An Analysis of the Problems Encountered in Implementing and Maintaining Lean Six Sigma at a Manufacturing Company in Namibia

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Abstract

The purpose of this paper is to analyze the problems encountered during the implementation and maintenance of Lean Six Sigma (LSS) at a marking and bolts manufacturing company in Namibia, herein referred to as BMS Namibia. The study is a single case study that was carried out at the factory of BMS Namibia in Windhoek. The factory manufactures a wide range of bolts, pin, cotters, and machine parts for export purposes. The study was conducted at the time when the company management wanted to optimize processes in order to improve productivity. Data was collected through a questionnaire with open ended questions. Participants were purposively selected from the operations and planning units of the company. A thematic approach was used to analyze data. It was established that the company's processes were sufficiently equipped to enable the implementation of LSS. However, the company does not have continuous improvement program to keep the employees and management informed of the efficiency of their production system. Since LSS is one of the best productivity improvement methodologies embraced around the world, BMS Namibia needs to invest in the implementation of LSS and in providing relevant training to the employees and management.

Key words
LSS implementation problems, bolts and machine parts manufacturing, LSS training, case study, Namibia

1. Background of the study

Businesses operate in a volatile and turbulent environment that is highly competitive. The high competition in the market requires firms to improve their productivity in order to keep abreast with the changes in their industries. Productivity is defined as the measure of a firm's efficiency and is determined by various factors such as plant layout, process planning, raw material specification and machinery technology (Omar and Mustafa, 2014). In order to increase productivity and ensure perpetuity, a firm must adopt various technologies and methodologies to match the desired performance (Shanmugaraja, 2017). Amongst the management programs that can be adopted by the business organizations in order to enhance competitiveness are the Six Sigma and the Lean management.

Besides being a measure of variability and organization's quality performance, Six Sigma is a management philosophy, strategy, as well as a problem-solving methodology that can be applied to any process in order to eliminate the root cause of defects (Bruce and Howes, 2005). Lean management is a paradigm shift that requires that an organization is structured around the customer's pull-value (Chelangat, 2006). It originated at Toyota Motor Corporation in Japan as an approach that reduces costs by eliminating waste in all the production process (Furterer and Eshennawy, 2005).

Recent manufacturing practices in Africa and the world have seen businesses adopting Lean Six Sigma (LSS), which a hybrid of Six Sigma and Lean management (Chelangat, 2006). It blends quality and service improvement practice from Six Sigma, and efficiency from Lean management. Wang and Chen (2010) noticed that LSS that was traditionally applied in manufacturing settings, is now being applied in the service sector. LSS confers continuous improvement agendas that gives a company competitive advantage in the form of improved quality of products and services, as well as customer satisfaction.

1.2 The aim of the study

The aim that guided the study was to analyse the problems that were encountered in the implementation of Lean Six Sigma at a manufacturing company in Namibia hereafter called BMS Manufacturing. BMS Manufacturing's parent company is in German. The company adds value to imported nuts, bolts, pins and other machine components. The company's production has also been stretched to offer a variety of products that include type wheel markers, stylus markers as well as laser marking and camera reading systems.

The study was done in the production department of BMS manufacturing, and its layout is as shown in the schematic diagram in Figure 1.

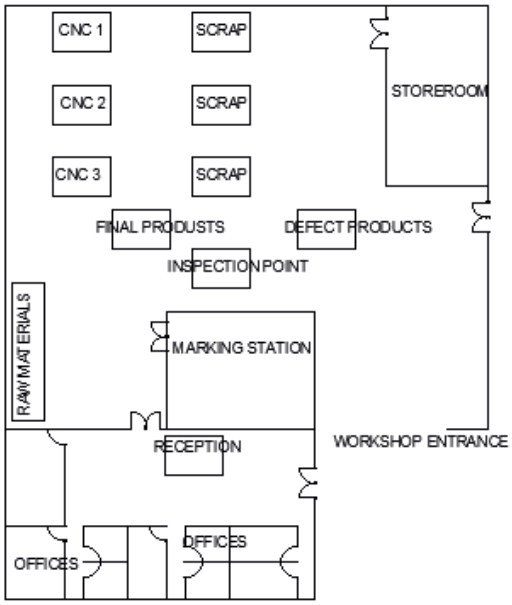

Figure 1: The schematic diagram of the production department in BMS Manufacturing

2. Literature Review

2.1 Lean Production

The lean production concept was coined in a manufacturing shop floor in Japan and was made popular by Toyota Motor Corporation (Kollberg and Dahlgaard 2007). Though lean was developed in the 1950s, it remained confined to Japan until 1990. Unlike the traditional production systems, lean production system focuses on minimizing waste (Womack and Jones 2003).

The lean system's sole aim is to add value to production systems in such a way that a company produces more output with less inputs. It achieves this objective through the following principles:

(i) Identifying Value (from the consumer's perspective)
(ii)Map the value stream
(iii) Pull on customer demand
(iv) Create flow
(v) Achieve perfection Chelangat, 2006.

Although it is popular in the manufacturing sector, it can be applied in other sectors of the economy. There are several lean Practices which includes elimination of waste, Just In Time (JIT) production, Kaizen, one piece flow, Quality Built in and mistake proofing among others, Sugimori et al., (1977)

Most scholars concur that the elimination of waste is at the core of all lean practices. Mulholland (2018) defines waste as all the undertakings and arrangements that do not add value to the process of producing the final good.
Toyota's lean production system identified seven major wastes that do not add value in the production process (Liker and Morgan, 2006). These types of waste are overproducing, production queues, unnecessary conveyance, over processing, excess inventory, unnecessary movements and defects (Liker and Morgan, 2006).

Reducing waste is usually accompanied with continuous improvement in Lean production (Mulholland, 2018). This is due to the fact that by continuous improvement in the production process, the company eliminates as much as possible a plethora of waste by removing all bottlenecks that exist in the production as well as through the optimization of the inefficient processes. Mulholland (2018) noted that the only way to improve the production practices continuously there is need to document and manage the processes and procedures first. This will enable the management to see where there are gaps and incompetence in the production process and which areas can be improved that will lead to the greatest outcomes.

Sugimori et al., (1977) noted that JIT condenses time by having all processes produce the essential parts at the necessary time and have on hand only the least stock necessary to hold the processes together. It adopts the pull production system where the replacement of materials and goods is prompted by consumption, and tasks are performed to meet the demand or order. Unlike the push system where mass production of commodities that are stored as inventory in warehouses waiting for suitors.

With the level of competition in the manufacturing sector getting fiercer due to globalization, companies have adopted the Quality Built-in Lean Practice. The concept stresses the need for quality to be built into the manufacturing process in order for the business to be more efficient and successful. The theory also stresses that there is no good in hastily producing products that are easier and cheap to make whilst they are full of latent defects. Such items will not sell. The quality built in practice acknowledges that quality is affected by either bad manufacturing processes or human error. The quality built in practice is adopted by considering the actual value and product that the business is providing the clients to make it a point that the productive efficiency aim does not deter the quality of the final product.

Mulholland (2018) defines one piece flow as a lean approach that optimizes production queues and minimizes work in progress. One piece flow is also viewed as a logical extension of JIT production. Instead of having several workstations and a bulk order where WIP is moved from one station to another, all the jobs are completed at the different workstations at the same time. The allows synchronous movement of material between workstations.

2.1.1 Advantages of Lean Production

The major benefits enjoyed from the implementation of lean production are:

- *Waste Minimization* – is one of the significant benefits derived from implementing lean. Lean manufacturing minimizes waste within a production facility. The process also reduces cost within the operation through minimization of inventories and reduction of defects.
- *Enhanced Customer Relationships* - Instead of solely focusing on the needs of all consumers, lean focuses mainly on loyal consumers. This is how the business is able to build strong and reliable relationships with trusted customers and keep a steady flow of revenue coming in (Marnewick, 2011).
- *Lean Infrastructure* - A lean infrastructure means the business is only dealing with several components: building, tools, supplies, equipment, and labour to fulfil near-term inventory demand. The facility does not waste any space within the operation and enables the facility to come as close as it can with regards to production efficiency.

2.2. Six Sigma Philosophy.

The Six Sigma ideology was developed in the 1980s by Motorola Company. The intention of the Six Sigma technique is to remove variation from processes and to manufacture defect-free products (Singh, 2018). Several companies throughout the globe have had considerable success through the implementation of the Six Sigma philosophy for example Citibank and Bank of America. Though there are many diverging views on the definition of the Six Sigma, it is agreed that Six Sigma offers a new structure that promotes exploration and control and exploration in improving efforts (Shroedder et al, 2008). Six Sigma can be classified both as a business strategy and a science. The Six Sigma is known by the acronym 'DMAIC'' which stands for Define, Measure, Analyse, Improve, and Control. This is a five-step problem-solving methodology that is trailed to find causes of discrepancy in system processes. The DMAIC defines a process to improve, measure the baseline and target performance of the process, analyse the process data to determine the key process inputs that affect the outputs, improve the process to optimise the outputs, and, finally, to control the process in order to sustain the improvement.

The Six Sigma concepts consists of the standard deviation, the Pareto Principle and the Voice of Customers (VOC). These concepts are some of the major concepts which are used as building blocks in improving projects and statistical process control (Rahman et.al, 2018).

There is a common consensus amongst scholars the world over that the fulcrum of the six sigma methodology is to reduce defects. By reducing the number of defects the six sigma team increase productivity, decrease overall costs, increase customer satisfaction and maximize profits. Standard deviation (σ) defines the distance between data values spreading around a central mean (μ) in normal distribution. A small standard deviation means that there are small variations on from the mean. If the standard deviation is far away from the arithmetic mean it means the data is widely dispersed.

2.2.1 The Pareto Principle.

The Pareto principle is named after the great Italian economist Vilfredo Pareto. The Pareto principle is also called the 80/20 rule which states that 20% of the causes lead to 80% of the effects. Other scholars call it the vital few law as there are only vital few inputs that can drive the majority of outputs. The Pareto principle is vital to six Sigma because it determines the few inputs that impact on a process more than the others. Individuals who want to reduce defects, target the vital inputs that have a significant impact on the outcome. The determination of the vital few is done using a Pareto chart.

2.3. Lean Six Sigma as an integrated approach.

The first integration of Lean and Six Sigma occurred in 1986 in the US-based George group (Salah et al., 2010). Modern trends in quality management philosophies are no longer choosing between Six Sigma and Lean Management but are now combining the two philosophies in order to harness the advantages of the two systems whilst minimising their negative effects. Six Sigma improves the quality of processes and the Lean method eliminates losses and wastage. A blend of the two leads to a reduction of costs associated with production (Kucerova, 2013). Rathialli and Singh (2018) noted even though there is a wide range of literature with many success stories of performance improvements related to Lean and Six Sigma as detached systems, there are also inherent flaws that have been acknowledged for each technique over the ages. The benefits are more when the two philosophies are combined.

2.3.1 Lean Six Sigma tools.

According to Chelangaat (2006), Lean six sigma consists of many tools and techniques for continuous improvement. The popular tools and techniques are the Kanban system, 5S, Value Stream Mapping (VSM), Pareto Analysis, Cause and Effect analysis (C&E), Voice of Customers (VOC), and DMAIC. Lean Six sigma tools like Value Stream Mapping (VSM) can be used to visually map out the entire product flow. Once the value stream is mapped, it is easier to find and eliminate the steps that do not add value on the final product. Kanban can help businesses establish a pull system to control the flow of materials in a production system (Chelangaat, 2006).

2.3.2 Critical Failure Factors for LSS.

Albliwi et.al (2014) explored the critical failure factors for LSS in different sectors like manufacturing, services and education by reviewing 56 papers concerning LSS from 1995 up to 2013. The study unmasked that there are 34 failure factors and these includes lack of top management support, lack of education and training, limited resources, poor LSS project prioritization, poor communication, lack of consideration for human factors, wrong selection of LSS tools, lack of VOC understanding, lack of employee engagement, poor selection of candidates of belts training, lack of effective model or roadmap, poor execution, threat of redundancy, ineffective project management among others.

Other critical failure factors in literature also include lack of performance measurement systems, weak infrastructure, weak links to supplies, misalignment between project aims and the overall goals of the organization and also trying to copy another organization's LSS strategy whilst not considering differences in the preconditions.

2.3.3 Steps in LSS implementation.

According to Alkhoraif, (2018) there are eight steps to a successful lean six sigma implementation in SMEs.

Creating a burning platform - the organisation must have a convincing reason for implementing Lean Six Sigma. For instance, the company could be suffering huge quality losses.

Putting the resources in place - the business must not hesitate to hire the right resource at the right price. This is applicable to any resource, be it employees, material or technology. The team members must be able to work together and must be empowered to make decisions (Alkhoraif, 2018).

Teaching the methodology- organizations need to train their workers to be powerful change agents. Yellow belt, green belt and black belt training can help increase awareness of LSS implementation and maintenance. The employees identified for training should share the organization's vision.

Prioritizing activities - organizations must make it a priority to; listen to the customer, identify critical-to-quality criteria and ensure Lean Six Sigma efforts are linked to business goals. Activities must be assessed to ensure that they are meeting the company's expectations and goals.

Establishing ownership - it must be clear who owns the Lean Six Sigma initiative in the company. This may involve appointing a committee to find out who is responsible for the entire team. With ownership comes empowerment and a sense of pride. The team members will be more committed, accountable and engaged.

Taking the right measurements - what cannot be measured cannot be improved (Evere & Black, 2003). By creating a measurement system, practitioners can determine the baseline performance and use the data in decision making and analysis of variations. According to Evere & Black (2003) the key for measurement is to get right the cost of quality. Organizations also must find a way to measure process performance in order to receive data fast. Having too many items on a scorecard may shift practitioners' attention from the critical few metrics. They need to identify and measure the key leading indicators instead of measuring the many lagging indicators.

Governing the program - a proper governance structure can help a program to succeed. Poor governance can lead to the vision falling apart. Proper governance also helps practitioners create a platform for sharing. Without regular and productive meetings or review sessions, the program can veered off course.

Recognizing contributions - rewards and recognition play a valuable role in making sure the team members remain satisfied in their roles. They can help build enthusiasm for the program from a top-down and at grassroots level. Rewards and recognition can help drive innovation throughout the organization.

3. Methodology

3.1. Research Design

According to Maree, (2011) a research design is a framework of methods and techniques chosen by the researcher to combine various components of research in a reasonably logical manner so that the research problem is efficiently handled. The study deployed a qualitative research technique. The study also employed an exploratory research design. This design was selected ahead of other designs because it offers an in-depth understanding of the subject. LSS's research and its implementation in Namibia is still at a very early stage. By the time of writing this research, the researcher had not come across any Namibian article with regards to LSS or even in their single form and hence this leaves a research gap that needs to be explored first and will be explained or described by future scholars. The extensive literature on LSS is scarce in the Namibian manufacturing industry.

3.2. Research Paradigm

The information of LSS manufacturing at BMS Namibia could only be obtained in the form of words and narratives from the employees and hence this favored a qualitative research paradigm. The qualitative method was chosen because it provides a better understanding of behavior. The strategy helped the researcher to explore more information on a small area to achieve depth in the study. The area does not allow the use of other research strategies like quantitative and mixed strategy because the later will require triangulation of the data which may end up being more complex which may reduce credibility of the research.

3.3 Research Approach

The study employed an ethnographic research approach. This approach has been chosen ahead of other approaches because it can be conducted entirely by one individual which in this case is the researcher and has limited capital to employ extra people in the research and does not require modern expensive and elaborate tools. The method is also flexible as it can be conducted at any place whilst giving the researcher an insider's perspective about the BMS manufacturing process by obtaining profound important data. Since this study is being carried for academic purposes by the researcher, then the ethnographic approach is the best way to go since it recognizes the role of the researcher clearly.

3.4 Data Collection tool

A questionnaire was used to collect information at BMS Namibia. The questionnaires were accompanied by a cover letter to all the respective work groups at BMS Namibia. The questionnaire was divided into two sections with each section having a well-structured open-ended set of questions about the workers' view of LSS and background.
Although the observation and direct interviews method are widely used in the ethnographic research approach, this study only used the questionnaires alone as the global Covid-19 pandemic that is ongoing made the researcher to have limited interactions with BMS employees and hence the questionnaires presented a safer method of data collection. The self-administered questionnaires were answered by the employees whilst maintaining the social distance precautions.

3.5. Data Collection

After obtaining the needed permission to carry out the study, the researcher administered the questionnaires to the participants. The questionnaires were completed and collected after five days, thus allowing the participants to have ample time to answer. The questionnaire was designed by the researcher guided by empirical literature.

3.6. Data Analysis

Statistical Packages for Social Sciences (SPSS) software was used for sophisticated analysis purposes. Though the SPSS is mainly used for quantitative data analysis, modern developments in the software package has made it compatible with both qualitative and quantitative data. The SPSS Text Analytics which is a module of the SPSS software can be used for coding and analyzing the information obtained from open ended questionnaires.

4. Results

This section presents the findings on the problems encountered in the implementation and maintenance of LSS at BMS Namibia.

4.1 Profile of the Respondents

4.1.1 Response Rate

The researcher issued out a total of 60 questionnaires and 50 of them were returned within a week. This presents an 83.3 % response rate which can be considered satisfactory for the analysis, Creswell (2014b). Among the 50 respondents, 20 % were in management positions at BMS Namibia, 25% were members of the procurement department, and the production department constituted 55% of the respondents. The respondents' rate across the board was sufficient for the researcher to garner adequate information needed for the study.

Respondents from the Procurement Department had more insight on the type of raw materials used. The Production Department were more informed on the manufacturing techniques used at BMS and the Management were insightful of the overall operations of the company.

4.1.2. Job Function

The respondents had varying job functions. Twenty percent of the respondents were in the managerial positions, 40% were in the CNC operating department and 30% were in the machine alignment, positioning and fabrication department. The last 10% had primary supervisory roles at BMS Namibia as shown in figure 2 below.

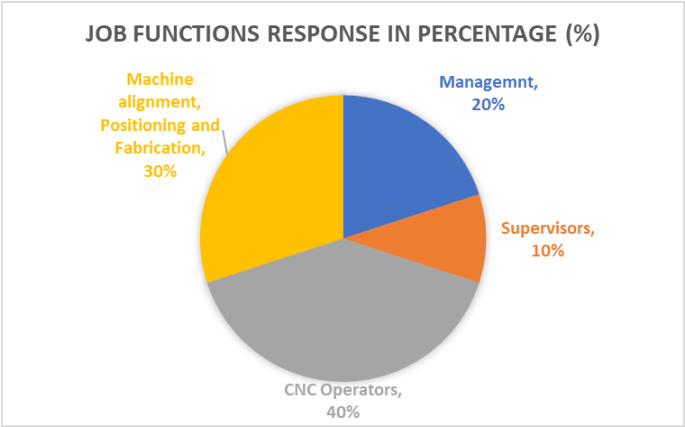

Figure 2: Job function

The majority of the respondents were CNC operators. This is a group of workers who participate in the implementation and maintenance of the lean six sigma in the company. In this regard, the findings discussed in the paper truly reflect the company's experiences in lean six sigma implementation in the company. CNC operators are directly involved in a day to day production and manufacturing of components.

4.1.3. Years of Experience at BMS Namibia

The respondents at BMS Namibia had varying years of experience at the organization. As shown on the pie chart in figure 3 below.

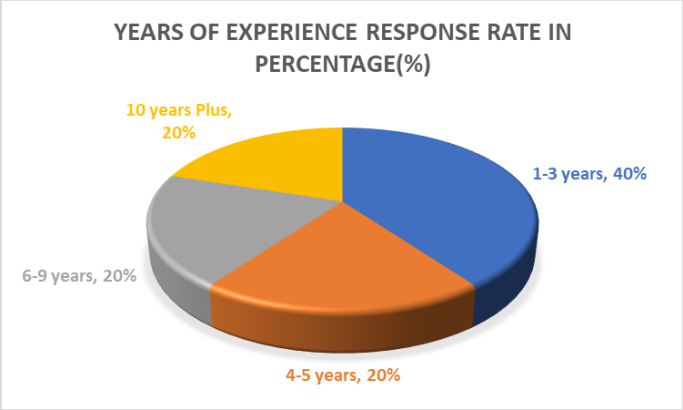

Figure 3: Years of experience

Out of the 50 employees who responded, 40 percent of the employees had one to three years of experience. The three to five years, six to nine years and the ten plus years' experience all had 20 % of the total respondents.

The 20% who had worked in the company for 10 years, had institutional memory of the company's experiences and operational culture. The forty percent of the respondents have been with the company for 1-3 years. This indicate that the company is still growing hence, recruiting new people. The new employees will pose a challenge when implementing LSS because they are still learning the organization's culture and needs time to grasp the concept.

4.2. Quality Management at BMS Namibia

4.2.1. Quality assessment of incoming material and machine parts

The employees were also asked to decide on the department responsible for the assessment of the incoming material, machine acquisition and spare parts. Sixty percent of the respondents acknowledged that the management department was responsible whereas the remaining 40 percent cited the production department as the one responsible for quality assessment. This clearly indicate that the organizational structure and job functions are not clear to all the employees and this is one of the causes of failure when implementing LSS. For a successful LSS implementation, all employees need to know and understand the organizational structure and responsibility of each section within the company.

Upon further enquiry from the management it was clarified that it was indeed the Quality Unit within the production department that is responsible for the assessment of quality of the finished products. It was also discovered that the incoming raw materials are assessed by the procurement team, which have less knowledge on quality assessment. It is the Researcher's view that the quality department become directly involved in inspecting the quality of both raw materials and finished products because low quality materials can affect the quality of the finished goods.

4.3 Customer Satisfaction and problem solving

The respondents showed that their company only measure customer satisfaction using two main ways. Sixty-five percent of the workers noted that they measure customer satisfaction through customer inquiry whilst 35% of the respondents showed that they rely on customer feedback.

The respondents were also asked on the most important aspects that had helped their company to win customer loyalty and 74 percent of them cited quality products and on-time delivery whereas the other 26 percent cited the production of precise machine parts.

All respondents indicated that they had no idea about the department responsible for LSS as well as members of the problem solving team although 80 percent of them acknowledged that the team meets when a problem arises.

LSS is a continuous improvement process, therefore the team need to meet more often to discuss matters affecting the company and the quality of their products and services and not only when problems arise. BMS also need to follow up on customers through surveys and ratings and not just waiting for spontaneous feedback from customers because this will lead to failure of customer satisfaction measurement.

4.4 Waste Control

Seventy percent of the workers cited the waste control sheet as the basis for quality assessment whilst 30 percent had no idea. The workers were also asked about the waste measured at the company and their responses were noted. This can be shown on the chart in figure 4 below.

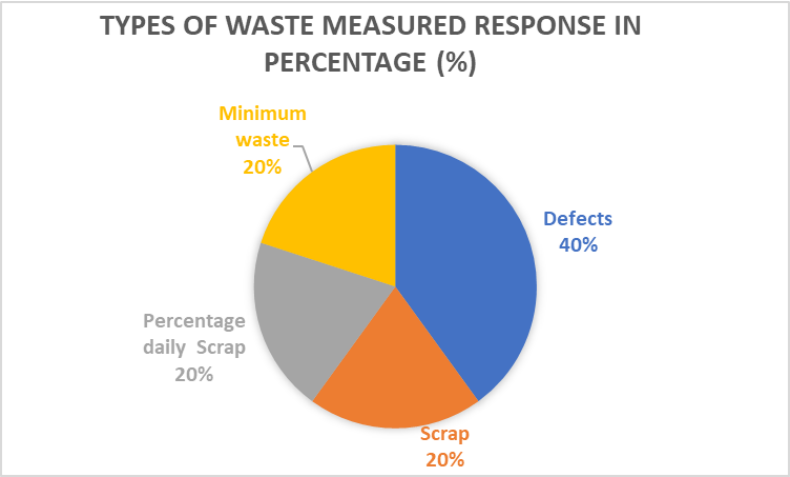

Figure 4: Waste measured

The respondents cited different type of wastes recorded at their workplaces. Forty percent of the workers indicated that defects were the measured waste whilst the other 60 percent cited minimum waste, scrap and percentage of daily scrap.

Quality assessment and waste control are crucial parts of LSS. It is worrisome to have 30% of the respondents who have no idea on quality assessment of their products. For successful implementation of LSS, all employees need to be aware of quality assessment of the products. Employees needs to know how wastes are measured and why they are measured. Once all employees are made aware of why scraps and defects are measured, and the importance thereof, employees' attitude is likely to change and improve leading to utilizing lesser resources to optimally produce more quality products.

4.5. Lean Six Sigma Knowledge

The respondents were asked on how their company rank their standard deviation criterion and all the 50 employees had no idea about the sigma level. The totality of the respondents (100%) also did not have any idea about sigma level in the core process of BMS Namibia.
The respondents also noted that there are no LSS trained personnel at their organization as they all noted that there are no any six sigma champions, yellow belts, green belts, black belts and master black belts. The respondents also acknowledged that the company have never arranged any LSS training.

4.6. Production Metrics used to measure process performance

The respondents were asked on the productivity metrics they normally used to measure process performance and they only cited two metrics. About 24 percent of the respondents cited the job card as the most used production metric for process performance. The other 76 percent of the respondents picked the waste control sheet as the most used metric. The respondents also provided some copies of the recent waste control sheets.
The respondents were also asked how these production metrics are used to explain the impact of LSS at BMS Namibia but all of them had no idea and some were not sure. Even those in the in the management had no idea about the impact of the production metrics on LSS.

4.7. Lean Six Sigma application at BMS

The respondents were asked about the infrastructure that has been put in place to support the application of LSS at BMS Namibia and 50 percent of them cited the CNC machine whilst the other 30 percent had no idea.
The respondents were asked about necessary tools that they think BMS should introduce in order to assist in the application of LSS and they had different perspectives. This can be represented on the pie chart in figure 5 below.

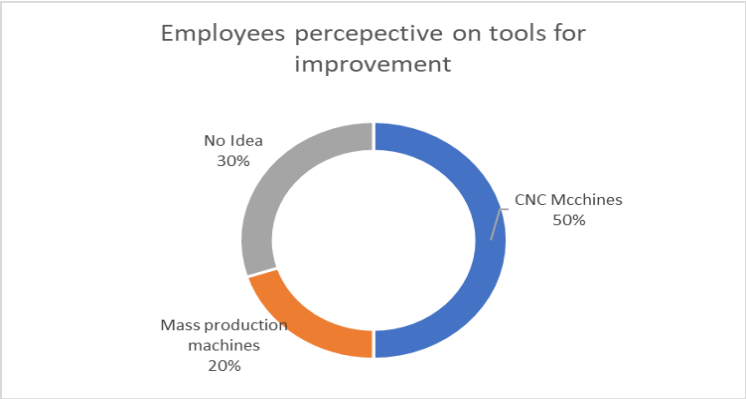

Figure 5: Employees Views

As shown on the pie chart above, about 50 percent of the workers cited the CNC machine as the most necessary tool, whereas 20 percent of the respondents cited the mass production machines as the necessary tool. Thirty percent of the respondents had no idea of the necessary tool for LSS. BMS does not have robot arms and conveyer belts for easy movement of scrap and finished products. For successful implementation of LSS, BMS will have to invest in modest machinery and LSS training for the employees.

The company is applying the lean concepts of waste control. This was evidenced by the results which showed that the waste control was being used. Though some of the workers had no idea of the recorded waste, this was a smaller proportion and consist of those in the production department who appeared not to be taking note of the supervisors' work. The company also measures different kind of waste like daily scrap, defects and minimum waste so as to see if the production is going with little or no defects.

The results obtained showed that there are no LSS trained personnel or practitioners. The lack of any belt holder at a big company like BMS Namibia will imply that the LSS concept cannot be maximized. More so, the company has not even organized any LSS trainings or workshop and this is a clear recipe for LSS failure according to Pham (2017).

Another root cause for the problems encountered stems from the results that all the 50 respondents had no idea of the standard deviation or sigma level even though they measure waste on a daily basis. This according to Harrison (2008) leads to partial adoption of the LSS methodology. Furthermore, the production metrics like job cards and waste controls sheet are just mere collection of data as 100 percent of the respondents at BMS Namibia have no idea on the impact of these metrics on LSS application. This deters the success of LSS application.

5. Conclusion

The single case study was conducted at BMS Namibia in Windhoek to analyze the problems encountered during the implementation of LSS. BMS Namibia manufactures a wide range of bolts, pin, cotters, and machine parts for export purposes. Data was successfully collected through a questionnaire with open ended questions. Purposive sampling was used to selected participants from the operations and planning units of the company. It was found that the company's processes were sufficiently equipped to enable implementation of LSS. However, the company does not have continuous improvement program to keep the employees and management informed of the developments in LSS. It was concluded that BMS Namibia is using some Lean practices but there is no team that monitor the successful implementation. This will lead to LSS implementation failure. BMS Namibia needs to invest in the improvement of LSS structures in the company, and in providing relevant training to the employees and management.

6. Recommendations

6.1 Implications for Competitiveness of the BMS Namibia

Using the results obtained from the respondents' answers showed that the company's LSS need a lot of input for the company to reap the benefits of the methodology. BMS Namibia need to adopt the critical success factors for LSS deployment, these include management commitment, education and training.

The commitment by the top management at BMS Namibia towards LSS application can be questioned as there is no LSS training that has been done. As long as the top management is not able to offer the LSS training one can say that there is no commitment towards LSS success, and this ultimately leads to failure. The top management must see to it that the whole package and resources vital for LSS are provided and try to remove all the hurdles that may hinder progress.

On the lack of LSS champions and belt holders at BMS Namibia, there is need for education and training of the workers. Though this will cost money and time to the company, it will be a long step in enhancing the competitiveness of the business. There are many companies offering LSS training, and these must be hired to offer training and this will result in abridged LSS execution time which will in-turn result in higher savings due to lower labor costs.

6.2 Implications for Policy formulation

Policy makers in Namibia and Africa as a region need to put more investment in the education sector. Most LSS training companies are based in the developed countries and it is no coincidence that the LSS programs in these developed countries have excelled. LSS training centers need to be put in place so that different levels of belt holders can be ordained in the country without going overseas living their families behind.

Since the LSS methodology is not only meant for the manufacturing industry, there are many success stories of LSS application in the service sectors like health and finance. Namibia can benefit much improvement and cost reduction by the use of LSS concepts in banks and hospitals after subsidized trainings are offered by the state. To reduce a heavy burden on the already struggling Namibian fiscal, the government can make a policy that requires all the major service and manufacturing firms to have specified number of LSS practitioners.

6.3 Production layout

The production layout at BMS Namibia is well organized however, the company should invest in modest machinery such as a robot arm and conveyor belt to be installed at the workshop. The robot arm will assist to remove scraps from the CNC machine to the scrap bay at the end each cycle of operation. This will reduce the machine cleaning time and result in more cycles per day. The robot arm will also be responsible to place the finished products onto the conveyor belt. The conveyor belt will transport the finish products straight to the inspection point. This arrangement will speed up the process and result in more process cycles per day compared to manual picking of scraps and finish products.

6.4 LSS Training

For BMS Namibia to successfully implement LSS, the Company must invest in a proper LSS training for the employees. An organization can have all the machineries suitable for LSS implementation, but it will still fail if its personnel have no idea of the methodology. The company need to have some experts in LSS like Black belt holders to lead the projects. One of the challenges that BMS have in implementing LSS is the lack of trained employees in LSS. It is highly recommended that BMS send its employees for LSS training before implementing this methodology into the company production system.

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