PERFORMANCE MEASUREMENT PRACTICES AND MAINTENANCE IMPROVEMENT AMONG COCACOLA BOTTLING PLANTS IN KENYA

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DECLARATION

STUDENT'S DECLARATION

I declare that this research project is my original work and has never been submitted for a degree in any other university or college for examination/academic purposes.

Signature:…… Date:……

SUPERVISOR'S DECLARATION

This research project has been submitted for examination with my approval as the University Supervisor.

Signature:…… Date:……

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DEDICATION

I dedicate this project to my wife Sharon as well as my mother, sisters, brothers, nephews and nieces who supported and encouraged me in my academics.

ACKNOWLEDGEMENTS

My first gratitude goes to the almighty God for enabling me throughout my academic achievements. I am grateful to the University of Nairobi MBA Teaching staff for the knowledge I have acquired from them. My vote of thanks goes to my supervisor, Onserio Nyamwange for his objective criticism, feedback and friendly guidance throughout the entire period of proposal writing, research process to the final report writing. I also thank my fellow students and friends who through their interaction, companionship and experiences shared helped broaden my knowledge while undertaking my studies.

ABSTRACT

The study sought to establish the performance measurement practices implemented among the CocaCola bottling plants in Kenya, the challenges faced in the implementation of the performance measurement practices and the relationship between performance measurement practices and improvement in maintenance among the plants. This study used a descriptive research design and the target respondents included the maintenance managers and senior ranking staff in the maintenance department. The study made use of a questionnaire with closed questions since they are easier and quicker to answer (Dillman, 2000). Quantitative data collected was analyzed by the use of descriptive statistics while qualitative data was analyzed using content analysis. In addition the study conducted regression analysis to determine the relationship between performance measurement practices and improvement in maintenance. The study established that the bottling plants have been focusing on use of key performance indicators and benchmarking as major performance measurement practices. The study established that the challenges impacting more on the implementation of the performance measurement practice(s) in the organization include complexity of the system, lack of ownership of the process by employees, choosing the right measures, communication barrier among members of staff, sustainability of the process and too many reports. The study revealed that 67.94% of the changes in improvement in the maintenance could be attributed to the combined effect of the predictor variables (performance measurement practices).The study concludes that there have been improvements in the maintenance especially in the number of shut downs, overall equipment effectiveness and spillages because of the measurements. The study also concludes that the plants have been focusing more on use of key performance indicators and benchmarking as the performance measurement practices. The study also concludes that performance measurement practices are key to improvement in maintenance.

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LIST OF ABBREVIATIONS

BSC-Balanced Scorecard

CBM-Condition Based Monitoring

CSF's- Critical Success Factors

KPI's-Key Performance Indicators

MTBF-Mean Time Before Failure

MTTF-Mean Time To Failure

MTTR-Mean Time To Repair

PM-Performance Measurement

PMS-Performance Measurement Systems

RGB-Returnable Glass Bottles

TPM- Total Productive Maintenance

QFD-Quality Function Deployment

OEE- Overall equipment effectiveness

CHAPTER ONE: INTRODUCTION

1.1 Background of the Study

As organizations grow, they experience a combination of business complexity and changing organizational roles, coupled with improved power of information technology. These developments are exerting pressure on organizations to act in order to remain competitive (Tsang, 1999). Companies have been forced to reassess their strategic direction and operating models. As a result of this, companies have been forced to lay more emphasis on performance measurement to ensure the organization can identify success, identify whether they are meeting customer demands and identify bottlenecks within the system (Camarata and Camarata, 2000).

Performance measurement is an established concept that has taken on renewed importance in varieties of organizations (Camarata and Camarata, 2000). Performance measurement systems historically developed as a means of monitoring and maintaining organizational control which is a process of ensuring that organizations pursue strategies that lead to achievement of overall goals and objectives (Nani, Dixon and Vollman, 1990). In attempting to change focus of the organization, Brignall (1992) suggests that performance measurement is a key agent of change. The development of performance measurement in management has followed a path that has been influenced by a general push to improve quality and service. For many organizations the justification has been acknowledged by senior management that a lack of appropriate performance measurement can act as a barrier of change and improvement (Bititci, Turner and Begemann, 2000).

Maintenance is considered as an integral part of the business process and in the past decade manufacturing organizations have been forced to shift their business models from closed system orientations to more open system- orientations due to drastic competitive forces (Parida and Chattopadhyay 2007). The change in the industries' strategic paradigm have made managers to get more and more interested in comprehending the contribution of maintenance towards total business goals. Today it has been acknowledged by many authors and practitioners that maintenance is a major contributor to the performance and

profitability of manufacturing systems (Maggard and Rhyne, 1992; Pehanich, 1995; Coetzee, 1998). Therefore performance measurement with a view of improving maintenance levels in an organization is important considering the value attached to maintenance in organizations.

1.1.1 Performance Measurement Practices

Performance measurement practices refer to activities done in efforts to measure performance in an organization (Neely et al., 1995). Performance measurement practices indicate where the organization is and where it is headed (Rose, 1995). It functions as a guide as to whether the organization is en route to achieve its goals. The practices are powerful behavioral tools since they communicate to employees what is important and what is required to achieve organizational goals. Performance measurement practices adapt the principle of PM, that unless you keep a score, it will be difficult to know whether you are winning or losing (Hatry, 1978). Webstar and Hung (1994) state that measurement is key management activity that provides decision makers with information necessary for decision making, monitoring performance and effective allocation of resources.

Traditional performance measurement practices focused on financial measures. However they have faced various criticisms such as lack of strategic focus, measuring only one aspect, being historical in nature and not providing information for productivity measurement and improvements (Rose, 1995). As such, on their own, they lack the ability to guide the firms in its efforts to achieve excellence. Modern performance measurement practices recognize the multi-dimension views of performance measurement, link performance to strategy and presents a balance view of the system (Nely et. al., 2005). Modern performance measurement practices include use of Balanced Score Card perspective, Benchmarking, use of Cleaner Production, focusing on Key Performance Indicators and Total Quality Management philosophy.

1.1.2 Improvement in Maintenance

To improve the maintenance, in any context, it is essential that its performance both external (the impact on customers' business process that is the value generated for the customer) and internal (the work processes in maintenance itself and its integration with the organization) are measured (Parida and Chattopadhyay 2007). Haman and Delahay (2010), discusses three aspects of improving maintenance levels namely: increased asset utilization, increased safety of equipment, reduced cost of maintenance.

Asset Utilization seeks to increase the technical availability of technical equipment. With higher technical availability, it is possible to produce and sell more products with the same invested capital, generating more income while the fixed costs remain the same (Haman and Delahay 2010). Plant safety is very important because failures have catastrophic consequences while the cost of maintenance has to be minimized by keeping the risks within strict limits and by meeting the statutory requirements. Cost control is achievable by having a smarter preventive program, higher technician productivity, lower procurement prices for materials and services and the right ratio of the number of technicians, managers and indirect personnel (Haman and Delahay 2010).

Haman and Delahay (2010) mention metrics for checking improvement in maintenance. Plant uptime should be used to check the level of asset utilization of the plant. Reducing the number of breakdowns, scheduling plant maintenance in a smarter way and performing repairs and inspections faster increases the technical availability of the equipment hence increased uptime. Number of safety and environmental incidences should be used as metrics to check on improvement of safety levels. Zero incident levels features as a major objective in many processing and manufacturing plants (Tsang, 1999). The metric used to monitor cost control is the maintenance budget. If a plant can reduce its maintenance budget and still meet its statutory requirements, then it increases the overall benefits to the company (Tsang, 1999).

1.1.3 CocaCola Bottling Plants in Kenya

There are six CocaCola bottling plants in Kenya namely Coast Bottlers, Nairobi Bottlers, Mount Kenya Bottlers, Rift Valley Bottlers, Equator Bottlers and Kisii Bottlers. Nairobi Bottlers is owned by Sabco group of companies while the rest having ICDC and Centum Investments as the major shareholders. The plants produce a wide range of beverages including Cocacola, Coke Light, Sprite, Fanta, Stoney,Dasani, Krest and Sweppes.

The maintenance team of the companies has diversified structures. The work of the maintenance team is to ensure that the production equipment is in operational mode at all times and breakdowns fixed as quickly as possible. The production equipment comprise the washer (for cleaning the RGB), the conveyor belt, bottle inspection machine, syrup blending machine, bottle fillers and date coding machine.

CocaCola bottling plants in Kenya have a well-defined maintenance function that consists of maintenance strategy, preventive maintenance, computerized management system, planning, scheduling, and execution. Maintenance strategy gives the direction on performance targets for the maintenance function. Preventive maintenance identifies faults in plants and creates work orders for the planning function. A successful Preventive maintenance system will ensure machine break downs are kept at a minimum and equipment availability is high. Computerized management system keeps records of the current status of maintenance jobs; whether closed or on going. The system is very important for keeping track of performance achieved against performance required. Planning function will determine how corrective maintenance activities will be carried out while scheduling function will determine when the corrective maintenance activities will be carried out. Execution function carries out corrective jobs given to them by planning. Such jobs include: Machine overhaul, Bearing replacement, Motor rewinding, Alignment, Balancing. Execution function then gives feedback to preventive maintenance team on the jobs they have done and ask them to check the machine again.

1.2 Statement of the Problem

Performance measurement practices has received an increasing attention in many organizations in the recent past due to increased competition, improved initiatives,

changing nature of work and improved technology (Neely,1998). Performance measurement practices is a key management activity that provides that provides decision makers with necessary information for decision making, monitoring performance and effective allocation of resources (Webstar and Hung, 1994).

CocaCola bottling plants in Kenya are an asset intensive industry with maintenance playing an integral role in the business function. For many asset intensive industries, maintenance costs are a significant cost of the operational costs and this is a concern to financial health of profit pinched companies (Linage and Kumar, 2003). Therefore efforts to improve on maintenance levels have been intensified in the plants with a view of improving the overall maintenance function. Performance measurement in maintenance is important for control and for taking appropriate corrective actions in the area of safety, cost and enhance the effectiveness and efficiency of the asset maintained.

Several studies have been done on Performance Measurement on maintenance function. A study conducted by Visser and Kotze (2010) on Performance Measurement Practices in maintenance departments in the South African Mining Industry established that maintenance departments do not fully utilize performance measurement in over 70% of the sampled industries. Parida and Chattopadhyay (2007) conducted a study on maintenance productivity and performance measurement. The research established that more industries are developing specific performance measurement frameworks best suited for them to measure productivity. Ilhan, Kyungrai and Sangyoon (2007) conducted a study on comparable maintenance performance measurement systems for Korean construction companies and established that well defined KPI'S can potentially support identification of performance gaps between current and desired performance.

However, none of these studies has dwelt on performance measurement practices and improvement in maintenance levels in Kenya Industries. To bridge this gap, this study focused on performance measurement practices and improvement in maintenance among the CocaCola bottling plants in Kenya because of their well defined maintenance function. The study sought to answer the following research questions. What performance measurement practices are implemented among the Coca- Cola bottling

plants in Kenya? What is the relationship between performance measurement practices and improvement in maintenance among the Cocacola bottling plants in Kenya? What challenges are faced in the implementation of the performance measurement practices among the Coca- Cola bottling plants in Kenya?

1.3 Objective of the Study

i. To establish the performance measurement practices implemented by Cocacola bottling plants in Kenya.
ii. To establish the relationship between performance measurement practices and improvement in maintenance among the Cocacola bottling plants in Kenya.
iii. To establish challenges faced in the implementation of the performance measurement practices among the Coca- Cola bottling plants in Kenya.

1.4 Value of the Study

The study findings will be beneficial to Kenya's Manufacturing and Processing Industry. It will help the management of the companies in the industry to comprehend the effects of having a performance measurement system for the maintenance function. This will assist the management in assessing the value created by maintenance function in their system, revising resource allocation and justifying investments for the maintenance departments

The study findings would be of great importance to academic research, as it will contribute to both theoretical and practical knowledge on the maintenance performance measurement practices in manufacturing industries in Kenya. Scholars would find it important as it would increase the body of knowledge in this area. It would also assist the researchers in doing further studies on the same.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter summarizes the information from other researchers who have carried out their research in the same field of study. The specific areas covered here are concept of improvement in maintenance and performance measurement practices.

2.2 Performance Measurement Practices

Performance measurement practices refer to activities done in efforts to measure performance in an organization. Most performance measurement practices adopt performance measurement systems (Neely et al., 1995). Below are performance measurement practices found in literature.

2.2.1 Implementation of Balanced Scorecard

Tsang (1998) adapted the balanced scorecard developed by Kaplan and Norton (1992) to bring a strategic approach to maintenance performance measurement. The balanced scorecard includes operational measures on customer satisfaction, internal processes and the organization's innovation and improvement activities, as well as financial measures Tsang argues that considering maintenance as a purely tactical matter is myopic. Maintenance also has a strategic dimension covering issues such as design of facilities and their maintenance programs, upgrading the knowledge and skills of the workforce, and deployment of tools and manpower to perform maintenance work. Tsang (1998) advocates that the balanced scorecard, as specifically applied in maintenance, should consist of a mix of both outcome measures and performance drivers. Outcome measures reflect outcome of past decisions, performance drivers have the power to predict future outcomes.

2.2.2 Benchmarking

Benchmarking can be defined as a structured approach for learning about processes and operations from other organizations and applying that knowledge gained in the organization. It consists of dedicated work in measuring, comparing and analyzing work process among different organizations in order to identify causes for superior performance. However, it must be adapted and implemented in order to have a complete cycle of learning. Due to its external focus, benchmarking is a way of challenging internally accepted standards and prejudices. Hence, it helps businesses align their practices with market demands and strategic dimensions (Dale, 1996).

The objective of benchmarking is to accelerate the process of strategic change that leads to breakthrough or continuous improvement in products, services or processes. Thus, it results in enhanced customer satisfaction, lower operating costs, and improved competitive advantage. Thus, by adapting best practices and business process improvements, these organizations are recognized for superior performance.

At the core of successful benchmarking lies a regular and documented worldwide scan for organizations that are skilled at what they do, regardless of the industry. Therefore, if benchmarking is carried out using the best in class companies, the improvement goals are likely to be stretch goals, which ensure maximum learning and improvement (Gavin, 1992). It is acknowledged that it is not so much tangible resources that create a competitive advantage, but rather service rendered by those resources.

2.2.3 Use of Cleaner Production (CP) philosophy

Cleaner Production is a preventive, company specific environmental protection initiative intended to minimize waste and emission and maximize production output (Yacooub, 2006). By analyzing the flow of materials and energy in a company, one tries to identify options to minimize waste energy and emissions out of industrial process through source reduction strategies. Cleaner production addresses both productivity and environmental

aspect of the organization system in an integrated manner. It uses appropriate indicators which should be generally applicable and measurable. The concept was developed during the Rio Summit as a programme of United Nations Environmental Programme and United Nations Industrial Development Organization.The programme was meant to reduce environmental impact of industry.

2.2.4 Total Quality Management philosophy

Sharp, Irani, Wyant & Firth (1997) adapted the total quality management philosophy to improve maintenance performance. In a case study, the authors identified critical success factors (CSFs) associated with maintenance. Then they broke down these CSFs into various critical processes and defined individual roles. Sharp et al. (1997) reported a case study that achieved dramatic improvements through performance measurement in all aspects of maintenance. Furthermore Sharp et al. (1998) showed that improved maintenance performance can be achieved through the complementary use of total productive maintenance and total quality management.

2.2.5 Focusing on Key Performance Indicators

A Performance Indicator is a measure of performance. (Fitz-Gibbon, 1990). KPI's are general indicators of performance that focuses on critical aspects of ouput (Chan and Chan, 2004). Different categories of maintenance performance indicators can be identified from literature. The total productive maintenance (TPM) concept (Nakajima 1988), launched in the 1980s, provided a quantitative metric called overall equipment effectiveness (OEE) for measuring productivity of manufacturing equipments. It identifies and measures losses of important aspects of manufacturing namely availability, performance/ speed and quality rate. This supports the improvement of equipment effectiveness and thereby its productivity. The OEE concept has become increasingly popular and has been widely used as a quantitative tool essential for measurement equipment performance in industries (Huang and Dimukes 2003, Muchiri and Pintelon 2008).

Campbell classifies the commonly used measures of maintenance performance into three categories based on their focus (Campbell 1995). These categories are: measures of equipment performance (e.g. availability, reliability, etc.), measures of cost performance (e.g. maintenance, labour and material cost) and measures of process performance (e.g. ratio of planned and unplanned work, schedule compliance, etc.)

Coetzee outlines four categories of maintenance performance measures with detailed indicators for each category (Coetzee 1998). These categories of indicators are: maintenance results (measured by availability, mean time to failure (MTTF), breakdown frequency (mean time to repair (MTTR) and production rate); maintenance productivity (measured by manpower utilization, manpower efficiency and maintenance cost component over total production cost); maintenance operational purposefulness (measured by scheduling intensity(scheduled tasks time over clocked time), breakdown intensity time (spent on breakdown over clocked time), breakdown severity (breakdown cost over total maintenance cost), work order turnover, schedule compliance and tasks backlog), and maintenance cost justification (measured by maintenance cost intensity (maintenance cost per unit production), stock turnover and maintenance cost over replacement value).

Ivara Corporation developed a framework of defining the key performance indicator for managing maintenance function based on the physical asset management requirements and asset reliability process (Weber and Thomas 2006). They propose 26 key maintenance performance indicators and classify them into two broad categories of leading and lagging indicators. Leading indicators monitor if the tasks are being performed that will 'lead' to results (e.g. if the planning took place or if the scheduled work was completed on time) while lagging indicators monitor the results or outcomes that have been achieved (e.g. the number of equipment failures and down time).

2.2.6 A matrix structure of Quality Function Deployment

Kutucuoglu et al. (2001) adapted a QFD matrix to develop a maintenance performance measurement system. The QFD matrix developed is divided into the main stages: First

stage involves identification and alignment of KPI'S; at this stage, critical elements of performance are determined. Each KPI is assessed and given a score according to its contribution to the overall business success. This enables organization to focus attention on the most critical areas. The second stage involves selecting measurement unit specific measures. The sources of critical elements of performance are identified and related to KPI'S. The third stage involves measurement and evaluation. It is at this stage at which the measured performance is recorded and assessed against the target for each measurement unit.

The authors argued that the matrix has the following advantages: The way it is used and the matrix approach makes it simpler to match specific goals with suitable KPI'S, it can hold both objective and subjective data, it shows the possible trade-offs between technical characteristics and it can also be modified to employ a balanced view of the maintenance system.

Based on literature, a good performance measurement practice should have the following features: - appropriateness of the KPI's in relation to the strategic objectives of the organization, vertical alignment of performance indicators to translate the strategic objectives into different levels of hierarchy, recognition of different hierarchies, balanced view of maintenance system, integration of objective and subjective measures, employee involvement and cross functional structure.

2.3 Improvement in maintenance

British Standards Institute defines maintenance as a combination of all technical and associated administrative activities required to keep equipments, installations and other physical assets in the desired operating condition or restore them to this condition (BSI 1984, Pintelon et al. 1997, Pintelon and VanPuyvelde 2006). Tsang (1999) defines maintenance as engineering decisions and associated actions, necessary and sufficient for optimization of specified equipment 'capability'. The 'capability' in this definition is the ability to perform a specified function within a range of performance levels that may relate to the capacity, rate, quality, safety and responsiveness.

Improvement in maintenance involves meeting or exceeding maintenance objectives. Kelly (1998) states that the maintenance objectives is to ensure that the plant functions, ensure that the plant achieves its design life, ensure that the plant and environmental safety is achieved, ensure cost effectiveness in maintenance and effective use of resources.

For production equipment, ensuring the system function is the prime maintenance objective. Maintenance has to provide the required reliability, availability, efficiency and capability of production system in accordance to the need of these characteristics. Ensuring system life refers to keeping the equipment in good condition to achieve or prolong their design life. In this case, cost has to be optimized to meet the desired plant condition (Dekker 1996). Kutucouglu et al. (2001), states that with the change in manufacturing process emphasizing lean manufacturing, the reliability and availability of plant are vitally crucial. Poor machine performance, downtime and ineffective plant maintenance lead to the decrease in the profit, loss of market opportunities and loss of production. Importance of safety cannot be over-emphasized. Poor maintenance has caused many catastrophic incidences and in particular the spillage of oil in the Gulf of Mexico caused massive damage to the environment. Total accumulated loss to BP which was the affected company was around $12 billion (Robin, 2010). Increase in safety levels involves reduced incidences in the work place (Haman and Delahay 2010).

Presence of a well organized maintenance system helps an organization to increase machine availability, reduce production downtime, production losses and overtime costs. It also lowers labour requirements for maintenance personnel leaving them with more time on ordinary adjustments and repairs than on breakdown repairs (Kutucouglu et al., 2001).

2.4 Challenges in the Implementation of Performance Measurement

Neely et. al. (1995) states that many organizations find it challenging in choosing the right measures. Organizations are facing a challenge of excessive measurement and there is a desire to quantify absolutely everything. If the focus is on the customers, there will be

proposals to measure customer complaints, satisfaction, loyalty and profitability, returns, rejects and warranty claims – and the list goes on and on. So the current challenge is not necessarily identifying what you could measure, it is identifying what you need to measure so as to concentrate on what is absolutely vital.

Neely et. al (1995) also states that the problem is many organizations is that managers are presented with raw performance data and left to draw their own conclusions. This can lead to time-consuming and largely unnecessary debate to justify individual figures while the focus should be on the current situation, what can be learned from it and, more importantly, how targets can be achieved.

Parida and Chattopadhyay (2007) outline challenges that may affect the proper implementation of a performance measurement practice. Incorrect reporting and lack of staff ownership of the process may lead to ineffective perfomance management. He further states that employees should understand the maintenance process in detail (process mapping) before developing an effective maintenance performance measurement system.

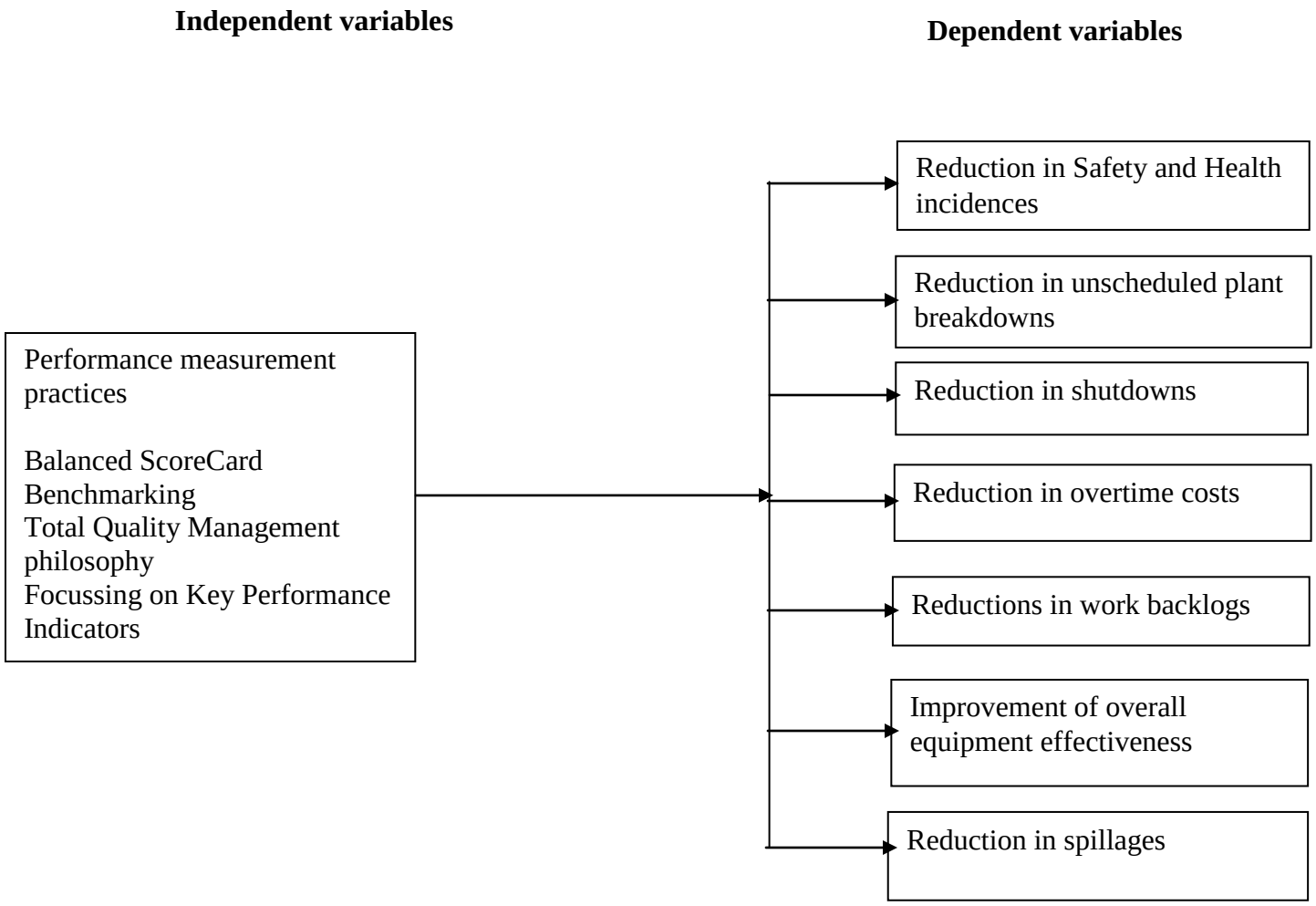
Pintelon and Van Puyvelde (1997) explain the difficulties associated with establishing an effective performance measurement system for maintenance. Maintenance is a service function for production; therefore both the merits and shortcomings of the service rendered are not immediately apparent. It is clear that the complexity of the maintenance function and its dependence on the specificity of the situation are also relevant problems. Parida and Chattopadhyay (2007) also state that measuring of maintenance performance will always be a complex issue especially when intangibles such as repair and quality of service are involved.

Parida and Chattopadhyay (2007) also state that many organizations find it difficult to align their Performance Measurement Practices with the corporate strategy. They further state that organizations should translate corporate goals and strategies into operational level. The results from the operational level should then be should to develop strategic KPI'S at the corporate level.

The effectiveness of the different facets of the performance system is very much dependent on the competency, training, and motivation of the overall human factor in charge of the maintenance system (Ljungberg, 1998). In this context, factors such as, years of relevant work experience on a specific machine, personal disposition, operator reliability, work environment, motivational management, training and continuing education, are all relevant factors, which tend to impact the effectiveness of the performance of the maintenance system (Cabahug et al., 2004). Operators are in direct contact with the maintenance activities and efforts. Therefore, they are able to judge the quality of the service they receive. In this context, their regular feedback should be incorporated into the evaluation of the maintenance system.

2.5 Conceptual Framework

A conceptual framework assists to simplify the proposed relationships between the dependent variable and independent variable in a study and allows the same to be depicted graphically.. The independent variable is performance measurement practices while the dependent variable is the improvement in maintenance levels. When an organization implements proper performance measurement practices, it leads to improvement in maintenance levels.


Independent variables
Dependent variables
Performance measurement practices
Balanced ScoreCard
Benchmarking
Total Quality Management philosophy
Focussing on Key Performance Indicators
Reduction in Safety and Health incidences
Reduction in unscheduled plant breakdowns
Reduction in shutdowns
Reduction in overtime costs
Reductions in work backlogs
Improvement of overall equipment effectiveness
Reduction in spillages

(author, 2013)

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

This chapter sets out various stages and phases that were followed in completing the study. It involves a blueprint for the collection, measurement and analysis of data. Specifically the following subsections are included; research design, target population, sample design, instrumentation, data collection and finally data analysis.

3.2 Research Design

The design of this study was descriptive survey. Descriptive survey method is used when a researcher intends to describe a situation or a condition as it is. It offered the opportunity for a logical structure of the inquiry into the problem of study.

3.3 Target Population

The population of the study was the 6 Cocacola bottling plants in Kenya. The respondents to the survey were maintenance managers, maintenance engineers and any other senior professionals within the maintenance function in the six bottling companies. This rank was chosen since high-ranking informants are considered to be a reliable source of information according to Phillips (1981). At least 8 respondents from each plant were selected making a total of 48 respondents.

3.4 Data Collection

This research used primary data that was collected by use of questionnaire (Appendix I). The questionnaire had close-ended questions in order to provide more structured responses which then facilitated tangible recommendations. The first section contained questions on demographic information of the respondents while section two contained questions to achieve the objectives of the study. Likert scale was used where appropriate. Two methods were used to administer the questionnaire; the first was the drop-and-pick later method. This method was used for the plant in Nairobi. The second method used email. This method was used for plants outside Nairobi.

3.5 Data analysis

Quantitative techniques were used to the analyse data. The researcher made use of the statistical measure of central tendency such as mean to analyse objectives one and three of the study. The mean was used to analyse on average the number of responses on the performance measurement practices performed in the companies as well as challenges affecting the practices. The results from the analysis were presented in graphs and charts.

To achieve objective two, regression analysis was used to determine how the performance measurement practices relate to the maintenance improvement levels. The regression model to be used is given below:-

$$Y = a + BX_{+U}$$

Where Y= Improvement in maintenance

a=y intercept when x=zero

B=coefficient of X

X= Performance measurement practice(s)

U=error term

CHAPTER FOUR: DATA ANALYSIS AND INTERPRETATION

4. 1 Introduction

This chapter presents the analysis of data and discussion of the research findings. The chapter outlines the findings based on the research objectives. The purpose of this study was to establish the performance measurement practices and the improvement in maintenance among Cocacola bottling plants in Kenya. SPSS was used to generate the descriptive statistics and to establish the relation between the dependent and the independent variables of the study. The research findings were presented in form of tables, graphs and charts. Tabulation helped to summarize the data whereas graphs and charts were used to present the study results.The researcher targeted a sample size of 48 respondents from which 25 filled in and returned the questionnaires making a response rate of 52.1 %. This response rate was good and representative and conforms to Mugenda and Mugenda (1999) stipulation that a response rate of 50% is adequate for analysis and reporting; a rate of 60% is good and a response rate of 70% and over is excellent.

4.2 General Information

The study sought to establish the demographic information of the respondents including the duration that the employees had worked in their current positions and the number of years the employees had worked in the company.

On the years of service/working period in the current position, the findings show that 36.8% of the managers had worked for 1-5 years, 28.9% had worked for 11-15 years, 23.7% had worked for 6-10 years, 7.9% had worked for less than 1 year while 2.6% of the managers had worked in the current position for over 15 years.

The study further sought to find out the duration that the employees had worked in the firm. From the findings, 30% of the respondents had 9-10years of experience, 26% had worked for 6-8 years, 22% had experience for above 10 years, 18% had 3-5 years of experience with their current company while 4% of the respondents had worked in their company for 1-2 years.

4.3 Performance Measurement Practices Utilized at Cocacola Bottling Plants

The study sought to establish the extent that the organization utilizes various performance measurement practices. Performance measurement practices refer to activities done in efforts to measure performance. Most performance measurement practices adopt performance measurement systems (Neely et al., 1995).

Table 4.1: Performance Measurement Practices

	Mean	Std. Deviation
Focusing on Key Performance Indicators	4.6091	.29194
Benchmarking	3.5636	.50752
Implementation of Balance Scorecard	3.5152	.50752
Total Quality Management Philosophy	3.5030	.72822
Use of Cleaner Production	3.1515	.86775
Quality Function Deployment Matrix	1.4545	.69233

On the extent that the organization utilizes various performance measurement practices, majority of the respondents indicated that Cocacola bottling plants in Kenya have been focusing on use of key performance indicators to a very great extent as shown by a mean score of 4.6091. They also indicated that the company to a great extent has adopted the use of benchmarking as shown by a mean score of 3.5636, implementation of balance score card is shown by a mean score of 3.5152 and total quality management philosophy as shown by a mean score of 3.5030.

The respondents also indicated that Cocacola bottling plants in Kenya have only adopted cleaner production to a moderate extent as shown by a mean score of 3.1515 and that quality deployment function matrix it not adopted at all as shown by a mean score of 1.4545. This is consistent with Kutucouglu et al. (2001) who observed that many organizations have not adapted performance measurement practice(s) that is specific for maintenance. Quality Function Deployment Matrix is specific for maintenance and makes is easy for organizations to match performance indicators to specific goals (Parida,

2007). The study also required the respondent to indicate how the results from the Performance Measurement Practice(s) are communicated in the organization. From the study, all the respondents (100%) indicated that the results from the Performance Measurement Practice(s) are communicated in the organization using the company notice boards, a whopping 90.9% said it was through departmental meetings, 66.7% said it was at the management level, 9.1% said it was communicated one on one with Individual while an equal proportion (9.1%) of the respondents said they were not communicated at all. The results are shown in the table below.

Table 4.2: Communication of Performance Measurement Results

	Yes	**No**
Not communicated at all	9.1	90.9
Company notice boards	100	0
Departmental meetings	90.9	9.1
Management level	66.7	33.3
One on one with Individual	9.1	90.9

4.4 Relationship between Performance Measurement and Improvement in Maintenance.

Maintenance data of the plants were collected from 2007 to 2012 as shown in Table 4.1. This data was used for regression analysis to determine if there has been improvement in maintenance among the CocaCola bottling plants within the specified period especially on the number of shut downs, overall equipment effectiveness, spillages, number of work backlogs, number of safety and health incidences, number of unscheduled plant breakdowns and also on overtime costs as indicated in the conceptual framework.

Table 4.3: Summary of maintenance data in the plants						
	2007	**2008**	**2009**	**2010**	**2011**	**2012**
No. of Safety and Health Incidences	1	2	2	1	2	1
No. of Unscheduled plant Breakdowns	1	2	1	3	2	2
No. of work backlogs	2	1	3	1	2	1
Overtime costs	0	0	0	0	0	0
No. of shut downs	1	2	0	1	0	0
Spillages	1	2	1	1	1	0
Overall equipment effectiveness	73	71	76	73	74	78

Performance measurement practices is a key management activity that provides decision makers with necessary information for decision making, monitoring performance and effective allocation of resources (Webstar and Hung, 1994). In this study, a multiple regression analysis was conducted to test the relationship between performance measurement practices and improvement in maintenance among the Cocacola bottling plants in Kenya. The research used statistical package for social sciences (SPSS V 21.0) to code, enter and compute the measurements of the simple regressions.

Table 4. 4: Model Summary				
Model	**R**	**R Square**	**Adjusted R Square**	**Std. Error of the Estimate**
1	0.8303	0.6895	0.6794	0.4720

The adjusted $R^{2,}$ also called the coefficient of multiple determinations, is the percent of the variance in the dependent explained uniquely or jointly by the independent variables. 67.94% of the changes in improvement in the maintenance levels could be attributed to the combined effect of the predictor variables (performance measurement practices).

Table 4. 5: Summary of One Way ANOVA results						
Model		**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
1	Regression	15.335	1	5.335	6.147	.019[a]
	Residual	6.907	31	.868		
	Total	22.242	32			

The probability value of 0.019 indicates that the regression relationship was highly significant in predicting how performance measurement practices affect improvement in maintenance levels among the Cocacola bottling plants in Kenya. The F calculated at 5% level of significance was 6.147 since F calculated is greater than the F critical (value = 4.1709), this shows that the overall model was significant.

Table 4. 6: Regression coefficients of the relationship between performance measurement practices and improvement in maintenance levels

Model		**Unstandardized Coefficients**		**Standardized Coefficients**	**t**	**Sig.**
		B	**Std. Error**	**Beta**		
1	(Constant)	3.882	.336		11.541	.001
	Performance measurement practices	0.561	.226	0.407	2.479	.011

As per the SPSS generated table above, the regression equation becomes:

$Y= 3.882 + 0.561X_1$

The regression equation above has established that taking performance measurement practices constant at zero improvement in maintenance levels will be 3.882. The findings presented also show that a unit increase in the performance measurement practices would lead to a 0.561 increase in the scores of improvement in maintenance levels. At 5% level of significance and 95% level of confidence, performance measurement practices had a 0.011 level of significance showing that the variable is significant ($p<0.05$).

4.6 Challenges impacting on the implementation of the performance measurement practice(s)

The respondents were requested to indicate the extent that various challenges impact on the implementation of the performance measurement practice(s) in the organization.

Table 4.7: Extent that various challenges impact on the implementation of the performance measurement practice(s) in the organization

	Mean	Std. Deviation
Communication barrier among members of staff	4.3576	.61392
Lack of employee training of the process	4.3333	..64550
Lack of ownership of process by employees	4.0606	.65857
Choosing the right measures	3.9394	.65857
Lack of goodwill from management	3.7879	.85723
Sustainability of the process	3.7576	.75126
Too many reports	3.5455	.90453
Complexity of the process	3.4848	.75503
Lack of knowledge by staff	3.3636	.85944
Cost of implementation of the process	3.3939	.78817

Majority of the respondents indicated that the challenges impact more on the implementation of the performance measurement practice(s) in the organization include communication barrier among members of staff as shown by a mean score of 4.3576,

lack of employee training of the process as shown by a mean score of 4.3333, lack of ownership of the process by employees as shown by a mean score of 4.0606, choosing the right measures as shown by a mean score of 3.9394, communication barrier among members of staff as shown by a mean score of 3.7879, sustainability of the process as shown by a mean score of 3.7576 and too many reports as shown by a mean score of 3.5455. Those that had a moderate impact include complexity of the process as shown by a mean score of 3.4848, cost of implementation of the process as shown by a mean score of 3.3939 and lack of goodwill from management as shown by a mean score of 3.3636. This confirms Neely et. al. (1995) findings who state that many organizations find it challenging in choosing the right measures and that managers are presented with raw performance data and left to draw their own conclusions. This can lead to time-consuming and largely unnecessary debate to justify individual figures while the focus should be on the current situation, what can be learned from it and, more importantly, how targets can be achieved.

CHAPTER FIVE: SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter presents a discussion of the findings, and conclusions drawn from the findings and finally recommendations for practice and further research on the problem. The purpose of this study was to establish the performance measurement practices implemented by Cocacola bottling plants in Kenya, the relationship between performance measurement practices and improvement in maintenance levels among the Cocacola bottling plants in Kenya and the challenges faced in the implementation of the performance measurement practices among the Coca- Cola bottling plants in Kenya.

5.2 Summary

The study found that there has been an improvement in the maintenance among the Cocacola bottling plants in Kenya from 2007 to 2012 especially on the number of shut downs, overall equipment effectiveness, spillages, number of work backlogs, number of safety and health incidences, number of unscheduled plant breakdowns and also on overtime costs. According to Tsang (1999), maintenance is engineering decisions and associated actions, necessary and sufficient for optimization of specified equipment capability. Improvement in maintenance levels involves meeting or exceeding maintenance objectives.

On the extent that the organization utilizes various performance measurement practices, the study deduced that Cocacola bottling plants in Kenya have been focusing on key performance indicators to a very great extent. The study also revealed that that the company to a great extent has adopted the, benchmarking. It was also clear that Cocacola bottling plants in Kenya have only adopted implementation of balance score card to a moderate extent and that quality deployment function matrix it not adopted.

The study established that the performance measurement practice(s) are well defined to members to members of the organization to a large extent. Further, the study established that the Performance Measurement Practice(s) are communicated in the organization using the company notice boards, through departmental meetings, management level and

one on one with Individual. The study also found that management support innovation and training for the employees to facilitate performance measurement oriented culture to a large extent.

The study established that the challenges impact more on the implementation of the performance measurement practice(s) in the organization include lack of goodwill from management, lack of employee training of the process, lack of ownership of the process by employees, choosing the right measures, communication barrier among members of staff, sustainability of the process and too many reports. Those that had a moderate impact include complexity of the process, cost of implementation of the process and lack of knowledge by staff. Parida and Chattopadhyay (2007) contend with this and outline challenges that may affect the proper implementation of a performance measurement practice. Incorrect reporting and lack of staff ownership of the process may lead to ineffective perfomance management.

The study revealed that 67.94% of the changes in improvement in the maintenance levels could be attributed to the combined effect of the predictor variables (performance measurement practices). The regression findings also show that a unit increase in the performance measurement practices would lead to a 0.561 increase in the scores of improvement in maintenance levels. At 5% level of significance and 95% level of confidence, performance measurement practices had a 0.011 level of significance showing that the variable is significant ($p<0.05$).

5.3 Conclusions

From the findings, the study concludes that there have been an improvement in the maintenance levels especially on the number of shut downs, overall equipment effectiveness and spillages. The study also concludes that Cocacola bottling plants in Kenya have been focusing more on key performance indicators and benchmarking as the performance measurement practices. These practices are communicated in the organization using the company notice boards, departmental meetings and at management level.

The study further concludes that there is a strong, positive and significant relationship between performance measurement practices and improvement in maintenance levels such that that a unit increases in the performance measurement practices would lead to a 0.561 increase in the scores of improvement in maintenance levels. The study finally concludes that the challenges impact more on the implementation of the performance measurement practice(s) in the organization include lack of goodwill from management, lack of employee training of the process and lack of ownership of the process by employees.

5.4 Recommendations

Foremost the study recommends that to enhance the performance management practices effectiveness, the management should organize for staff training both internal and external through seminars and workshop which will go a long way in enhancing ownership of the process by employees. The management should also support innovation to facilitate performance measurement oriented culture. Further, there should also be clear and consistent communication among members of staff in the company.

Secondly, the study has established that performance measurement affects improvements in maintenance. This study therefore recommends that the organization should enhance these practices as maintenance has to provide the required reliability, availability, efficiency and capability of production system in accordance to the need of these characteristics.

Thirdly, the study revealed that managers should not be presented with raw performance data and left to draw their own conclusions as this can lead to time-consuming and largely unnecessary debate to justify individual figures while the focus should be on the current situation, what can be learned from it and, more importantly, how targets can be achieved.

To overcome the challenge of lack of goodwill from management, the managers and operators should be in direct contact with the maintenance activities and efforts and their regular feedback incorporated into the evaluation of the maintenance system.

The study also recommends since choosing the right measures was one of the main challenge cited, the study recommends that employees should understand the maintenance process in detail (process mapping) before developing an effective maintenance performance measurement system. The organization should translate corporate goals and strategies into operational level and the results from the operational level should then be used to develop strategic KPI'S at the corporate level.

5.4.2 Suggestions for Further Research

This study concentrated on the performance measurement practices and improvement in maintenance among the CocaCola bottling plants in Kenya. However, this is not conclusive for Kenya considering that there are other major manufacturing companies. This makes the findings of the study to be limited to CocaCola bottling plants in Kenya. Further studies should be undertaken in all other manufacturing companies so as to come up with exhaustive findings on the performance measurement practices and the improvement in maintenance among manufacturing companies in Kenya and thus give conclusive recommendations that would be adopted countrywide. Secondly, further studies should also be done on the factors that affect adoption and successful implementation of performance measurement practices among manufacturing companies in Kenya.

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APPENDICES

Appendix I: Introduction Letter

RE: REQUEST FOR DATA COLLECTION

I am Master of Business Administration student at the University of Nairobi and in my final year of study.

As part of the requirement for the award of the degree of Master of Business Administration for graduation, I am undertaking a research on PERFORMANCE MEASUREMENT PRACTICES AND IMPROVEMENT IN MAINTENANCE AMONG THE COCA COLA BOTTLING COMPANIES IN KENYA

In this regard, I am kindly requesting for your support in terms of time, and by responding to the attached questionnaire. Your accuracy and candid response will be critical in ensuring objective research.

All information received will be treated in strict confidence.

Thank you for your valuable time on this.

Yours' faithfully,

Malaki Opondo

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MBA PROGRAMME

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P.O. Box 30197
Nairobi, Kenya

DATE 16/08/2013

TO WHOM IT MAY CONCERN

The bearer of this letter MALAKI RADOL OPONDO OGINGA

Registration No. D61/66931/2011

is a bona fide continuing student in the Master of Business Administration (MBA) degree program in this University.

He/she is required to submit as part of his/her coursework assessment a research project report on a management problem. We would like the students to do their projects on real problems affecting firms in Kenya. We would, therefore, appreciate your assistance to enable him/her collect data in your organization.

The results of the report will be used solely for academic purposes and a copy of the same will be availed to the interviewed organizations on request.

Thank you.

UNIVERSITY OF NAIROBI
SCHOOL OF BUSINESS
16 AUG 2013
P.O. Box 30197 - 00100, NAIROBI

PATRICK NYABUTO
MBA ADMINISTRATOR
SCHOOL OF BUSINESS

Appendix I: Questionnaire

1. Section A

Name of the respondent……. (Optional)

Position/Designation……

Number of years in the position…….

Number of years in the company……..

2. Section B

2.1 Please give the following maintenance data in your plant.

		2007	2008	2009	2010	2011	2012
1	No. of Safety and Health Incidences						
2	No. of Unscheduled plant Breakdowns						
3	No. of work backlogs						
4	Overtime costs						
5	No. of shut downs						
6	Spillages						
7	Overall equipment effectiveness						

2.2 To what extent does your organization utilize the following Performance Measurement Practices? 1- not at all 5- very large extent

		1	2	3	4	5
1	Focusing on Key Performance Indicators					
2	Total Quality Management philosophy					
3	Quality Deployment Function Matrix					
4	Implementation of Balance ScoreCard					
5	Benchmarking					
6	Use of Cleaner Production					

2.3 How are the results from the Performance Measurement Practice(s) communicated in your organization?

Not communicated at all ☐
Company notice boards ☐
Departmental meetings ☐
Management level ☐
One on one with Individual ☐
Others ☐
Specify
……
……

2.4 To what extent does the following challenges impact on the implementation of the performance measurement practice(s) in your organization? Where 1- least impact 5-most impact

		1	2	3	4	5
1	Lack of goodwill from management					
2	Lack of ownership of the process by employees					
3	Lack of employee training of the process					
4	Complexity of the process					
5	Lack of knowledge by staff					
6	Cost of implementation of the process					
7	Choosing the right measures					
8	Too many reports					
9	Sustainability of the process					
10	Communication barrier among members of staff					