Using bench marking in manufacturing as an improvement tool to achieve world class status: A case study of a Zimbabwean company.

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Abstract

Bench marking help organisations to see how healthy their company is in comparison with others. It gives a guide as to how far an organisation lags behind world class manufacturing companies. This paper has developed a radar chart comparing the performance measurement index for a beverage manufacturing company X against world class standards. The beverage manufacturing company has recently introduced world class manufacturing techniques in 2011. The results of the research showed that; Research and development is nonexistent at the company. Workforce responsible for global business is at 6%, but companies which aspire to become world class should be doing more business at global level; the number of employees who are helping to assess and upgrade the skills of other workers is also low at 3% instead of above 10% of the workforce. New products that are being introduced by the organisation are also low at 1% instead of above 20%. The introduction of new products is very critical because today's consumers continuously and rapidly change their tastes; companies need to match those demands with new products.

Keywords: bench marking, performance measures, world class, global business

1. INTRODUCTION

The world has fast become global in the way goods and services are exchanged across both national and regional boundaries. The opening up of trade across boundary is leading to technically weak and less innovative companies to suffer the onslaught from world class manufacturers who are in a position to compete in terms of cost, product quality, flexibility, quick delivery, product reliability and reliable delivery. In order to keep abreast of competition organisations are resorting to bench marking their processes to those of the world class companies. The difference between their performances becomes the target for continuous improvement process (Adams, 2001).

2. THEORATICAL FRAMEWORK.

Company X is in the process industry that produces beverages. The company has just introduced world class manufacturing techniques in 2011. World class manufacturing involve techniques such as: Total Productive Maintenance (TPM), Total Quality Control (TQC), Computer Aided design (CAD), Computer Aided manufacturing (CAM), Flexible Manufacturing Systems (FMS) and Just in Time (JIT). An assessment was done to bench mark its performance standards against the best in the world. Beverage manufacturing Company X like any other Zimbabwean companies is experiencing challenges such as high cost of capital, unreliable supply of energy, high utility bills.The company is facing a decline in consumption of its products from the year 2014. The decline is attributed to the impact of high consumer price on the backdrop of increased excise duty on its product. Water supply disruption weighed against the production. The revenue generated for the full year was down by 1% for the overall organisation in 2014.

3. Bench marking for world class manufacturing.

Bench marking is a way of helping organisations to compare themselves against other companies with the idea of learning from them. It provides the easiest way to measure progress over a given time, it is also about using best practices throughout the business operations (Keegan & O'Kelly, 2004). The business dictionary (2014) has defined benchmarks as *a measurement of the quality of organisations policies, products, programs, strategies, and their comparison with standard measurements or similar measurements of their peers.*

Benchmarking is processes were an organisation compares itself with others for it to learn from them. It helps organisations to identify and prioritise areas which require improvement in their systems (Keegan and O'Kelly, 2004). Bench marking is defined as the process by which a company assess aspects of its performance or totality of its performance against performance of another company or other companies, they maybe be competitors, in similar business or dissimilar business in order to establish objectives for improvement (Early, 1995).

Benchmarking is a process of comparing ones business processes and performance metrics to industry bests or best practices from other industries (Frampton, n.d). The dimensions that are normally measured when doing bench marking are quality level, time and cost. Ahmed and Benson (n.d) have defined benchmarking as a process of continuously measuring and comparing ones business performance against comparable processes in leading organisations to obtain information that will help the organisation identify and implement improvements. It involves comparing business processes and performance measures, the process is structured, the focus is on external companies it is about coming up with improvements not only evaluation. It is about learning from others. Bench marking is a critical step for the organisation to evaluate its performance against others, the organisation can then focus its improvement efforts were they are required most (Partida, 2013). Bench marking is not only about comparing performances but it is used to add value to the organisation. Changes can be performed by organisation if only that change brings benefits (Sapcharoenkel & Anussornnitisarn, 2012).

3.1 Bench marking best manufacturing Practices

Granite Bay Global (2010) has identified twenty (20) best manufacturing practices which when applied by world class manufacturing companies in their totality enables the organisation to compete globally. A world class company must show its capability in both process excellence and people effectiveness. Table 1 shows people effectiveness and process excellence which forms the basis for selecting the required performance benchmarks for the organisation.

Table 1. Best manufacturing practices in WCM adapted from GraniteBay Global (2010)

People effectiveness best practices	Process excellence best practices
• Associate engagement	• lead time reduction focus
• Cross functional teams	• Manufacturing cells(focused factories
• High performance leadership	• Strategic inventory reduction
• Visual management systems	• Equipment process reliability
• Cross training and multi skilling	• Quick changeover
• Supplier partnerships	• Continuous improvement
• Incentives rewards and recognition	• In process quality
• Problem solving capabilities	• Standard operating procedures
• Plant safety	• Optimum shift schedule
	• World class performance measures
	• Goal deployment

3.2 World class manufacturing benchmarks

Bench marks that are given in numbers or percentage they help organisations to continuously improve their operations through targeting the international benchmarks. Some of the listed bench marks in Table 1 can be achieved over a long time of continuous improvements (Olofsson, 2009). Next Generation Manufacturing (NGM) in their WCM benchmarks has been combined to come up with the following list in Table 2 which is world class bench mark list that organisation can use to bench mark their performance measures.

3.3 Types of bench marking

Four types of bench marking have been identified, which are: internal, competitor, functional and generic (Early, 1995), (Ahmad & Benson n.d.).

- **Internal bench marking**

Internal bench marking is about comparing departments within the same company. It can also mean comparing sister companies within the same organisation (Ahmed and Benson, n. d). Comparison of internal operations of a company, department against another, one site against another site within a given country or internationally (Early, 1995)

- **Competitive bench marking**

Competitive bench marking it compares competitors using a function which is of interest (Ahmed and Benson, n. d). Competitor bench marking pits companies producing the same product or performing the same function (Early, 1995), Competitive bench marking was started by Xerox; it is the concept of studying major competitors to check their strength and weakness. It is a study that is in detail from design, manufacturing, marketing,

Table 2.Benchmarks for world class manufacturing

Performance measures	Performance index
Setup time	10 minutes
Utilised capacity	90%
Breakdown losses	1%
On schedule production	100%
Engineering change process response time	1day
New products as a % of total SKUs launched annually	>20%
annual sales derived from products introduced in the past three years	>50%
% of workforce dedicated to new product development	>10%
Organisations investment in R&D as % of sales	>10%
Annual labour turnover rate	0%
% of employees regularly participating in empowered work teams	>90%
% of employees dedicated to assessing and upgrading organisations talent pool	>10%
Productivity improvement over the past three years	>100%
Deliveries reach customer in perfect order(on time, high quality, meet customers specification	>98%
Organisations investment in capital equipment as percentage of sales(3 year average)	>10%
Reduction in total value of inventory throughout the supply chain for primary product furthest supplier to end customer over the last three years	>50%
% of work force dedicated to supply chain, partner development, management and collaboration	>10%
Investment in information technologies(hardware and software) as a percentage of sales(three year average	>10%
Annual reduction in energy per unit of product output	>50%
Annual reduction in usage of non recycled material per unit product output	>50%
Products(as a percentage of sales volume) that are completely recyclable/reusable	100%
% of workforce dedicated to reducing energy, material or emissions in its operations	>10%
% of workforce dedicated to green products(products and packaging impacts, green products and markets	>10%
total direct workforce located overseas or located locally and responsible for global business activities	>50%

customer support, distribution. The key aspects of the company's success areas are noted. The benchmarking company then sets goals to achieve the level of performance achieved by the competitors in these key aspects (Maskell, 1991).

- **Functional bench marking**

It is a comparison of similar functions within a broad industry (Ahmad & Benson, n.d). Comparison can be between companies who are in the same industry meat processing and cooking oil processing by virtue of being in the same food industry (Early, 1995).

- **Generic bench marking**

Generic bench marking is comparison of business function or process that are the same but in different type of industry. An example would compare a function in

furniture manufacturing and meat processing (Early, 1995).

3.4 Key performance indicators

When benchmarking is used there is need to know which performance indicators are used as a comparison. The main key indicators that are mainly used are; customer service, reliability of assets, operational excellence, motivated people and safety, health and environment

Customer service: Can be measured using customer complains, due date reliability, on time in full, adherence to production plan and stock turn
Reliable asset: Production rate, quality rate and availability
Operational excellence: Statistical process control, manufacturing speed
Motivated people: Which is determined by absenteeism, training days and staff turn over
Safety, health and environment: Annual reported injury due to accidents, environmental performance

3.5 Advantages and disadvantages of bench marking

Bench marking comes up with new and innovative ways of managing operations; it is an effective team building tool. There is an increase in awareness of costs and product performance in relation to those of competing organisations. It brings together all divisions and develops common front for facing competition. It encourages recognition of individual team effort. It requires financial capital; there is need for investment in time and labour (Blakeman, 2002)

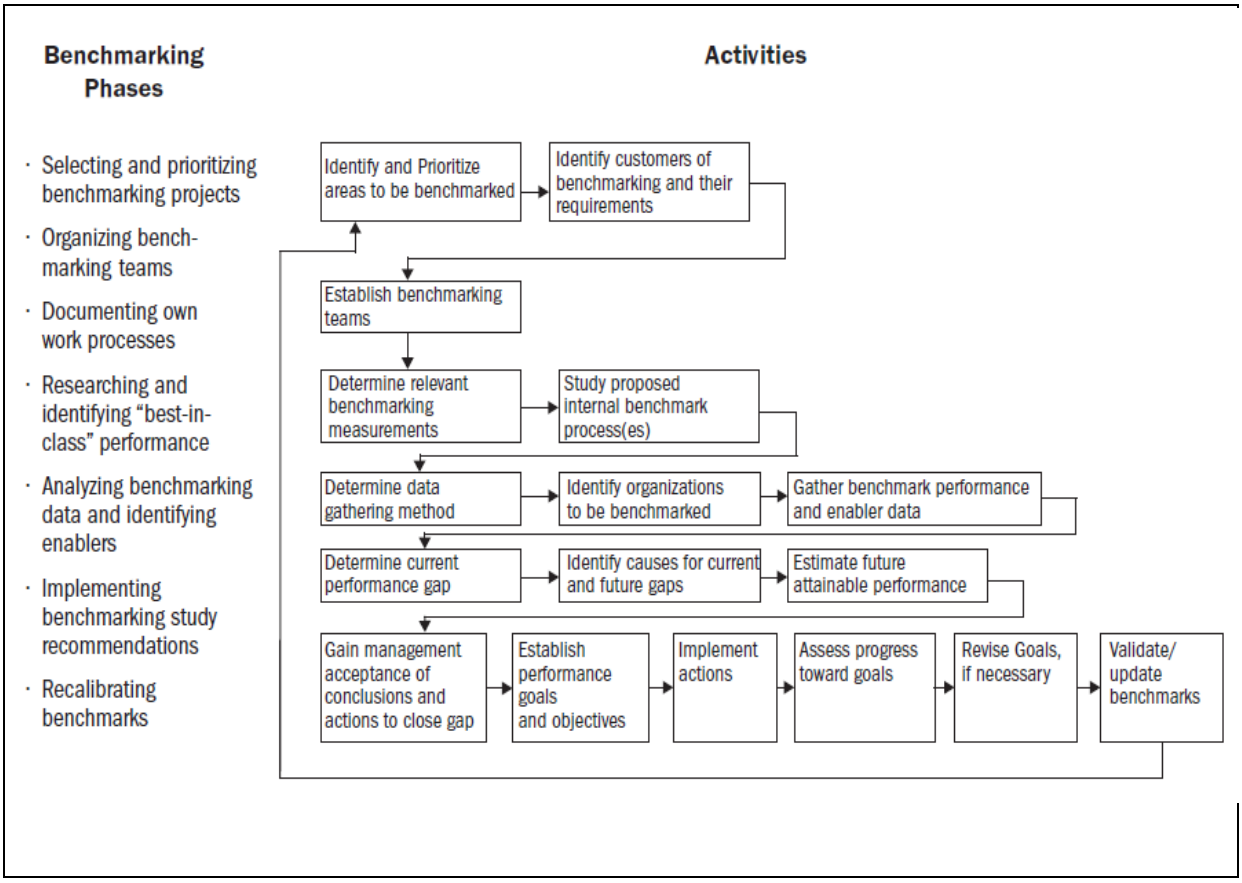


Figure 1.The bench marking process adapted fromInstitute of Management Accounting (Kharbanda, 1995)

3.6 Bench marking process.

Most of the authors have agreed that the benchmarking process is made up of five processes such as selecting and prioritising projects, organising benchmarking teams, documenting own work processes, identifying best in class performance, analysing benchmarking data and identifying enablers, implementing bench marking study recommendations and recalibrating benchmarks(Kharbanda,1995).

Bench marking like any another process improvement or business improvement technique is made up of five stages which are planning, assembly, analysis, integration and review (Early, 1995).Selection of benchmarking process there is needed to identify the type of benchmarking. The planning process looks at what will be bench marked, who is the best competitor, and how the data is to be collected and then coming up with a bench marking team. Assembly is the collection and the organisation of data so that it can be efficiently and effectively used for analysis. Data analysis is when the company performance measures is a compared against bench mark target, ranking of magnitude and characteristic of aspects of performance, coming up with competitive gap and identification of measures for improvement process. Integration consists of setting goals for improvement, getting approval of set goals from management. Coming up with mechanism and time required to achieve the stated improvements, informing the implementers of the goals and objectives of the improvement and then implementing improvements within the processes of the organisation.

The last stage in the process is to verify the effectiveness of the implementation process, the comparison of improvement measures against the set target. The last stage is setting up target for the next bench mark cycles basing on the experiences of the past cycle, (Early, 1995).

4. Methodology

A questionnaire was developed and given to production manager to have it filled Supervisors in health and safety, production and maintenance departments participated as respondents. Some of the performance indicators were to be calculated. The beverage manufacturing company X used document analysis to extract some of the information which was in their archives. The questionnaire was divided into sections of: Manufacturing performance measures, Workers participation, Customer measures, Plant and equipment measures and Performance measures on environment.

5. Results

The results for manufacturing performance measurement, worker participation, customer measures, plant and equipment measures and environmental performance measures were established for the beverage manufacturing company and a comparison was made on bar chart with world class standard bench marks compared. The final result of all the performances measures were then summarised on the radar chart to see how far the company performs when compared with world class bench marks.

5.1 Bench marks compared with company achieved results

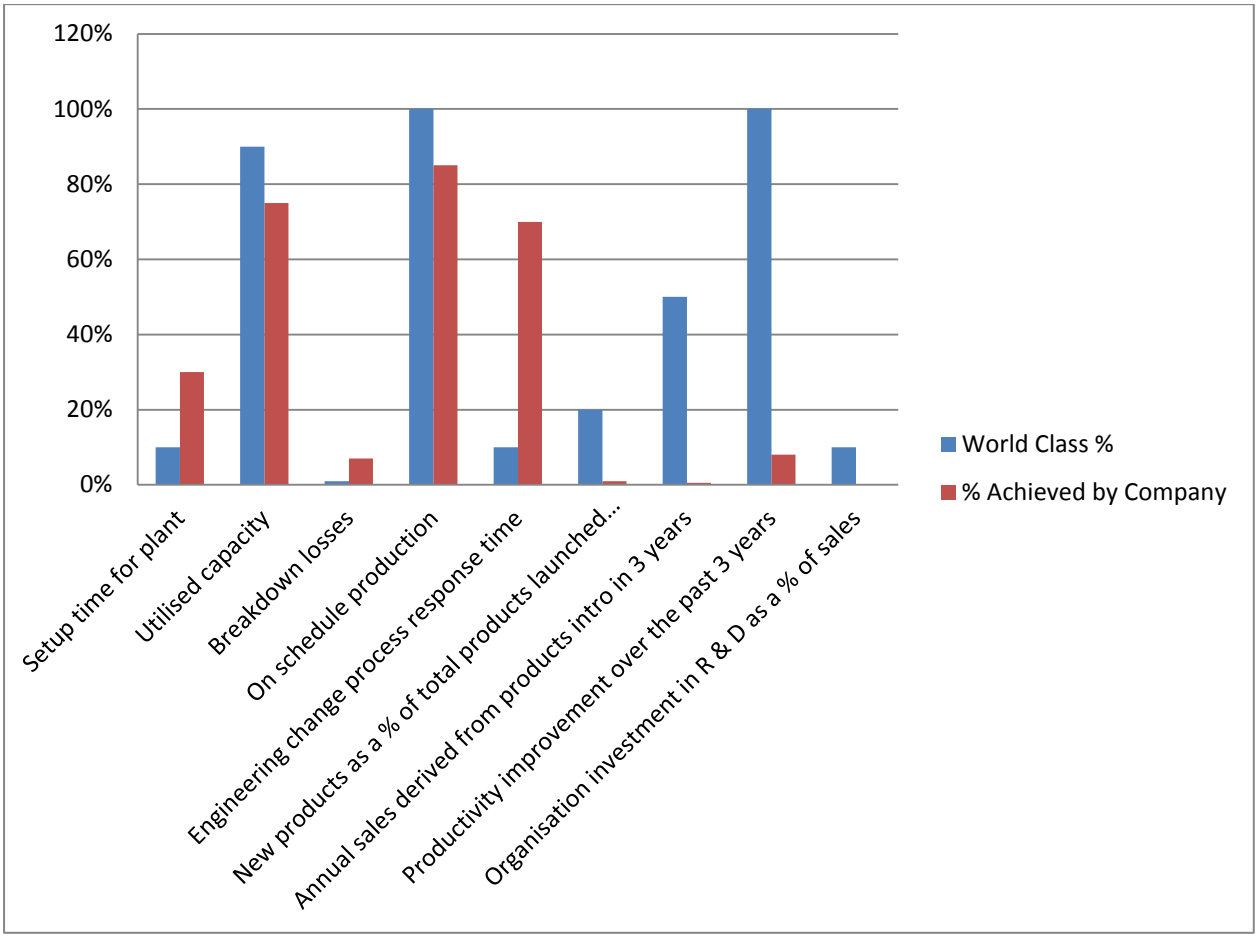
The results that are shown on Table 3 some of them were readily available in company records but others needed to be calculated from the available data to come up with the required performance measures.

Table 3. Bench marks achieved by the organisation X

	Manufacturing performance	Unit of measure	World class standard	Operating level	World class bench	World class%	Operating Level number index	%achieved by company
1	Plant setup time	mins	10%	30	10	10	8	30
2	Utilised capacity	%	90%	75%	10	90%	8.3	75%
3	Breakdown losses	%	1%	7%	10	1%	9.3	7%
4	On schedule prodn	%	100%	85%	10	100%	8.5	85%
5	Eng. Change process response time	days	1d	7d	10	1	5	7
6	New products as %of total launched yearly	%	>20%	1%	10	20%	0.5	1%
7	annual sales of products introduced over 3 years	%	>50%	0.5%	10	50%	0.1	0.5%
8	productivity improvement over three years	%	>100%	8%	10	100%	0.8	8%
9	organisation investment in R&D as % of sales	%	>10%	0	10	10%	0	0
	Worker performance measure							
1	annual labour turnover	%	0%	3.1%	10	0%	9.3	3.1%
2	% of workforce dedicated to supply chain development	%	>10%	8%	10	10%	8	8%
3	% of workers regularly participating inworkteams	%	>90%	60%	10	90%	6.7	60%
4	% of workers participating in upgrading of workers	%	>10%	3%	10	10%	3	3%
5	% of workforce dedicated to new product development	%	>10%	0%	10	10%	0	0
	Customer measures							
1	Stock availability	%	100%	85%	10	100%	8.5	85%
2	Deliveries that reach customers in perfect order	%	>98	94%	10	98%	9.6	94%
3	Reduction in total revenue of inventory throughout supply chain	%	>50	0%	10	50%	0	0%
4	total direct workforce responsible for global business	%	>50	6%	10	50%	1.2	6%
	Plant and equipment measure							
1	organisation investments in capital equipment as% of sales over 3years	%	>10%	65%	10	10%	10	65%
2	IT-technology as a% of sales over 3 year average	%	>10%	0%	10	10%	0	0%
	Environmental measures							
1	Annual reduction in energy per unit produc**t**	%	>50%	25%	10	50%	5	25%
2	Annual reduction in usage non recycled material per unit product	%	>50%	0%	10	50%	0	0%
3	products as % sales that are recycled	%	100%	98%	10	100%	9.8	98%
4	% of work force dedicated to reducing energy, material or emissions	%	>10	70%	10	10%	10	70%
5	products and packing	%	>10	90%	10	10%	10	90%

5.2 manufacturing performance measures

Table 4.Manufacturing performance measures



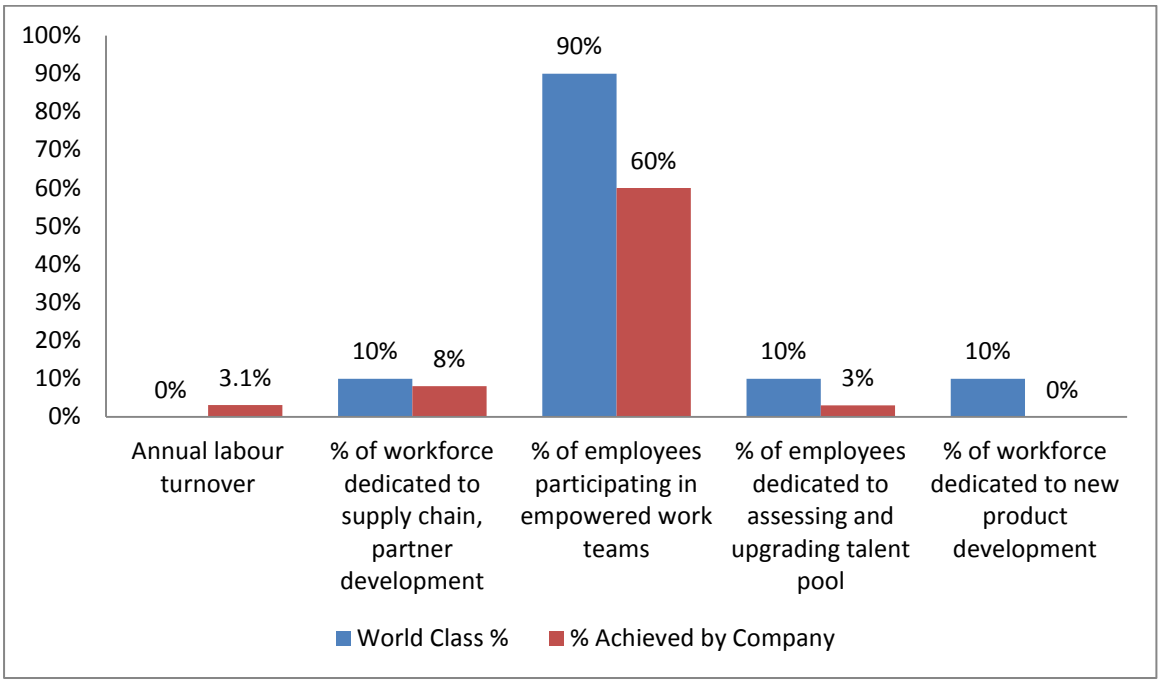
The set up time for the plant is at 30 minutes and the world class is at 10 minutes. The utilised capacity of plant is at 75% and the world class is at 90%.Breakdown losses are at 7% but they need to be reduced to 1%.On schedule production is at 85% needs to be raised to 100%. Engineering change response is at seven days needs to reduce to one day. New products as percentage of total products launched annually are 1% needs to be raised to a benchmark of 20%. Annual sales derived fromproducts introduced over the past three years is at a low level of 0.5% and needs to be seriously upped to 20%. Productivity improvement over the last three years 8% needs to be raised to 100%. The organisation investment in R&D as a percentage of sales is at zero and needs to be raised to 10%. The annual labour turnover at the company is at 3.1% needs to be reduced to a world class value of 0%. The number of workers dedicated to supply chain and partnership development is at 8% should be increased to 10%.

The number of people participating in empowered work teams is at 60% whilst the bench mark is at 90%. The number of employees dedicated to assessing and upgrading talent pool in the organisation is at 3% it has to be raised to 10%. The number of people dedicated to new product development is at 0% instead of 10%.

Vol.9 [2014]
e-ISSN 2409-0360
Zimbabwej.sci.technol

5.3 Worker participation measures

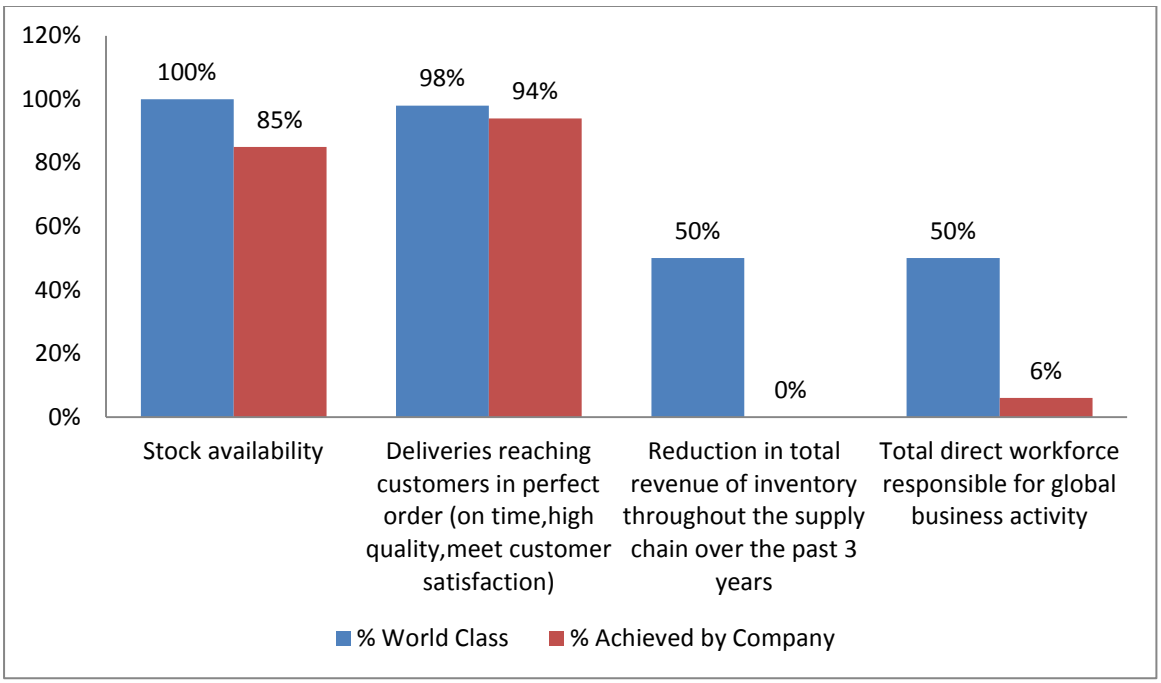
T able 5. Worker participation performance measures.



5.4 Customer performance measures

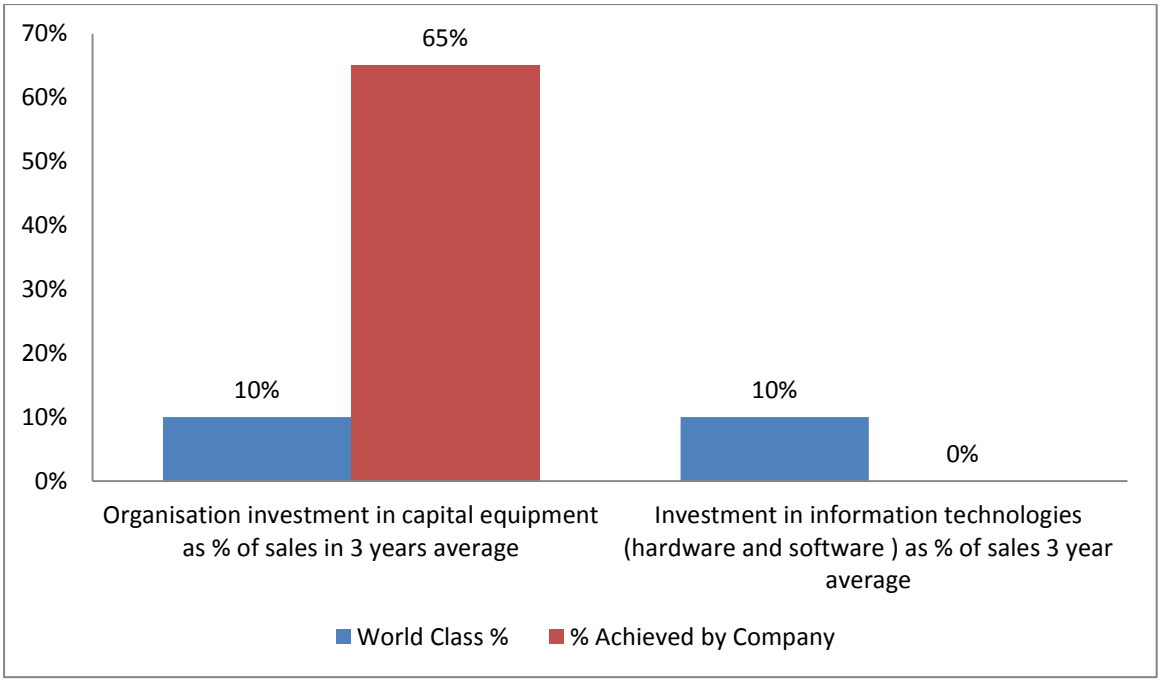
Stock availability of the originations' products is at 85% and the bench mark level is at 100%.deliveries reaching the customer in perfect condition (on time, high quality and meet customer satisfaction is at 94% and must be raised to 98%. The reduction in total revenue of inventory throughout the supply chain is at 0% needs to be raised to 50%. Number of people in directly responsible for global business activity is at 6% and has to be raised to 50%.

Table 6. Customer performance measures



5.5 Plant performance measures

Table 7.Plant and Equipment measures.



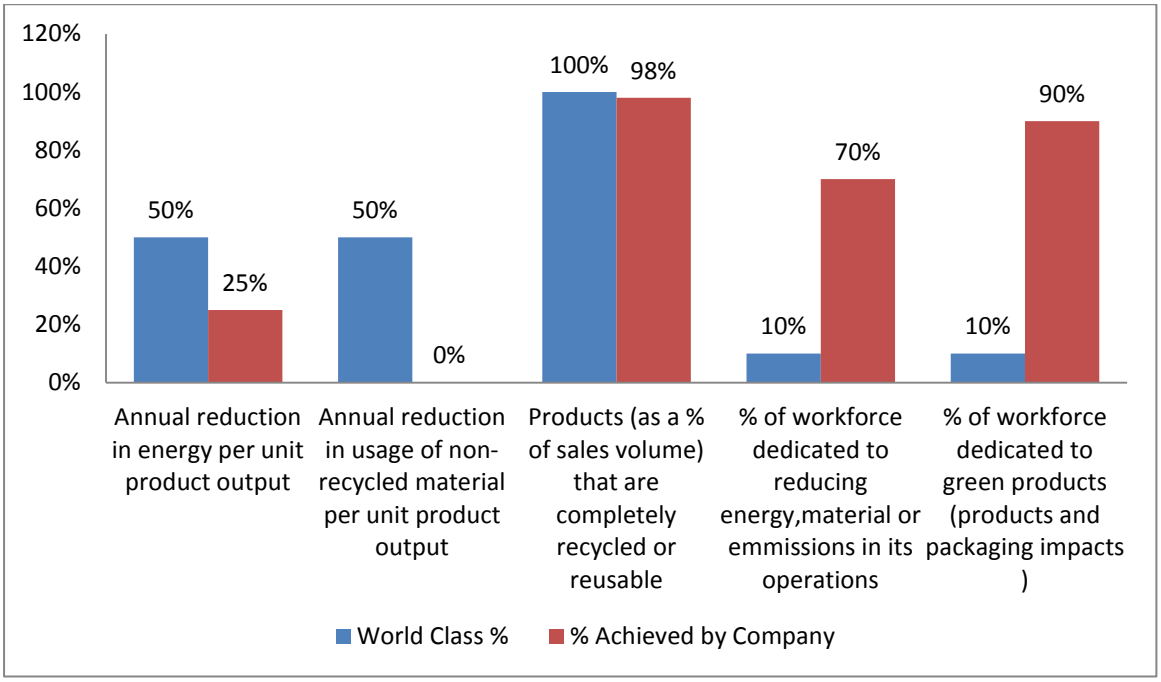
The investment in capital equipment as percentage of sales in 3years average is at 65% while the benchmark is at 10%. The investment here is quiet high since the company has recently acquired new equipment for the new production line. Investment in new technologies (hard ware and software) as a percent of sales over three year average is at zero percent needs to be raised to 10%. Any company which aspires to become world class must invest in information technology because it has become the driver of all technology and manufacturing.

5.6 Environment performance Measures.

The annual reduction in energy per unit product output is at 25% but needs to rise to above 50% to achieve world class standard. The products that are completely recycled or reusable as percentage of sales volume is at 90% and should rise to above 100% to achieve world class status. The workforce that are dedicated to reducing energy, material or emissions is above 10% and is one of the few performance measures that have exceeded world class status, the other indicator that has exceeded is the percentage of workforce dedicated to green products(products and packing impacts) which has also exceeded 10%.

There is need to reallocate extra manpower dedicated to green products.

Table 8. Environmental performance measurement



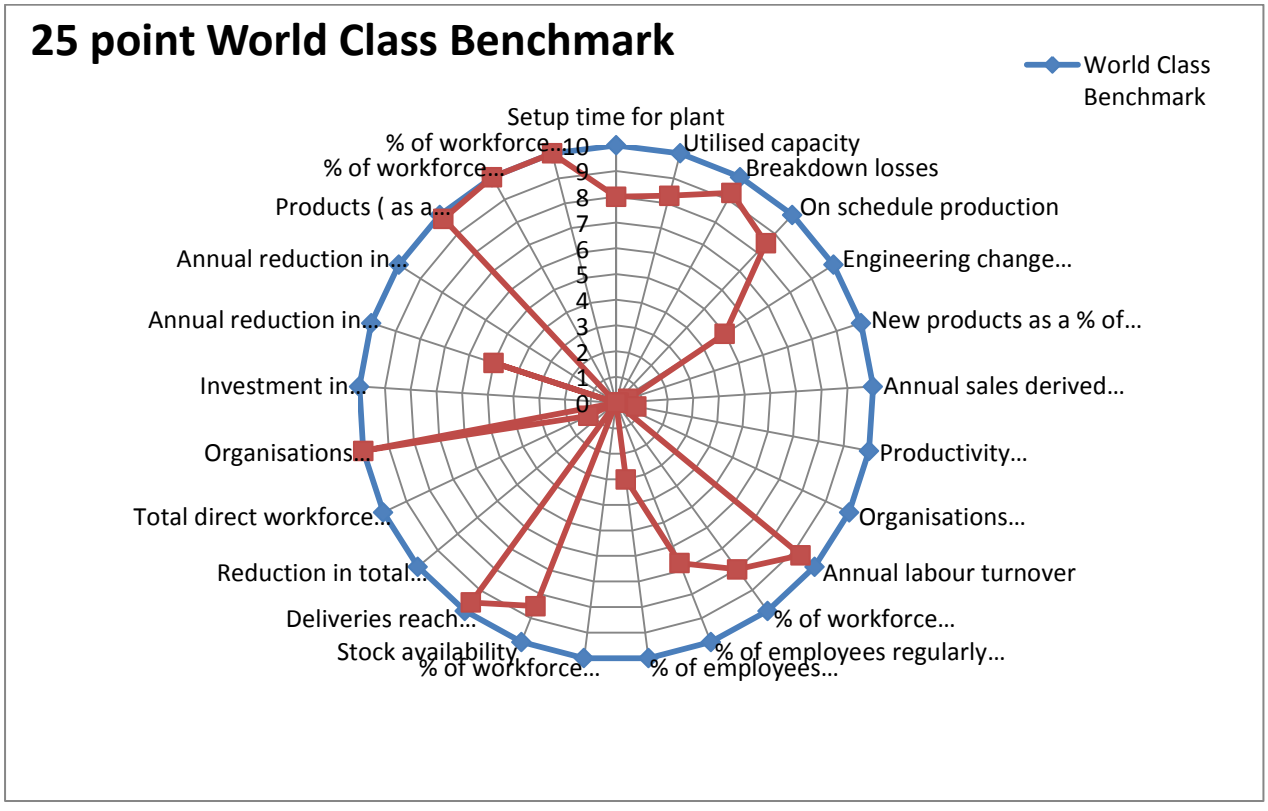


Figure 2 Radar charting for performance measures for company X bench marked with world class standards

5.7 Radar chart for performance benchmarks.

The areas which the organisation is performing at or near world class are; investment on equipment where the company has invested in new machinery, deliveries are also close at 94% instead of 98%, percentage of workforce dedicated to green has reached the benchmark level. The areas of concern are; Research and development is non-existent at the company, Total direct workforce responsible for global business is at 6%, companies which aspire to become world class should be doing more business at global level, the number of employees who are helping to assess and upgrade the skills of other workers is also low at 3% instead of above 10% of the workforce. New products that are being introduced by the organisation are also low at 1% instead of above 20%. The introduction of new products is very critical because today's consumers continuously and rapidly change their tastes; companies need to match those demands with new products.

6. Conclusion

Bench marking as a justified copying process has shown that people need not to reinvent the wheel but to use the available information. From the results of bench marks it is evident that research and development is not getting the attention it deserves this is even true with most Zimbabwean companies. Investment in information technology is also not enough and is below world class standard measure. Information technology is revolutionising the manufacturing industry and most companies are using it as a competitive weapon to their advantage. Introduction of new products is not getting enough attention some companies continue to produce products which were overtaken by events and eventually products with no customers.

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