

Improving Waste Reduction Decisions through Resources Efficiency and Cost Effectiveness in a Brewery

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ABSTRACT Contemporary environmental problems such as waste issues arise from inefficient production processes. The lack of an appropriate contemporary management accounting tool to capture waste process information limits opportunities for cost saving. Against this background, this study adopts observation and interview techniques in an empirical qualitative single case study approach to build an understanding of South African Breweries Limited's approach to capturing waste cost information and its effect on the process of waste reduction decisions and strategies. Findings reveal the need for organizations to adopt a waste-specific cost accounting system to increase the efficacy and efficiency of waste information management systems to improve corporate sustainability practices.

INTRODUCTION

The global society is experiencing serious environmental problems and it is widely believed that industrial waste contributes to these contemporary environmental issues (Rosen 2012). Waste reduction decisions and waste information tools have become imperative to assist in alleviating these environmental problems. The lack of sound process for waste reduction decisions by managers and the consequences of inadequate waste information often contribute to the pile of waste generated during manufacturing. The lack of adequate measures for determining waste costs and the related benefits of pollution and waste prevention programs present a barrier to the full implementation of an appropriate waste reduction strategy (Tanner et al. 1996). This barrier is due to the lack of a contemporary waste specific management accounting tool such as a material flow cost accounting model by most of these organizations to capture process waste flow in terms of its actual cost to support their waste reduction decisions (Jasch 2006; Singh et al. 2013). In South Africa, for example, the South African Breweries Limited (SAB Ltd) uses the conventional management accounting system to collect and record its process waste cost information. This system of capturing environmental costs, whereby vital waste information is not separated from the mainstream overhead account, has limited opportunities for cost savings and corrective actions to be taken (Jasch 2006).

An essential requirement to assist managers in making sound waste reduction decisions from a management accounting point of view is the use of an appropriate Environmental Management Accounting (EMA) tool to capture adequate environment related data on material flow, energy, and systems costs that will enable managers to improve on their waste reduction decisions and to adopt an appropriate environmental management strategy (Wagner 2003). To improve organizations' waste reduction decisions and strategies, Yakhou and Dorweiler (2004) suggest that the management accounting function should work within an interdisciplinary approach to minimize organizations' negative environmental impact. Accordingly, Van Berkel (2005) recommends that an effective approach to become a waste-less business should be based on helping the organization understand the cost implications on it when waste is generated. However, many organizations are yet to fully embrace environmental accounting (Gray et al. 1993), which requires that conventional accounting systems undergo and incorporate environmental changes to their costing system (Da Silva Monteiro and Aibar-Guzmán 2010; Barquet et al. 2011). In addition, the slow pace at incorporating organizations' environment related impact costs on corporate annual reports through the conventional management accounting systems which has limited opportunities to make informed waste reduction decisions is due to the lack of an appropriate and adequate waste information gathering tool (Fritsche et al. 2010).

The question about the extent and use of the conventional management accounting systems by SAB Ltd to capture its process waste information and how such information supports and improves its waste reduction decisions is vital. Hence, this study adopts the observation and interview techniques in an empirical qualitative single case study approach to build an understanding of SAB's approach to capturing waste cost information and its effect on its process waste reduction decisions and strategies. The next sections discuss relevant literature, methods, findings and discussions, as well as the conclusion for this study.

Theoretical Framework

This study provides an understanding of the limitations in the use of conventional management accounting systems to capture waste related costs and to influence sound waste reduction decisions. A view through the lens of a manufacturing process indicates that changes in existing management accounting systems will most likely lead to changes in the governance structure, behavioral regularities, as well as institutionalized formal practice of capturing waste related information. However, those responsible for implementing management accounting changes need to anticipate potential challenges with existing management accounting systems in relation to capturing waste information. In addition, this study focuses on highlighting issues that are taken for granted by those responsible for implementing management accounting change so that they can anticipate potential problems and sources of resistance and be able to take necessary initiatives to deal with such institutional challenges that could directly affect the management accounting change to be introduced.

Need For Process Waste Cost Information

Process waste results from a manufacturing process due to inefficiencies in the production system from the input stage, throughout the production process, to the output stage (Jasch 2009). As such, financial managers have a responsibility to capture the cost of the process and to ensure that appropriate process waste cost information is made available to the re-

sponsible managers for sound waste reduction decisions (Darlington et al. 2009). The capturing and reporting of an organization's waste costs should be integrated in the annual financial reports so that stakeholders can evaluate both social and environmental performance of the organization concerned. Tuttle and Heap (2007) support the argument that the process waste reduction option, which is the beginning-of-pipe approach, should be preferred to end-of-pipe approach. The beginning-of-pipe approach to waste reduction attempts to limit the creation of process waste from the input stage and to be sustained throughout the whole production process in order to avoid excessive waste treatment costs, disposal costs, and negative impact on waste sites and the environment from the resultant output. In contrast, the end-of-pipe approach to waste management favors the treatment of output waste in order to reduce its hazardous content for safe disposal to waste sites (Zotter 2004).

While the beginning-of-pipe approach to waste reduction is desirable, an objective of process waste reduction decisions from an environmental point of view is to eliminate inefficiency in resource usage throughout the whole production process (Gray and Bebbington 2001; Schliephake et al. 2009). This can be achieved when managers saddled with the implementation of the waste decision strategy are fully aware of the cost implications of production inefficiencies. Successive studies into accounting for waste maintain that the elimination of inefficiency in resource usage within the manufacturing process has a direct impact on the profitability of the organization (Wagner 2003; Gale 2006; Jasch 2009). Invariably, some other researchers indicate that most organizations have focused on waste treatment and disposal only in compliance with environmental legislations (Gray and Bebbington 2001; Ahuja and Khamba 2008; Janhoma et al. 2009; Massoud et al. 2010; SAB Limited 2012).

Essentially, by focusing an organization's attention only on legislative compliance, many cost saving opportunities could be lost. Although there has been strong resistance to environmental legislations among organizations due to the cost of adherence (Darnall et al. 2010), many have included environmental responsibility as a key performance indicator as part of their strategic objective. In order to achieve the stra-

tegic objective of being environmentally responsible, organizations would require that existing conventional management accounting and management information systems be adapted to fully account for all environment related costs incurred for improved environmental decision and strategy.

Overview of Management Accounting Information Systems' Benefit in Waste Management

The quality of data contained in a management accounting information system has a significant impact on both internal business decision-making and external regulatory compliance. Hence, an objective of the management accounting information systems is to provide relevant and timely information for decision-making (Drury 2008). Since management accounting information systems are designed to accumulate, measure and communicate financial information about businesses, inadequate and incomplete information that does not incorporate environmental information from a management accounting system can lead to wrong waste reduction decisions. Such environment related accounting information would lead to sound and informed decisions on how best to use available resources.

In the past, conventional management accounting systems excluded environmental and social costs in financial information because these costs were regarded as externalities (Mook and Quarter 2009). However, growing concern over the organizations' environmental impact has generated criticism of existing accounting conventions. This criticism led accounting scholars to adjust existing conventional management accounting systems to include the negative environmental impact caused directly or indirectly by organizations in annual reports so as to meet the information needs of its stakeholders. Just as Schaltegger and Burritt (2000) state, the "conventional management accounting systems do not provide information on how much the environment is harmed, no matter how high the social costs and no matter whether the damage is irreversible or whether carrying capacity is exceeded".

The pressure on organizations to increase their environmental performance has attracted continued attention in recent times, particularly

of external and internal stakeholders. The pressure is even more specified in South Africa, especially on organizations within the industrial sector that are considered to be high on creating negative environmental impacts (Republic of South Africa 2009). Some of the impacts on the environment by these organizations have been blamed on their unsustainable use of natural resources as well as from production inefficiencies such as greenhouse gas emissions (GHG) and the high concentration of process waste discharged into the atmosphere on a daily basis. The high volume of process waste discharged into the environment by these organizations and its related monetary value need to be captured effectively and adequately through its management accounting systems for efficient waste management decisions and strategies. This will enable corrective actions to be taken to reverse the negative environmental impact. These corrective actions need to extend beyond compliance with environmental legislations through innovative strategies based on the motivation to become socially, environmentally, and economically responsible. The unavailability of adequate accounting information systems to measure accurately all inefficiencies in production raises a major challenge on the conventional accounting systems.

Primarily, an accounting information system should provide adequate cost information to assist managers to make informed decisions and improve the efficiency and effectiveness of existing operations (Drury 2008). This means that the accounting information system should be able to provide both financial and non-financial information to enable managers to decide on the best use of an organization's resources. However, most conventional accounting systems have failed to provide adequate and sufficient environment related information for informed decisions. As such, Peat (2007) indicates that accounting practitioners have been too comfortable in dealing with readily quantifiable information, and therefore tend to handle environment related issues with reluctance. Meanwhile, Peat (2007) argues that conventional accounting systems provide environmental related information that is vague and non-verifiable and inconsistent to stakeholders. Now is the time for accounting information systems to be more responsible in the provision of necessary environmental cost information for improved waste reduction decisions (Dascalu et al. 2010).

Basically, management accounting information systems are responsible for providing adequate financial and non-financial environment related information (METI 2007). Such environment related information should be useful to both external and internal stakeholders since different stakeholders require different information. In relation to the diversities of stakeholders' information requirements, Yakhou and Dorweiler (2004) suggest that a management accounting information system should work within an interdisciplinary approach to minimize organizations' environmental impact. They continue to argue that, while conventional management accounting systems include environmental costs in overhead accounts, such costs should be separated in the annual financial statements for clarity so as to enable managers to make informed decisions. Therefore, in order to manage both internal and external environmental issues effectively, adequate and accurate waste data should be made available to decision-makers through the management accounting systems.

Since waste generation is the result of inefficiencies in a production system, it is inevitable that management accounting information systems should generate adequate and accurate waste information at specific points in the material flow process for informed process waste reduction decisions to be made. While progress has been made in recent years in reporting organizations' environmental practices, with respect to Corporate Social Responsibility (CSR) reporting and with developments of environmental reporting instruments such as the Global Reporting Initiative (GRI) (GRI 2013) and the King III Sustainability Reporting in South Africa (IOD, 2009), the necessity of a waste specific capturing tool cannot be ignored.

METHODS

This study adopts the observation and interview techniques in an empirical qualitative single case study approach to build an understanding of SAB's approach to capturing waste cost information and its effect on its process waste reduction decisions and strategies. Gaining access to the company to conduct the study took 18 months to setup due to company bureaucracy. Participants include, the general manager, the brew master, and the financial manager. The choice of a case study is based on a con-

structive paradigm that allows for a close collaboration between the researcher and the participants, while enabling participants to tell their stories (Crabtree and Miller 1999). The approach was to gain a better understanding of the participants' actions, because participants are able to describe current reality as they tell their stories (Lather 1992). The single case approach was used because SAB Ltd is the largest beer producer in South Africa, contributing about four percent of the country's annual Gross Domestic Product (GDP) (SAB Ltd 2012).

The South African Breweries Ltd

The South African Breweries Limited (SAB Ltd), founded in 1895, is the South African subsidiary and historical birthplace of SAB Miller Plc., one of the world's largest breweries by volume, with more than 200 brands and brewing interests and distribution agreements in 75 countries across six continents. The SAB Ltd is headquartered in Johannesburg, South Africa and has been listed on the Johannesburg Stock Exchange since 1897. SAB Ltd is a dominant brewing company in South Africa with a market share of about ninety-eight percent. The company operates seven breweries and 42 depots in South Africa with an annual brewing capacity of 3.1 billion litres, selling an average of more than 2.5 billion litres per year. In 2009, SAB Ltd's Gross Domestic Product (GDP) amounted to R66.2 billion or 3.1 percent of the country's GDP. During the 2009 tax year, SAB Ltd paid R10.2 billion in tax revenue directly to the South African National Treasury from corporate taxes, employees' personal income tax, value added taxes (VAT) and excise duties. This accounted for 1.7 percent of the South African government's total tax take for 2009. Sales revenue in 2009 amounted to R32 billion. The next section presents the results of the in-depth interviews with the participants under different themes.

FINDINGS AND DISCUSSION

While there is almost no single approach in management accounting that can be applicable at all times and in all places because of the dynamism of individual corporations (Merchant 2012), the use of conventional management accounting systems by SAB Ltd to capture and support

its process waste information is yet to yield desired improvements. This is due to the lack of an appropriate contemporary waste capturing management accounting tool to measure waste related costs evident in SAB Ltd, thereby, limiting improvements to the organization's waste reduction strategies. Various limitations of the conventional management accounting systems to provide the necessary process waste information emerged from the study. Apparently, the current level at which SAB Ltd.'s conventional management accounting systems provide waste information appears inadequate because the brewery's process waste cost information is generated, based on variable costs. The implication is that waste related (environmental) costs that could not be captured through the variable costing approach are hidden in overhead costs (Qian et al. 2011). The use of the conventional management accounting systems to include environmentally related costs in overhead accounts override the adoption of improved waste reduction strategies while cost savings opportunities are lost. Table 1 sets out common features of capturing waste costs found in SAB Ltd from both observation and interviews.

By assigning all waste related costs to processes, brewery managers are sufficiently provided with accurate waste data to make sound waste reduction decisions. Related waste costs should include labor, depreciation, electricity, idle time of plant and workers, and other fixed costs. In contrast, SAB Ltd includes only the variable costs elements in the calculation of its waste costs, which is then submerged in the overhead accounts. Consequently, the previous week's waste cost information is made available to management only at the beginning of another week.

It is apparent from observations made and interactions with interviewees at SAB Ltd that the level at which the conventional management accounting systems provide waste information, limits its ability to improve its waste reduction decisions and strategies. The SAB Ltd case study provides evidence that despite the rigor of its management accounting systems, SAB Ltd lacks the ability to generate accurate waste data. The use of variable costs to value waste makes the conventional management accounting systems inadequate to provide the necessary waste information to support and improve waste reduction decisions and strategies. A significant impediment is that managers often have to wait

to assess waste information at the end of each batch, before initiating corrective measures. This reduces the chance to improve waste reduction decisions, and opportunities for cost savings and to adopt a better waste reduction strategy are lost. This has led to substantial losses, which could have been prevented if more waste specific tools had been used to capture waste information in individual processes.

CONCLUSION

Apparently, the lack of a contemporary management accounting tool has limited cost saving opportunities and to improve brewery process waste reduction decisions at SAB Ltd. Incidentally, the use of variable costs to calculate waste costs means that significant waste related costs have been left out, thereby reducing managers' chances to make appropriate waste reduction decisions. Similarly, the determination and analysis of waste cost variance by the company, which is based on predetermined targets by the financial manager, are in itself deficient and misleading. Notwithstanding, this study recommends the adoption of a waste specific cost accounting system, like material flow cost accounting (MFCA), which will not only be useful to capture and analyze process waste information in a brewery on a process-by-process basis, but will also assist to achieve improved production efficiency for reduced negative environmental impact and increased profitability through reduction in process waste costs at the same time. Further research to demonstrate the adoption of MFCA in SAB Ltd and other similar organizations is suggested.

LIMITATIONS OF THE STUDY

While this study may have suffered some inherent limitations in terms of subjectivity and generalization, attempts were made to overcome these limitations by asking open-ended questions, but this is unlikely to overcome the limitations completely. In addition, the research findings obtained from this single case study may not be applicable to other cases since every case is distinct and unique in their own right, however, each case may involve a number of commonalities. Since the study's focus is to understand to what extent and how the use of conventional management accounting systems have helped

Table 1: Common features of SAB Ltd waste accounting

<i>Common features of SAB Ltd waste accounting</i>	<i>Explanation</i>
<i>Traditional Accounting System</i>	The conventional management accounting system in SAB Ltd relies heavily on data provided by the production division to generate a waste cost. The analysis is made, based on the volume of input through physical verification of the actual volume used in the production division, against the actual physical count of material inventory at the end of each batch. The physical verification of inventory is done to ascertain the degree of variation in reported usage versus actual usage in production on a weekly basis. While the financial planner is of the opinion that the accounting system provides adequate waste information, in contrast, he hopes that it can be improved through the development of a more waste specific accounting information system.
<i>Use of Variable Waste Costing</i>	Specifically, the SAB Ltd finance division uses the variable costing approach to calculate its brewery's process waste costs. Waste costs are not separately identified from other costs and the value is assigned retrospectively at the end of a batch. Other costs, such as fixed costs that relate to production loss, are included in overhead accounts. The conventional management accounting system in SAB Ltd is used to capture waste costs based on the standard costing system. Actual output costs are compared with the standard output target by relying on production records to calculate waste costs. Material and energy costs were regarded as variable costs in SAB Ltd's waste cost calculations. Although, in the brewing process, provisions are made for normal beer loss, the financial planner believes that SAB Ltd has a perfect accounting system that captures all waste related costs. Conversely, in accounting for its waste costs, SAB Ltd has failed to include depreciation costs of wasted plant hours, which it includes in its overhead accounts.
<i>Waste Information in Arrears</i>	Basically, the brewery process waste information is collated in arrears at the end of each week. This practice often renders the waste information inaccurate since it cannot be determined when required because it is done retrospectively. The procedure in the SAB Ltd is to compare target production against actual production at the end of each batch to determine where process waste actually occurred for corrective action. As such, the brewery's process waste is quantified at the end of each batch through the input-output analysis method by the finance division, which applies only to related variable costs to measure the value of waste.
<i>Delayed Corrective Action</i>	Notwithstanding that SAB Ltd ensures that the volume of beer loss and effluent discharges are monitored on a weekly basis, waste loss reports do not reveal the particular process where waste actually occurs to provide opportunity for corrective actions to be taken in such a waste-generating process. This means that the practice of reporting waste volume on a weekly basis does little to help the brew master avoid losses and initiate waste reduction strategies for specific processes. Even more, beer losses are derived by calculating the product's Chemical Oxygen Demand (COD) and effluent charges through the municipality monitoring system on site. The report from the municipality monitoring system is to assist the brew master determine the extent of waste generated in the volume of kieselguhr discharged into the municipal drains every week.
<i>Use of Overhead Accounts for Waste Related Costs</i>	Another significant finding is that the amount of units of energy lost in the form of steam in each process cannot be immediately quantified. The practice at SAB Ltd is to estimate the cost of energy lost at the end of each batch, thus making it difficult for managers to initiate corrective action as soon as waste generation is noticed. In the calculation of waste costs, the amount of labor lost during brewing is exempted. Moreover, costs of idle production time due to production stoppages, as a result of valve breakage for instance, are included in overhead accounts. But, on a weekly basis, the finance division calculates factory efficiency retrospectively to determine the volume of losses from the previous week's production. By this method, the number of hours lost to inefficient plant operations is known. The financial planner is of the opinion that process waste cost information provided through the conventional management accounting systems can be improved upon so as to influence waste reduction decisions. He reiterates that the provision of timeous waste information on a weekly basis will go a long way to improve waste strategies.

to shape and improve SAB Ltd's waste reduction decisions and strategies, observation and the in-depth interview techniques were used to collect data which was analyzed based on themes relevant to the study. Moreover, it was impossible to provide details of waste related data from the records of SAB Ltd because of ethical reasons and assurances of confidentiality. However, access to relevant waste records was granted for observation, bound by the confidentiality clause. Three trips were made to the brewery during the period of the study.

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