

Application of Productivity Improvement Tools - A Case of an SME in Botswana

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Abstract— Low productivity is one of the major indicators of a company's decline. Failure to meet targeted productivity can result in high costs per unit, hence higher selling prices, making a company's goods, services, or commodities not competitive enough on the market. It is important for companies to implement strategies to improve productivity so that they can remain competitive in the market. The present study is based on implementing productivity improvement strategies with a small-scale company. The aim of this work is to assess the possibility of applying productivity strategies in a chosen small-scale company located in Gaborone, Botswana. To assess the situation, two tools namely the Japanese 5s and development of Key performance Indicators (PKI's) were used. The results show that 5S is an effective tool for improvement of organizational performance, regardless of organization type, size, products or services. Consequently, 5S technique would strongly support the objectives of an organization to achieve continuous improvement in performance and productivity. In addition, from the results, it is clear that using KPI's is of paramount importance and it contributes a great deal to monitoring the performance of an organization with the progression of time. The company can significantly improve its productivity by adopting the basic framework developed in the current study.

Keywords— Key Performance Indicator, Productivity, 5S, Small-to-Medium Enterprise.

I. INTRODUCTION

THE need for productivity improvement in small companies is due to high levels of competition from well-established and large companies in the same sector. A report on SMEs in Botswana indicates that companies in Botswana face external and internal challenges that sometimes hinder their growth and hence survival in the industry (Morapedi, 2014). These challenges include amongst others; Lack of skilled employees, Small local market, Lack of access to finance, few export possibilities, Customer orientation, Industrial relations, and

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Poor management styles . Productivity is a commonly used but often poorly defined term that regularly appears in both academic and practical discussions. Definitions of productivity seem to be dependent on the reviewer's point of view and the context in which it is used (Pekuri *et al.*, 2011). According to (Stevenson, 2012) Productivity is an index that measures output (goods and services) relative to the input (labor, materials, energy, and other resources) used to produce it while (Bernolak, 1997) defines the concept of productivity as how much and how good we produce from the resources used. In simple terms it can be seen as an aggregate of the overall efficiency and effectiveness of a company. Productivity is important due the fact that if it is improved it brings about benefits such as increase market share and increased profits margin which in turn benefit workers in term of wages and bonus. According to (Rahman, 2007) Small and Medium Industrial Enterprises (SMIs) (in our context SMEs) form the backbone of any economy. Irrespective of whether one looks at the developed countries of the world, such as USA, Japan and Germany or developing countries such as Thailand, Malaysia and China, a dynamic and vibrant SMIs sector is playing a key role in the successful economic growth of these countries. (Rahman, 2007) Also continued by noting that a strong SMEs sector help achieve many socio-economic activities and examples of which include; SMEs are the biggest source of low cost employment, Support and complement large scale industries, Help in achieving a fair and equitable distribution of wealth, and Key drivers for value-added exports etc. Looking at the importance of SMEs in any economy it is why most countries help in supporting their SMEs sector through various programs. They need support to overcome economic and competitive shortcoming they face due to their relatively small size.

Key Performance Indicators (KPIs) have become widely accepted as a standard of measurement for performance management. Their success is based on their ability to give insight on actions taken in attempts to improve current and future performance, and their ability to tie responsibility for actions to specific teams or team members. As opposed to metrics, which simply demonstrate the current state of events, KPIs are created to reflect the difference between current performance and clearly defined business objectives, and are able to clearly indicate where actions for change should be taken. They should answer crucial organizational questions such as “where are we now?”, “what do we want to be (and when do we want to be it)?” and “how are we going to get

there in the most efficient and cost effective manner?" A breakdown of the term "key performance indicator" reveal the following meanings:

Key – something important and meaningful to the success of the business,

Performance – relating to some activity that allows the business to do what it needs to do whether that activity is operations, development, sales, or accounting oriented.

Indicator – a measurement tool. Increasing the volume of information does not mean better information, more meaningful information or more clarity for the decision maker.

KPIs are non-financial indicators that can be either quantitative or qualitative and measure results compared to set goals (Velimirovića, et al., 2010). By linking them to target values, one is able to evaluate current performance in relation to expectations. Once this variance between actual performance and targets is shown, actions can be taken and viewed in terms of success in achieving these set goals. Organizations can become burdened with so much information that they cannot see the forest for the trees. The best management systems acknowledge that not all information is equally important. The 20-80 rule applies here; a small number of variables are probably the keys to the success and health of the business. It is these key variables that an owner needs to measure and monitor. Theory dictates that KPIs should be SMART or specific, measurable, achievable, relevant, time-based and monitored frequently. They must also be based on actions, events and assets that you can control, and influence. Whilst it may be interesting to monitor external factors, which you cannot control, they cannot be used to improve performance and are therefore not KPIs. KPIs can be used to assist with planning and implementation of actions to improve performance, Development of a strategic business plan, Creation of a strong organizational culture through giving organizational members a focus on essential objectives and requirements and Identification of essential actions to take in processes such as change management.

Key performance indicators have been implemented in different companies before such as in the Toyota dealership (Velimirovića et al., 2010). Issues that arise from implementing the KPIs include; a poor understanding of issues and an absence of effective leadership within organizations to drive forward the KPI programs, seeking a quick solution or a simplistic measure performance, failure to pay attention to prevailing culture within organization ahead of the implementation of a KPI program Practice.

Practicing 5S creates and maintains a high quality workplace which results in the effective organization of the workplace, reduction of work space, elimination of losses connected with failures and breaks, improvement of the quality and safety of work (Michalsks & Szewieczek, 2007). The term 5S refers to five steps – sort, set in order, shine, standardize, and sustain – that are also sometimes known as the five pillars of a visual workplace. 5S programs are usually implemented by small teams working together to get materials

closer to operations, right at workers' fingertips and organized and labeled to facilitate operations with the smallest amount of wasted time and materials. The 5S system is a good starting point for all improvement efforts aiming to drive out waste from an organization's process, and ultimately improve a company's bottom line by improving products and services, and lowering costs. Many companies are seeking to make operations more efficient, and the concept is especially attractive to older manufacturing facilities looking to improve the bottom line by reducing their costs.

Implementing the 5S method means cleaning up and organizing the workplace in its existing configuration. It is typically the first lean manufacturing method that organizations implement. This lean method encourages workers to improve their working conditions and helps them to learn to reduce waste, unplanned downtime, and in-process inventory (in the context of a manufacturing firm). A typical 5S implementation would result in significant reductions in the square footage of space needed for existing operations. It also would result in the organization of tools and materials into labeled and color coded storage locations. The 5S methodology is a simple and universal approach that works in companies all over the world. It is essentially a support to such other manufacturing improvements as just-in-time (JIT) production, cellular manufacturing, total quality management (TQM), or six sigma initiatives, and is a great contributor to making the workplace a better place to spend time.

There may be issues that arise in the implementation of the 5S strategy. For example (Warwood & Knowles, 2004) identified that the use of 5S in practice is influenced by human factors that interfere with its effectiveness. In order to overcome this researchers point out that implementation requires commitment from both top management and workers in a company. (Gapp, Fisher, & Kobayashi, 2008) Show empirically that an environment of worker participation is required if the benefits of 5S are to be reaped. From a sample of Japanese companies, the authors found that managers placed a strong emphasis on the involvement of employees, not only in organizational aspects of development but also in the strategic and long-term application of the system. The other issue may be structural factor (firm size). Literature evidence suggests that large companies are more likely to adopt the 5S system as compared to small companies. This is due to the fact an enormous effort is required to achieving it, simultaneously with total productive maintenance, thus small companies may resist adopting this system due to economies of scale.

For a 5S System to be successful one must be successful at changing the culture and the behavior of employees and management. Since by nature people are resistant to change, this can be the biggest obstacle to overcome. By using the slow and steady approach one will be able to gradually change the culture. The key is to start small and never stop improving. By using the **Kaizen**, approach of small incremental changes it allows employees to adapt to the changes with little disruption.

With this type of implementation the 5S System will be better received and be more sustainable (Grier, 2014).

The aim of this paper is to assess the possibility of applying productivity strategies in a small-scale company located in Gaborone, Botswana. Two productivity improvement studies were implemented, 5S and Key Performance Indicators.

II. METHODOLOGY

Methodology involves literature review, study and analysis of business operations, identification of tools, planning the implementation process and implementation. Operations study and analysis was performed solely to understand the system and collect information and data relevant to the study. The typical data collected during this phase includes the problems that the company is having, the performance management system in place and mapping of appropriate improvement tools. The needs of the company were identified and choice of appropriate improvement tools resulted in having to implement a performance management system and the 5S system.

III. RESULTS AND ANALYSIS

A. Developing KPI's

KPIs are often used for internal financial, operational, organizational and other performance measurements, both quantitative and qualitative. As an important performance measure to help improve an organization, a KPI must be consensual. An effective KPI to measure a system should combine individual and organizational goals, so that organizations can detect faults and make rapid and transparent improvements, on an objective and measurable basis, to enable the most effective application of organizational resources

The company studied specializes in providing security, automation and specialized electrical installation services. Now the company does not have any KPIs or any other kind of explicit management systems. The only system in place in the company was the mandatory accounting system. The company uses the quick books software, which monitored all the transactions of the company and also produced financial and support documents for the transactions that take place, for example invoices and quotations. The growing pressure of the environment and competitors influenced towards reduction of sales of the company. In addition, customers' expectations increased on higher quality services with low price and shorter delivery times. Due to these reasons, the management of the company agreed on developing Key Performance Indicators to be able to measure and track the performance of the company. To carry out the work, a team of three members was established. The manager of the company, the person in charge of accounting, and one of the authors of this report were appointed members of this team. The work was completed in two phases. During the first phase, the issues the company faces were identified and KPI were developed based on those issues. Due consideration of issues that the company is facing, the Key Performance Indicators were defined as follows:

Gross Profit per service: this indicator shows the profit generated by each service that is being offered by the company. This is essential in the sense that it would help the company to identify the more profitable services and less profitable services. Looking at the Pareto (80/20) rule which states that 20 percent of the services or products generate 80 percent of the company revenue or sales, this KPI can be used to make decisions on which services to prioritize on and make more available to customers in order of profits or revenue generated.

Customer satisfaction: customers are not easy to please; to them it's either a service provider offers 100% service or 0 otherwise. This is evaluated in terms of the complaints that are filed by the customers. This can be of importance since the customers keep the service provider in check and through their contribution via complaints, they help to improve the services being offered to them. Customer satisfaction should be of paramount importance since the customers are the core business of the company.

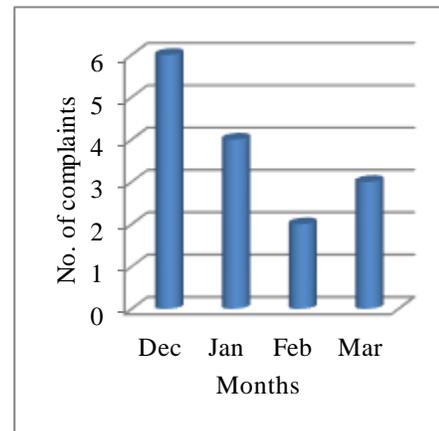


Fig. 1 Monthly complaints from the period of Dec 2014- March 2015

Fig 1 shows the monthly complaints recorded from the period of December 2014 to March 2015. The complaints were high in December and that was before the development of the key performance indicators. The records of these complaints were not filed properly and this hid this problem. Now that the problem was identified, there was a procedure for dealing with it due to the awareness. The management found a way of dealing with each one of the complaints that they got hence making the customers happy. This ended up reducing the complaints by a margin of 60%. The things that the customers complain of include low standard work, Incomplete work, and Workers leaving the place untidy.

The company deals with many electronic products, which are unpredictable in terms of their operation. The complaints seem to be reducing since now the management knows where to focus their efforts in dealing with customer complaints.

Return on sales: Also referred to as Net Profit After interest or Net Profit before Tax on some financial reports and the only other item to be deducted from this figure is taxation. It is important to monitor the trend of this KPI because a diminishing trend could indicate that the company is working

harder for a lower return. Many business owners consider this to be one of the figures that holds the most importance, as it provides them with the profit that the business have retained as a percentage of the products and services that have been sold. Return on Sales should be more than 2%. The formula used to calculate the KPI is:

$$(\text{Net profit after interest}/\text{company turn over}) * 100 \quad [1]$$

Labor Utilization: Also known as Utilization, Labor efficiency and selling efficiency. The statistic tells how much of the productive workers attended time is actually spent working productively. It can be accounted for by using time sheets and job cards. It helps management realize efficiency of the employees and whether or not they are being paid for underperforming. To counter underperformance, employee incentives can be introduced or where possible training to improve the skills of the employees. The formula used to calculate the KPI is:

$$(\text{Hours worked}/\text{hours attended}) * 100 \quad [2]$$

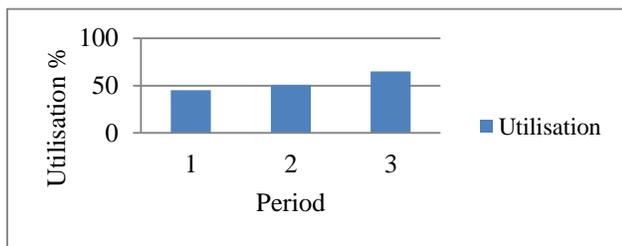


Fig. 2 Chart showing % of utilization

Fig 2 shows that the percentage labor utilization of the workers. A study on the labor utilization was conducted in a form of a time study. The workers were divided into three groups according to their specialty or expertise. The study was conducted over a period of three weeks and it lead to the results on figure 3 above. The study was based on extracting information on the efficiency of the workers and what really hinders their performance. Information (first hand) was gathered from the field as the author took some rounds with workers to their site during working days. Secondary information was gathered from the job cards and time sheets which they feel after completing their given tasks. The study was conducted in periods of time. In the first period that was the initial stage before the implementation.

The major factors identified for lower performance are:

1. **Material availability:** The company operates in a way that they buy material to be used for the day's tasks on the same day (morning). This resulted in waste of time as workers at times start work late waiting for materials
2. **Meetings:** these are a good way of communication but when they go on for long periods of time they tend not to be productive especially if they consume the time allocated for working.
3. **Late coming & absenteeism:** some workers tend to come late to work or not come at all especially when it is

payday. This habit reduces productivity because the workers work in teams and if one team member is not available it makes work to go on slower.

The second period of the results shows a pick in the results and this is after management took advice of dealing with the causes of low performance. Finally, the labor utilization *has* improved from 45% to 65%. This figure is not satisfactory but it has cultivated a way to more and more improvements since it is now clear that it is possible.

Debt collection: the company operates on a credit system where customers pay 50 percent of the payment and then pay the remaining balance after the job has been completed. This sometimes results in some payments being late, with the company not making any follow up to ensure payment is done. The debts are recorded in the accounting system (quick books) and they can be viewed and followed up made anytime. Debts collection should be efficient to avoid the company running at a loss.

The above KPI's were developed looking at the needs of the company. Unfortunately, the company was not willing to disclose their financial information as a matter of confidentiality so the indicators, which had some financial representation, could not be shown in a much greater deal in this document. Based on these KPIs a framework is developed on which the management can work on in assessing their performance in terms of their key performance indicators.

B. Implementation of 5S

Nowadays, in this dynamic and technological world, the secret of survival for any kind of organization is to be competitive in its products or services. Normally, this improvement has been achieved through implementation of best practices, which are chosen to meet a particular objective. 5S is a way to improve the performance and to organize the whole system, which has been used first time by Japanese companies. It comes from five Japanese words that start with S, which is translated into English words to give the best explanation for them. 5S is amongst the first and fundamental steps implemented by an enterprise towards the path of implementing Total Quality Management and continuous improvement at the operation level. 5S is a process designed to organize the workplace, keep it clean, and maintain effective and standard conditions. It instills the discipline required to enable each individual to achieve and maintain a world-class environment. It is expressed by five Japanese words that express cleaning and order at the company and accepting this as work discipline as shown in Fig. 3 below (Osada, 1993).

The 5S methodology is a culture; it must involve everyone for it to be successful. Participation is not on a voluntary basis. Everyone from the CEO to the shop floor must participate, and it fails unless this actually happens. Most employees consider this cleaning up to be beneath them, and top managers' direct participation is essential to prevent them from feeling this way and acting accordingly. With that said, in approaching this methodology at the case study company, awareness had to be raised first so that the author and the staff are at the same stage

when embarking into this project.

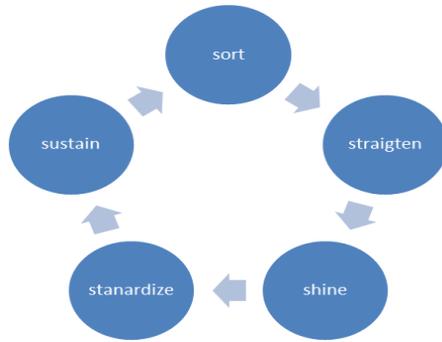


Fig. 3 5S techniques (Osada, 1993)

This was done through training and demonstration of what the methodology was about and how it can be applied for the betterment of the company. From this it was deduced that the staff were actually practicing some 5S but without really realizing it. This was an advantage since then the only thing left was to help them carry it out professionally using all the steps involved in carrying out this technique. The technique was carried out on a step by step mode until it was completed, and after each step staff were made aware of the benefits that can be realized.

i. Sort (Seiri)

According to (Osada, 1993) the emphasis of sorting is on stratification management and being able to spot the necessary and unnecessary before they become a problem. This simply means sorting out between wanted and unwanted materials at the work place and doing away with the unwanted items. In implementing or carrying out this first step, first there was a decision of what materials/items were necessary and what were unnecessary. These were checked in lockers, shelves the storeroom and the notice boards. The unnecessary materials were identified and put in a separate place. The items which had not been used for more than a year were discarded with the agreement from management that they were really unnecessary. The items that were regularly used were stored closer to or were they can be easily retrieved. The benefits achieved included: saving on usage of floor, better flow of work and reduced searching time of tools and materials.

ii. Straighten (Seiton)

Straightening (seiton) can be defined as neatness, having things in the right place or set up so that they are readily available for use, eliminating the need to search (Osada, 1993). This can be viewed as a place for everything (necessary) and everything in its place. While seiri helps one decides what items are needed, seiton helps on deciding the way things are to be placed. The case study company's work place was divided in to different sections. There was the store place and the workshop where some operations were carried out (e.g assembly of products). There was also space where the company cars parked at knock off time and also the sitting

place where meetings were held. The floor was marked out with a paint mark so as to differentiate these sections. In the store area, the shelves were labeled using tags. This was to allocate places for materials so that they are easy to find and put back. The tools had their tool boxes so they were place in the toolboxes and the tool boxes also allocate their place so that the workshop can be neat. The benefits achieved included reduction of searching time, having safe environment to work.

iii. Shine (Seiso)

Seiso places emphasis on cleaning so that things are clean; in other words carrying out cleaning as a form of inspection i.e. getting rid of waste, and foreign matter (Singh, Rastogi, & Sharma, 2014). This means removing dirt, strain, filth, soot and dust from the work area. This includes cleaning and care for equipment and facilities and also inspecting them for abnormalities. In a way it also includes primary maintenance of equipment.

To make the cleaning easier and more efficient, the total workplace area was divided into zones and in these zones there was allocation of responsibility for cleaning each zone. A cleaning schedule was constructed so that there is less supervision since people will now know their roles. During the implementation of these steps workers were also encouraged to look for defective conditions like loose bolts, vibrations, fallen tools, etc. and solve the problem. Cleaning materials were allocated space for easy accessing. The benefits achieved included preventing accidents, creating a pleasant environment to work.

iv. Standardize (Seiketsu)

This aspect of the 5S focuses on standardization; making the first three S's a constant routine. According to (Osada, 1993) the emphasis on this aspect of 5S is on visual management, an important aspect to attain and maintain standardized conditions to enable the individuals to always act quickly. This means that whatever cleanliness and neatness that has been achieved in the first three S's should be maintained. In this aspect of the 5S technique the guidelines and procedures for carrying out the first three S's were documented. This was done as a reference to the workers when carrying out the technique on their own or in future. A checklist or audit sheet was created which was to be used to carry out evaluation of the technique in place. The purpose of this checklist was to evaluate the progress of the implementation of the technique in whether it is making any change and whether the workers have been able to adopt it. The benefits achieved included simplification of activities, and consistency in the work practices.

v. Sustain (Shitsuke)

The last step of 5S program covers the maintenance of the methods directed to the adaptation of 5S as a habit by all personnel. The task here is undertaken by the lead directors. The management should explain the importance of 5S to the personnel through various trainings and the knowledge of the

personnel about 5S should be kept updated. Sustain also means 'Discipline'. It denotes one's commitment to maintain orderliness and to practice first 3S's as a way of life (culture). This aspect of the 5S technique is mainly the responsibility of management. The management was responsible for creating awareness and publicizing the system (5S) e.g initiatives such as 5S days. The other task included creating a structure of how and when 5S will be implemented. Management also had to provide support through leadership and resources. Management involvement is vital so that the workers don't lose morale thinking that the system is to undermine them by basically doing the housekeeping. The benefits achieved with this 5S pillar included improvement of teamwork, and creation of a healthy atmosphere and a good work place

vi. Visual Evidence

After completing or implementing the 5S technique there should be some evidence of transformation, that is to say one has moved from point A to point B. The aim behind this exercise was to actually straighten out everything so that it is in its rightful place in order to have a more conducive working environment with less waste. This is actually supported by photos or pictures showing the actual transformation that is being discussed here. The area of implementation was divided into the machining area, the store area and the general workshop.

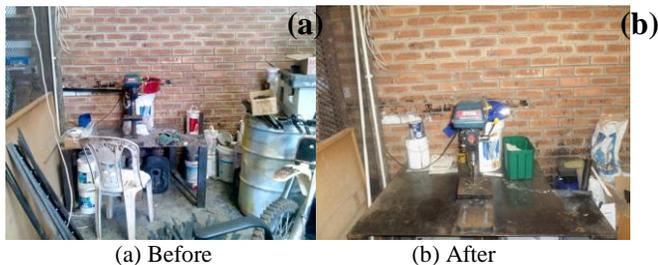


Fig. 4 Machining area

Fig 4 shows the comparison of the machining area before and after implementation of the 5S. Before the implementation everything is just not where it is supposed to be and the machine itself is dirty and also the scrap material is not picked up after working. In the opposite picture there is evidence of cleanliness and items are sorted out and placed where they should be. This state is maintained so as to avoid backslide to the initial situation.

The store area had already some shelves which were labelled or tagged with the item names but the problem is that this labelling was not being followed and the materials were just stored anywhere which ended up leading to the situation shown in fig 5(a). The materials were sorted out and stored

according to their names shown on the shelves (Fig 5(b)). The old and worn out labels were replaced so that they can be visible.



Fig. 5 Storage area

This process reduced the searching time by 70%, and also promoted safety in the store area because now there was no risk of tripping off from materials and tools lying around in the walk way. The benefits of this endeavor included elimination of possible injuries, motion waste and energy and an overall inventory management improvement.

C. 5S Audit

An audit is a "CHECK" in PDCA. An audit should be checking the PROCESS of 5S, not 5S itself. The audit process is a teaching process, not a scoring process. It actually teaches the workers what to look for, and how to check themselves. When carrying out the audit, emphasis was placed mainly on the following two things; (1) Ambiguity: Places where it is not perfectly clear what is needed and where it belongs. The first phases of 5S are about removing this ambiguity. That is why you sort, and why you find and identify places for everything. But extra things creep into the work area, and the check process is about determining why and how that happens. (2) Problem solving: Once you have a standard or specification for what belongs where, then a "Problem" is "any departure from that specification."

In carrying out the audit, the audit sheet template shown in figure 6 (a) and (b) was used as a tool to examine the process of 5S. It contains all the 5S's that were implemented. Each S has some guidelines or descriptions that help in the scoring process. The scoring is from 0 to 4, with a score of 0 being 'very poor' while a score of 4 being 'very good'. The total of the score is then summed up to see how the process is performing. This exercise is not really about the marks or the score, it actually helps as a continuous improvement initiative in the sense that the steps that are not performing well will be looked at to find out what is not really going according to plan and an intervention made.

Two audit sheets were extracted from the information that was available. In the first sheet, the target was to get at least a score of 60 out of a hundred since it was the beginning of the exercise. However, the audit produced a score of 64, which meant that the process was much better than it was anticipated. In the second sheet (fig 6(b)), the target was to get a score of 70 as a way of continuous improvement. The actual score was actually 70, which showed that the process was improving with time. The second audit was carried three weeks after the first one.

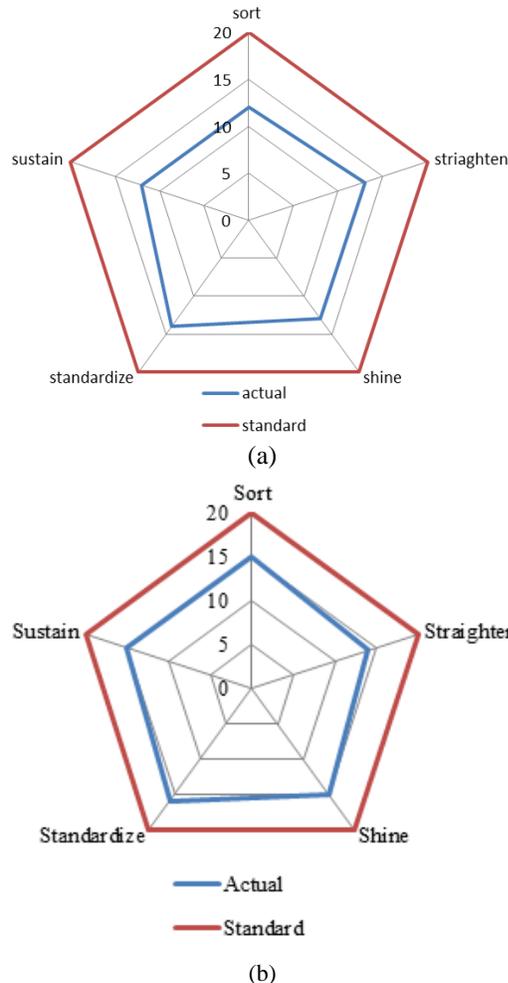


Fig.7 (a) and (b) Radar charts showing the actual results of 5Ss

From the audit sheet, radar charts were constructed (figure 7 (a) and (b)). The charts display the results in terms of each of the S's. This makes it easier to pick where the problem is in terms of which S is doing well and which one is under performing. In this case then one can be able to tell where the process is lacking or where to maintain or put more effort if the process's performance is good. A comparison of the two Radar charts (figure 7 (a) and (b)) shows that there is an improvement in each of the S.

IV. CONCLUSION

Productivity improvement is a vital initiative in the running of a business. KPI's developed in this report were done in light of the needs of the company and they could have worked

better if the management were cooperative enough. Some metrics needed financial information which management where not so eager to provide due to confidentiality clauses.

The most important barrier for implementation of 5S is poor communication. Techniques of communication and their efficiency are seldom evaluated and communication faults rarely addressed in an industrial workplace. Poor communication can cause wastage of resources, time and money, and lowering moral amongst employees. 5S implementation is not possible without proper training and employees are not capable to actively standardize the 5S. Resistance to change is another issue, which occurs during 5S implementation. Therefore, it is believed that continuous training is the key to changing the organization culture.

Overall, the application of performance improvement strategies or tools that were selected seemed to have the possibility of implementation. For this to be possible, it demands dedication from management and commitment to train other employees on how to apply productivity improvement tools in order to transform organizational culture.

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