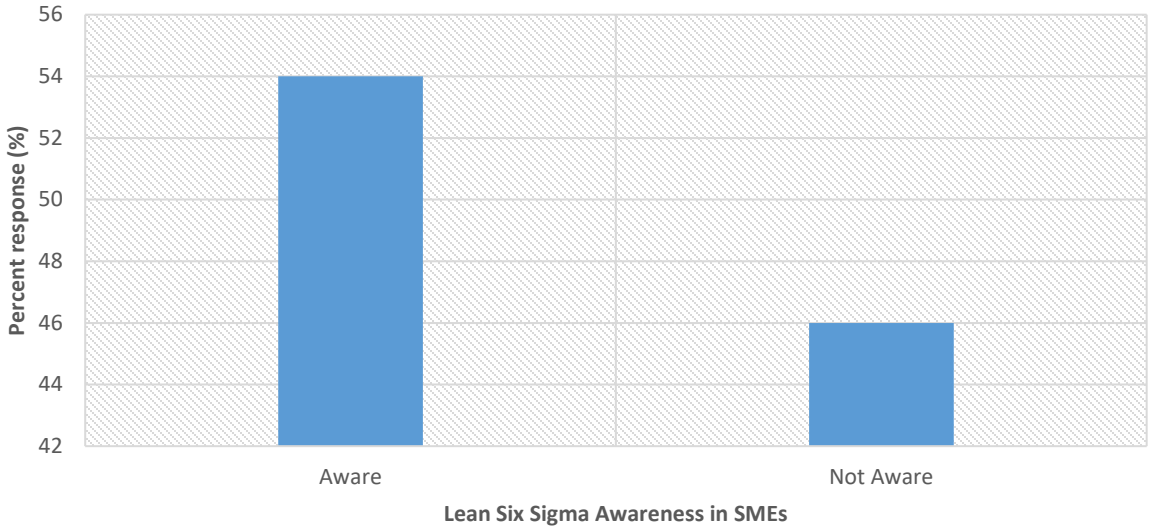

Figure 5: Lean six sigma awareness in SMEs

6. Conclusion

The benefits of QMS have been reflected in many businesses. Several have successfully leveraged these proven process improvement methodologies to raise productivity, increase the bottom line, and improve quality and the customer experience (Quality Magazine, 2020). The pilot study aimed to determine the awareness, feasibility, and effect of quality management systems in SMEs in the Gauteng province, South Africa. The pilot study results indicate that 64% of SMEs are aware of the ISO 9001:2015 quality management system; however, only 38% have implemented QMS in their companies. An interesting indication is that although most SMEs do not have a quality management system in place, they do comply with more than half of the surveyed ISO 9001:2015 QMS requirements. This shows that QMS implementation is feasible in SA SMEs. The results of the study showed that 62% of the SME have no QMS in place, this percentage reflects that there are still barriers experienced by various companies in implementing such a system. Although implementation barriers are present, 88% of the surveyed SMEs perceive QMS implementation as beneficial to SMEs. SMEs can adopt QMS as a business growth strategy to shape and develop the SME in the early stages, improving the probabilities of business growth and sustainability. An effective QMS aids in sustainable cost reduction and enables the delivery of quality products and enhanced customer satisfaction. Future studies will conduct an in-depth probe into the constraints to QMS implementation in SMEs. The findings of this study will be used in the main research and cover the shortcomings identified.

7. Recommendations

With reference to the pilot study results analysis, more than half of the SMEs already partially comply with some of the QMS requirements of ISO9001:2015. The revised ISO 9001 standard is more accommodating to businesses. It does not require an organization to have an assigned quality management representative; this alleviates the need to increase business overheads. A documented quality management system manual is no longer a compulsory requirement but optional for compliance to ISO 9001:2015, which eases the documentation exercise in SMEs, ISO store (2020). QMS implementation in SMEs is recommended to achieve the consistent provision of quality products and services. To increase productivity, customer satisfaction, improve internal control systems; reduce process variations, and increase global competitiveness. QMS can increase profitability in SMEs and subsequently contribute to the improvement of SMEs' sustainability in S.A. QMS should not be limited to a particular methodology, but one that complements and suites an SMEs needs.

References

Alič, M., and Rusjan, B. (2010). Contribution of the ISO 9001 internal audit to business performance, International Journal of Quality & Reliability Management, vol.27, no.8, pp.916-937, 2010

Al- Najjal and Kamel (2011). ISO 9001 Implementation Barriers and Misconceptions: An Empirical Study. *International Journal of Business Administration,* vol. 2 no. 3, pp.118-131

American Society for Quality, ASQ. (2020). About Lean six sigma. Available from: https://asq.org/quality-resources/six-sigma#Implementing%20Six%20Sigma

Barros. S, Sampaio. P & Saraiva. P. (2014) *Quality management principles and practices impact on the companies' quality performance*, ICQ'14-Tokyo, Japan., 9-22 October 2014

Bewoor. A.K. and Pawar. M.S (2010), An empirical study of the motives and benefits of QMS/ISO implementation among Indian SMEs, International Journal of Productivity and Quality Management, Vol. 6, no.3, pp.379-406

BSI (n.d), *Standards and small businesses, How can standards help small businesses*? https://www.bsigroup.com/en-ZA/Standards/who-uses-standards/Standards-and-small-businesses/ April 2020.

Connectamericas., Quality, a tool for improving SME competitiveness, https://connectamericas.com/content/quality-tool-improving-sme-competitiveness, June 2020.

Demartini, M & Tonelli.F (2019). Quality management in the industry 4.0 era, http://www.summerschool-aidi.it/cms/extra/papers/1402.pdf, October 2020

Etienne (2020). The Implementation Challenges of Six-Sigma in Service Business. International Journal of Applied Quality Management. Volume 2 Issue 1, pp. 1-24

Ilkay, M. S. & Aslan, E. (2012). The effect of the ISO 9001 quality management system on the performance of SMEs, International Journal of Quality & Reliability Management, vol. 29, no. 7, pp.753-778.

International Standard Organisation ISO (n.d), *Management system standards*. https://www.iso.org/management-system-standards.html March 2020.

Ismail. R, Jeffery. R and Van Belle. J.P, (2011), Using ICT as a Value Adding Tool in South African SMEs, *Journal of African Research in Business & Technology,* Vol. 2011 (2011)

ISO store, (2020). *ISO 9001:2015(en) Quality management systems — Requirements*, https://www.iso.org/obp/ui/#iso:std:iso:9001:ed-5:v1:en, June 2020

Johnson. C.N. (2002). The benefits of PDCA, Quality Progress; Milwaukee, vol. 35, no. 5: 120

Kain C. A. (2011). *The effect that a quality management system has on small, medium and micro-enterprises in the Durban metropolitan area of KwaZulu-Natal*. https://ir.dut.ac.za/bitstream/10321/701/1/Kain_2011.pdf April 2020.

Mahlatji, J. (2012). *Evaluating the implementation of ISO 9001: Standard to company operations: Case study of a catering equipment company in South Africa*. MSc Thesis, Department of Quality and Operations Management, University of Johannesburg. https://ujcontent.uj.ac.za/vital/access/manager/Index?site_name=Research%20Output April 2020.

Muiruri, Z. K. (2016). Quality management systems and organizational performance: A theoretical review in Kenya's public sector organizations, *Science Journal of Business and Management*, vol. 4, no. 5, pp.150-155.

Ndlovu, M. and Makgetla, N. (2017) *The real economy bulletin* https://www.tips.org.za/images/REB_Small_Business_Edition_September_2017_.pdf, April 2020.

Neena, S., Garg, A. K. and Neelam, D. (2016). Effect of TQM principles on performance of Indian SMEs: the case of automotive supply chain. *The TQM Journal*, vol.28, no. 3, pp.338-359.

ORD., M. (2018). Types *of quality management systems*, https://quality.eqms.co.uk/blog/types-of-quality-management-systems, Feb 2020

Pavel, A-P. & Roxana. S. (2014). Integrating Six Sigma with quality management systems for the development and continuous improvement of higher education institutions, Procedia - *Social and Behavioral Sciences*, vol.143, pp.643 648.

Pearson, M. (2018). *The small business owner's simplified guide to ISO 9001 and business improvement,* https://www.bsigroup.com/LocalFiles/en-GB/small-business/UK-SB-BSI-ISO-9001-Whitepaper-UK-EN.pdf, April 2020.

Quality Magazine. Available from: https://www.qualitymag.com/articles/91986-reasons-organizations-do-not-use-lean-six-sigma, September 2020

Sakka, S. E. (2013). The Impact of Applying Quality Management System and Environment Standard on Organization Performance an Application on SMEs in Egypt, *European Journal of Business and Management*, vol. 5, no.19, pp.82-86.

Setia, M.S. (2016). Methodology Series Module 3: Cross-sectional Studies. Indian journal of dermatology, 61(3), pp 261–264.

Skhmot, N., What is Lean? The lean way, https://theleanway.net/what-is-lean, June 2020.

Small Enterprise Development Agency, SEDA. (2007). The small, medium, and micro-enterprise sector of South Africa, http://www.seda.org.za/Publications/Publications/The%20Small,%20Medium%20and%20Micro%20Enterprise%20Sector%20of%20South%20Africa%20Commissioned%20by%20Seda.pdf, May 2020.

Small Enterprise Development Agency, SEDA (2019). SMME Quarterly Update 1st Quarter 2019. http://www.seda.org.za/Publications/Publications/SMME%20Quarterly%202019-Q1.pdf May 2020

Smith, R. A., Bester, A., & Moll, M. (2014). Quantifying Quality Management System performance in order to improve business performance. *South African Journal of Industrial Engineering*, vol. 25, no. 2, pp.75-95.

SME South Africa. SME landscape report: An Assessment of South Africa's SME Landscape: Challenges, Opportunities, Risks & Next Steps' 2018/2019, April 2020.

Solomon, N. P., Bester, A. & Moll, M. (2017). Diffusion of a quality management system: A case study. South African Journal of Industrial Engineering, vol. 28, no. 2, pp.149-164, 2017

Sousa-Poza. A, Altinkilinc. M & Searcy. C. Implementing a functional ISO 9001 quality management system in small and medium-sized enterprises, *International Journal of Engineering*, vol. 3, no. 3, pp.220-228, 2009

Takao, M. R. V, Woldt, J. and da Silva, I. B. (2017). Lean six sigma methodology advantages for small- and medium-sized enterprises: A case study in the plumbing industry in the United States, Advances in Mechanical Engineering, vol. 9, no. 10, pp1–10.

Weedmark, D. (2019). *What Is the Purpose of the ISO?,* https://bizfluent.com/facts-6778914-purpose-iso-.html, March 2020.

White S. K., What is Lean six sigma? Streamlining quality management. https://www.cio.com/article/3237692/six-sigma-quality-management-methodology.html June 2020.

Whitehead, A.L., Julious, S.A., Cooper, C.L., & Campbell, M. J. (2015). Estimating the sample size for a pilot randomized trial to minimize the overall trial sample size for the external pilot and main trial for a continuous outcome variable, *Sage choice*, vol. 25, no. 3: pp. 1057–1073.

Biographies

*** A.Y Magodi** is an industrial engineer with seven years of experience in the field. Her highest qualification is a Bachelor of Technology in Industrial Engineering at Tshwane University of Technology, Tshwane, South Africa. She is an associate member of the Southern African Institute for Industrial Engineering (SAIIE)

I. A. Daniyan is a postdoctoral research fellow at the Department of Industrial Engineering, Tshwane University of Technology, Pretoria, South Africa.

K. Mpofu is the Research Chair, Manufacturing and Skills Development at the Department of Industrial Engineering, Tshwane University of Technology, South Africa.

- Appendix

Appendix A: questionnaire

INTRUCTIONS FOR PARTICIPANTS:

- **Tick box where applicable**

Please note that your participation in this study is entirely voluntary. You have the right to withdraw at any stage without any penalty or future disadvantage whatsoever. All information obtained from the questionnaire is strictly confidential.

		Tick box where applicable		
1.	**Are you an owner, employee, business partner, or supplier to SMEs in South Africa?**			
	Owner			
	An employee at an SME			
	Supplier to an SME			
	Other			
2.	**What is your gender?**			
	Male			
	Female			
	Tick box where applicable	**Yes**	**No**	**Not Applicable**
3.	Are you aware of the ISO 9001 Quality Management System?			
4.	Are you aware of the Six Sigma process improvement method?			
5.	Is there any QMS implemented in your organization?			
6.	If your answer is YES to the previous question, please specify which QMS is used in your organization.			
7.	Does your company have defined objectives that are communicated to all employees?			
8.	Does your company have a document control system in place?			
9.	Does your company offer employee training?			
10.	Do you conduct regular customer satisfaction surveys?			
11.	Do you conduct self-audits, external audits and supplier audits?			
12.	Does your company embrace change to improve business processes?			
13.	Do you make use of cloud storage?			
14.	Does your company conduct regular organizational performance reviews?			
15.	How has QMS affected the work processes in your organization?	**Tick the relevant box**		
	Very positive			
	Somewhat positive			
	Neither positive nor negative			
	Somewhat negative			
	Very negative			
	Negative			
	Not applicable			
	Tick box where applicable	**YES**	**NO**	**Not applicable**
17.	If there is a QMS implemented at your company, has the quality of your products and service improved since the implementation of QMS?			

18.	If there is a QMS implemented at your company, has customer satisfaction improved since the implementation of QMS?			
19.	**How has QMS affected productivity in your company?**	**Tick the relevant box**		
	Very positive			
	Positive			
	Neutral			
	Negative			
	Very negative			
	Negative			
	Not applicable			
20.	**How much value do you think your company places the quality of their products/services?**			
	Much too much			
	Too much			
	The right amount			
	Too little			
	Much too little			
	Not applicable			
	Tick box where applicable	**Yes**	**No**	**Not applicable**
21.	Do you think QMS implementation is beneficial to SMEs in South Africa?			