
Integrating Environmental Management Accounting (EMA) Practices with Waste Management: A Case of an Electrical Item Manufacturer in Sri Lanka

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Abstract

Purpose – The purpose of the paper is to examine how an electrical item manufacturer in Sri Lanka uses EMA and other practices to manage waste.

Design/methodology/approach – The study followed the case study approach. In-depth interviews, and observations were used as primary sources of data and documentary evidences such as quality manuals, records prepared by the Finance Division, brochures and internal documents along with online resources were used as secondary sources of data. In collecting data, measures were taken to improve trustworthiness. Collected data were analyzed using explanatory building approach.

Findings – Despite the conventional absorption method to absorb waste related costs, the organization currently follows several practices such as cleaner production, Kanban and Kaizen to manage waste. The manufacturer has some physical and monetary accounting practices relevant to recording, measurement and analysis of waste. The study further reveals that the intensity of accounting and environmental management strategies depends on the significance of a particular cost element to the organization.

Research limitations/implications – Since the study covers only a particular electronic item manufacturer, generalizing the findings is somewhat difficult. This is mainly due to the context specific characteristics of the manufacturer. Therefore, the findings will be better suited for organizations in the electronic industry with similar characteristics.

Originality/value – This study aims to contribute to the dearth of research on the application of EMA practices towards waste management in the manufacturing sector of a developing country. The findings will be useful for manufacturing sector organizations to enhance focus on physical and monetary accounting practices towards improving efficiency in waste management.

Keywords- Electronic industry, manufacturing organizations, environmental management accounting practices, Sri Lanka, waste management.

Paper type- Case Study

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1. Introduction

In the recent past, environmental management accounting (EMA) has been spreading fast as an interface between management accounting and environmental management strategies organizations pursue (Bennett *et al.*, 2002). Reflecting this wide spread use, various researches on EMA have also been carried out around the world. Many of these researches focus on manufacturing sector organizations (see Kim, 2002; Kokubu and Kurasara 2002; Seuring, 2003; Setthasakko, 2010; Jalaludin, 2011; Lee, 2011) owing to the sector's significant environmental impacts (Moreno *et al.*, 2004; Chung and Parker, 2008; Lucas and Wilson, 2008). Specific industries within the sector that have attracted greater attention include heavy manufacturing industries such as energy, mining and paper. Nevertheless, most of these studies have focused on developed countries and little is known about conditions prevailing in developing countries despite their importance in the global economy (Herzig *et al.*, 2012). Bouma and Van deer Veen (2002) suggest that understanding of EMA can be enhanced by extending research into different countries and industries. Thus, in this study an electronic item manufacturer in Sri Lanka has been selected to examine how EMA practices have contributed for waste management. The findings of the study will shed light on the EMA practices in a less researched industry in a developing country.

The electronic industry is a major economic activity in most South-East Asian countries, providing employment to a larger segment of the population and contributing to a major share in the domestic production. However, in Sri Lanka, the electronic industry is still underdeveloped compared to its peers, and only a handful of organizations are engaged in some activity connected with electronics. There are 21 electronics-related industries registered with the Ministry of Industries, Sri Lanka. Further, the major products manufactured by the companies operating under the Board of Investment (BOI) include audio/video equipment & consumer electronics, electric appliances, magnetic heads, high frequency magnetic, telecom and datacom systems, energy safety lamps, electric safety systems, switch mode power supplies, other power electronics products and printed circuit boards. The organization under study is a premier manufacturer and a well-recognized brand name in the electronic power products market in Sri Lanka.

The organization engages in manufacturing, importing and exporting of electric products. It has started operations in 1978 as an Australian - Sri Lankan joint venture with a limited range of switches and sockets produced in simple assembly lines. The turning point for this company was the sale of the venture to a French multinational company and in 2004 the main branch of the organization was established. Currently, it is operating a successful business under the vision of "creating a billion dollar global electrical brand" and the mission of "adding more

life with electricity". Under the guidance of the present CEO, the company has become a successful business venture and a trusted brand name among the customers within a short period of time.

The organization highly appreciates the assurance of quality and customer satisfaction and the company has been awarded the Super Brand status for the superior quality products in 2007. While maintaining quality and customer loyalty they have been able to spread the network to many parts of the globe and currently they are well established in countries such as India, England, Australia, Austria, Korea, Japan, Taiwan, Cypress, Nepal, Maldives, Bangladesh, Pakistan, Singapore, Dubai and Uganda.

The main products of the organization are switches and sockets, compact fluorescent lamps (CFL), low voltage switchgear alpha & sigma, cables, industrial application and other electrical accessories such as electric mountain boxes, electric plug tops, electric lamp holders and electric plug tops. All these products are produced and assembled in the organization's own factory situated in Sri Lanka. Currently, the company consists of around 1000 employees and earns an annual turnover of USD 32 Mn. Recently, a CFL bulb recycling plant has been established as a Corporate Social Responsibility (CSR) project. Presently, the organization has the ISO 9001 and ISO 9002 Certification for quality management system in the manufacture of electrical accessories and is in the process of obtaining ISO: 14000 Certification as well.

The rest of the paper is organized as follows: Section Two presents the literature review of the study and Section Three provides the methodology. This is followed by findings and discussion of the study in Section Four. The last section presents the conclusions.

2. Literature Review

EMA can be identified as the identification, collection, estimation, analysis, internal reporting, and use of materials and energy flow information, environmental cost information, and other cost information for both conventional and environmental decision-making within an organization (United Nations Division for Sustainable Development, 2001). Following a similar approach International Federation of Accountants (IFAC) (2005) defines EMA as the management of environmental and economic performance through the development and implementation of appropriate environment-related accounting systems and practices. Through EMA, both monetary and physical environmental-related information is identified, collected, estimated, analyzed and used for decision making within the organization (Burritt *et al.*, 2002). By expanding this definition, IFAC (2005) has presented a guideline for EMA which uses both monetary and physical information

in internal decision making process. Physical information includes flows and fates of energy, water, and materials (including waste), and monetary information includes environmental related costs, savings and earning (Burritt *et al.*, 2002). This results in two types of EMA systems, monetary EMA and physical EMA systems.

Environmental management by firms has two dimensions. It involves firstly, the process of being environmentally pro-active and secondly, the measuring of environmental costs. Being proactive in environmental issues definitely influences product costs. Therefore, firms need to estimate all corporate costs (including environmental costs) for better decision making (Jasch, 2003). Under EMA, costs which remained hidden and scattered in different accounts in conventional accounting systems are identified, classified, allocated, and measured. This prevents firms from overseeing opportunities to obtain environmental improvements (Henri and Journeault, 2008). Therefore, IFAC (2005) indicates that environmental costs need to be captured both internally and externally, while social expenditures need to be considered and collected as social costs or externalities. Companies also need to appropriately identify and measure these costs before allocating them to a single production activity to evaluate reductions in and controls of these costs and contaminants such as wastes, solids, and emissions.

The management of waste has been the central focus of Cleaner Production (CP). According to United Nations Environmental Programme (UNEP) (2014) CP is the continuous application of an integrated environmental strategy to processes, products and services to increase efficiency and reduce risks to humans and the environment. Further, Fresner (1998) views CP as a strategy to prevent emissions at the source and to initiate a continuous preventive improvement of environmental performance of organizations. Also, CP and ISO 14001 support each other in order to reduce waste of an organization. Quantifiable results in terms of reduced wastes and emissions and improved material and energy efficiencies have been recorded by implementing CP around the world (Kjaerheim, 2005).

Managing waste can be challenging for industrial, commercial and institutional (ICI) sectors. Organizations must deal with a wide variety of materials, large volumes of waste and behaviors of many customers and visitors from within and outside of the organization. Davidson (2011) says that, there is no one action that will best fit the needs of all ICI sector organizations. However, a strategic solid waste resource management planning approach will help to define solid solutions. Integrated waste resource management planning enables organizations to create a comprehensive strategy that can remain flexible in light of changing economic, social, material (products and packaging) and environmental conditions.

Operational logistics play an important role in designing a waste management plan. The equipment, human resources, and budgetary requirements of the plan must all be considered in the design process as well as how the plan will be implemented, monitored and reviewed. Davidson (2011) also found that most organizations will require some services provided by commercial waste recycling and composting service providers. With proper research, the contractual relationship with waste service providers can be negotiated to ensure that the contract provisions will allow for the successful implementation of the waste management strategy. Sustainable management of resources is not an easy task for an organization. To reduce and precisely consume the resources while managing the quality is a challenging task. Waste is an obvious factor in this type of large scale organization and managing waste should be concerned thoroughly to gain both financial and non-financial benefits.

Despite the importance of waste, there is a lack of empirical evidences on its accounting side, especially how EMA supports waste management in emerging economies. This study, therefore, focuses on the waste management practices implemented by an electronic item manufacturing company at present. The next section explains the methodology followed in the study to achieve this end.

3. Methodology

The case study method was followed in this exploratory study (Yin, 2009). In collecting data both primary and secondary sources were used. The researchers personally visited the manufacturing facility of the electrical item manufacturer which was situated in a sub urban area in the district of Colombo. Before visiting the plant, an initial interview was conducted with the Factory Manager. Then, the researchers visited the manufacturing plant with an operational manager who clearly explained the production flow. During these observations better understanding was obtained on how the production process is carried out and how waste is generated. Following the observations, several unstructured and semi structured interviews were conducted with employees and the management of the company including Factory Finance Manager (refer Appendix 01 for the interview themes). The researchers also visited the CFL bulb recycling plant which is situated distance little further from the main manufacturing facility. While visiting the plant, the plant manager and the plant operators were interviewed. In addition to these primary mechanisms to collect data, documentary evidences including quality manual and other records prepared by the Finance Division, brochures and other cost and management relevant documents along with online resources were used to collect secondary data. Measures such as use of multiple sources of data, involvement of many researchers in data gathering, etc., were taken to ensure the reliability and validity of the data gathered as suggested by Golafshani (2003) and

Yin (2009). Also we had several follow up meetings with the Finance Manager to fill the information gaps and to obtain further clarifications.

For the purpose of analysis, the researchers used the prevailing EMA concepts and approaches. Initially, an in depth analysis of company practices on cost identification and allocation to the products was done in order to identify how the waste is identified and accounted. Next, a comprehensive comparison was carried out between those results and existing EMA approaches. Particularly, the concepts of CP in were referred to in the analysis. , This analysis helped us to identify the types of waste and the places of waste generation (refer Appendix 02 for the flow of material from raw material acquisition to the final product). Under the explanatory building approach the data gathered through interviews, observations and documentary evidences were analyzed to build up the case (Yin, 2009). The next section provides the findings and discussion of the study.

4. Findings and Discussion

This section provides the data analysis and findings of the study. They are presented under the current accounting practice, CP approach and other EMA oriented practices.

Current practice on cost identification and accounting

Identification of Environmental cost is very much essential for an organization as it accurately allocates costs to the specific area and helps on decision making in many types of management activities such as, product design, capital investments, process design, facility setting, cost control, waste management, purchasing, cost allocation, product pricing and performance evaluation (EPA, 1995; IFAC, 2005).

According to the current practice, the company identifies costs in the conventional way such as direct labor, direct material and overheads. Direct labor includes wages paid to factory workers and direct materials include mainly the cost of Polycarbonate and chemicals. Overheads include factory electricity, water, energy, depreciation of machinery and equipment, repairing and maintenance cost of machinery and packaging materials such as glues, cardboards, and paper. In product costing, the company uses the process costing method and the overhead costs are allocated to products using the absorption rate based on machine hours. The costs of assembly lines are allocated using the absorption rate based on labor hours. Waste is absorbed using an estimated normal loss rate. In this method the overhead costs which are incurred in the factory for all the production processes and other administration processes are absorbed on the same basis to the products. And the waste is treated equally without differentiating between the amounts of waste created by different products. This has resulted in the pooling of

waste related overhead costs as highlighted by IFAC (2005) and Soonawalla (2006).

In cable production, the organization's major cost is the direct material cost which is copper. Copper is a very expensive material which costs Rs. 2,000 per kilo. The copper, in the form of wires, is input to the process and are pressurized under heat and pulled until it become thinner to the width of a cable line. It is done through a specialized machine and the output consists of 2% - 3% waste of copper. Other overheads are absorbed based on the machine hour rate. In terminators production brass and copper are the main inputs. There are two special machines for this production where all the small connectors and other parts for the switches and sockets are produced. The material costs of these are directly identified and other overheads such as energy and water are absorbed on machine hour basis. It creates a waste of used copper and brass dust and a considerable amount of waste water. These costs are also included in the products. The copper and brass dusts are reused by selling them to external parties for production of copper and brass handicrafts.

Production of runners and switch panel is done separately in two machines and it is the only part produced in house in switch creation. The inputs are directly allocated to the costs and electricity is the only energy used for this purpose. Electricity is absorbed in the normal machine hour base as mentioned above. In the runners' production, 52% is a non-product output (see IFAC, 2005) and it is recycled and 20% of the waste is again added to the machine as input. The cost of the waste is absorbed as a normal loss. The organization is not allowed to dispose waste water and chemicals directly to the environment and a cost has to be incurred to refine it before disposing. Since, there is a cost involved in that process, the company uses the refined water for gardening and washing purposes within the factory in a bid to reduce costs of water consumption, it was identified that these costs are hidden under overheads as emphasized by EPA (1995).

The company has incurred a considerable research and development cost by establishing recycling plants as a part of waste reduction. Further, Rs. 1.5 Mn. has been incurred for consultancy services to obtain industrial expertise and support for the betterment of the project. This recycling plant has obtained the ISO 14001 certification as well. All these measures are carried out by the company beyond the compliance on a voluntary basis and can be regarded as volunteer environmental costs (Kim, 2002).

Cleaner production approach

Although the company does not practice CP as a concept, the 3 R's practice, which includes waste management through Reduction at source, Recycling and Reusing,

could be identified within the production process (UNEP, 2014). The application of these approaches is illustrated below.

Source reduction

Source reduction can be achieved either by changing the process or practicing good housekeeping. The organization under study has achieved process change by improving the quality of input materials, better process control, equipment modification and technology change.

Process change through improving input materials has been mainly followed in the cable manufacturing process. Accordingly, the company uses imported copper wires as input raw material. However, currently measures are underway to develop a plant to recycle copper parts collected from outside parties as well. This new venture is expected to reduce cost as well as provide a solution to waste. In this industry, product quality mainly depends on the choice of right raw materials. If the company uses a raw material which does not meet the standard level, at the end of the production after incurring all the costs, the product will be rejected. Hence, the company checks the quality of raw materials from time to time and suppliers are checked once in three months. These measures aimed at improving the quality of input materials have been very effective in managing waste.

Further, the company has changed the process by following better process control. In this regard, human resource has been at the forefront. The employee behavior directly impacts the efficiency and effectiveness of a process. Therefore, the company commenced supervising workers closely by assigning supervisors for each division. This resulted in a higher level of performance compared to earlier times. In addition, supervisors, who ultimately control the behavior of the employees and thereby ensure the processes run smoothly, are motivated through various means. Based on a concept of the Managing Director of the company they conduct annual meditation programs in which Rs.20,000 will be given to each of the employee who participates. The Finance Manager during an interview says;

“Employees participate just for monetary benefit but according to our experience there is a direct impact on the production process... Providing a lunch with a vegetarian menu is another approach to develop the morale of the employees.”

The statement of the Finance Manager clearly indicates the benefit of these programs in ensuring better process control while improving employee commitment towards better waste management.

At the end of every operating day, all machines are cleaned using a specific chemical. At the start-up, machines take longer durations to warm up and special

duty allocation has been designed for maintenance staff to report to the job early and prepare the machines for immediate operations. As a control mechanism, production divisions have given a maximum waste percentage and Key Performance Indicators (KPIs) are continuously evaluated on 25th of each month. These measures, perhaps indirectly, too have given a better platform for the organization to reduce/manage waste to a greater extent.

Process change through equipment modification has been achieved in many areas of the manufacturing process, but it is significant in pallet making. In the process of producing pallets and other related parts, the company experiences a high volume of non-product output which is resulted from the design of the moulds (IFAC, 2005). Therefore, the production division staff has redesigned those runners, up to some extent, and expects to develop more in the future. Further, the company has changed the process through changing the technology used. The company is engaged in production of panel boards for commercial customers. In this process they use AutoCAD software to develop the design which offers lesser space for customization. Therefore, currently the company is on the process of implementing new customized software which is expected to reduce waste.

Next approach for source reduction is good housekeeping. This involves with the layout of the factory premises. The company follows 5S concept in their factory. Further, they occupy a professional consultant on lean manufacturing, Total Productive Maintenance (TPM) and further development of 5S. These methods help to minimize unnecessary wastage arising from improper housekeeping and maintenance and avoidable mishaps.

Recycling and reusing

Another aspect of CP is recycling and reusing waste. The company has invested LKR 65 million in setting up a CFL bulb recycling plant. The project, which started as a CSR activity, was largely influenced by the vision of the top management. The company collects the in-house rejected bulbs and market rejected bulbs in addition to the defected bulbs from other manufacturers. These collected bulbs are recycled in a special plant situated in Pitipana. This venture has improved the green image of the company significantly as it is the only CFL bulb recycling plant in Asia. Moreover, some components of the bulbs that come into the Plant for recycling are reused with minor modifications, whenever possible. The main intention of this venture is not revenue generation but the benefit to the society. Despite the massive investment the plant is yet to make profits. During an interview the Plant Manager says;

"The revenue generated so far is very little compared to costs incurred... Still we do not have a right mechanism in place to collect the bulbs for the full capacity of the recycling plant. But we are

working on to improve this plant because we believe that the idea it creates in the minds of the stakeholders adds more value than the revenue it creates.”

The statement of the Plant Manger emphasizes that some environmentally oriented initiatives can't be justified in traditional financial based measures. This calls for consideration of broad analysis of costs as suggested by EPA (1995). Despite these issues and the concerns of the finance personnel regarding the viability, the project is carried with the great encouragement of the top management. As IFAC (2005) and EPA (1995) highlight it is clear that some environmentally oriented projects will not be feasible unless the potentially hidden costs/benefits are incorporated.

Other EMA oriented practices

Further, in order to reduce waste and maintain the efficiency level in other parts of production, the company maintains some other physical practices. These include a Kaizen system, a Kanban system, special focus on energy accounting, employee engagement and environmentally oriented capital budgeting system.

The manufacturer is always concerned on Kaizen or continuous improvement of the production and many steps have been taken to reduce the wastes and improve efficiency (Drury, 2006). These steps encompass all over the production process at the point of purchasing of raw material from the suppliers to the finished goods stores. Before approving raw materials the company checks the sample and after the goods are received from the shipment another quality check is done. They always communicate with the suppliers to encourage them to maintain quality in their supplies.

In order to identify the material requirements of the machines the company has implemented a Kanban system. Digital signal boards hung in front of stores give directions on which machine requires what quantity of materials at what time. This system helps the smooth flow of material to the production floor minimizing waste of material, time and energy.

In order to reduce the waste of energy and improve energy efficiency, the company has taken several measures. Reporting of energy consumption is done for electricity as it is the main type of energy used by the company. A unit reader is attached to each machine at the production floor to measure the electricity consumption in units and they report the measurements to the management on a daily basis. They have identified that the nineteen molding machines have the highest consumption of electricity. There are built up rates to absorb the cost based on the consumption. Thus, the accounting for energy reflects the application

of both physical and monetary EMA (Burritt *et al.*, 2002). For the review and analyzing of the information, the management accountants hold a meeting once a month and take necessary steps to control the negative deviations from the targets. The emphasis on energy accounting also plays a key role in managing waste.

Another EMA oriented approach in managing waste is the employee engagement for waste reduction. The aforementioned meditation program inspires to develop the employee morale and improves loyalty towards the company. The Manufacturing Finance Manager in an interview mentions:

“The intention of the management is to develop the mental condition of the employees and the program changes the employees a lot... Although they go there without any deep intention of developing morale, they automatically become different persons through it, and their work and attitudes become more positive towards the company. It will help the lower level workers to think out of the box and come up with innovative ideas to improve their day-to-day operations.”

This statement highlights the benefit of these non conventional programs to ensure employee engagement in reducing waste through novel ideas. The contribution of this program towards reducing waste was proven once when an employee came up with an idea to redesign a part of the copper production machine and was able to save around one million rupees with the implementation. As Gunarathne and Lee (2013) identified, continuous employee engagement is the key to success in any environmentally oriented program. This has been further confirmed by Gunarathne and Fonseka (2013) by identifying the human factor as the most important factor in EMA, even surpassing the superiority of the technique being applied.

In order to monitor waste generation, the management of the organization always monitors the deviations in the production run. The raw material inputs which are used in molding machines, the purchased components and the produced components used in assembly lines are measured in quantities and recorded daily in the daily production plan. These recording and accounting aspects reflect the application of physical EMA (Burritt, *et al.*, 2002). The estimated output from these inputs and the actual output are measured and the efficiency of each production process or assembly line is measured daily and recorded by the “line leader”. Normally the efficiency of an assembly line should be maintained at 85% and if the assembly line achieves it, the employees will be rewarded in monetary incentives.

5. Conclusions

The study identifies that the electronic item manufacturer has mainly concentrated on the reduction of waste of raw materials as the cost of materials represents the single most important cost item. It demonstrates that the intensity of the development of EMA practices depends on the significance of the cost element to an organization or industry. Further, the study shows that certain investments and projects cannot be financially justified unless the broader societal or potentially hidden benefits and costs are taken into account.

The adoption of EMA practices in the organization under study is not without room for improvement. In order to mitigate the prevailing shortfalls in waste management, the company can undertake some actions for improvements. Among them, the potential for redesign of machinery is significant as a substantial amount of waste is generated from the production process due to the design of machinery. Especially in the Runners production machine 52% of the input, comes out as the non-product output. This has been highlighted by IFAC (2005) as a part of waste. This can be reduced by redesigning the machinery. Another avenue for improvement is the application of activity based costing (ABC). Currently, the company practices an assortment of conventional costing and ABC costing initiatives in order to absorb costs for each product. Yet, majority of the overheads are absorbed using general overhead absorption drivers i.e. labor hours and machine hours. Further, the additional activities and associated costs are not considered in determining the overhead rates. For example, the recycling process in the molding section incurs additional costs in terms of energy and water to crush raw materials. But the ignorance of such costs incurred has resulted in pooling of environmental costs in general overheads as highlighted by EPA (1995), IFAC (2005) and Soonawala (2006). If ABC is implemented to the whole process it would help absorb overheads to the product more accurately. Further improvement potential exists to systemize the production floor by centralized material supply and reduce unnecessary movements within the flow through better layout planning. Moreover, the CFL recycling plant can be used as a cause-related marketing tool as highlighted by Kotler (2011). Also as highlighted by Fresner (1998) there is potential to use CP and ISO 14001 together to bring better benefits for the organization.

The study focused on a lesser known manufacturing sector, electronic item manufacturing industry, to broaden the knowledge on EMA in a developing country context. The findings of this study will particularly be useful for other organizations in this industry and other manufacturers in general. However, since this case is based on a single organization, the findings may be difficult to generalize (Lukka and Kasanen, 1995; Enquist *et al.*, 2006). Therefore, in future, more research can be carried out to explore other organizations in the same

industry or different manufacturing industries. In addition to this general issue, another main limitation relates to the limited number of interviews and interviewees involved. However, the quantum of information collected can reasonably be regarded as complete due to the small scale of the organization. Moreover, while interviewing the key parties to collect data we used other means of data gathering such as observations, artifacts, documentary evidences and other sources of secondary data to mitigate any issues with interviews.

References

- Bennett, M., Bouma J. J. and Walters T. (2002). "The Development of Environmental Management Accounting: General Introduction and Critical Review", In Bennett, M., Bouma, J. J. and Wolters, T. (Ed.). *Environmental Management Accounting: Informational and Institutional Developments*, Kluwer, Dordrecht, pp. 1-18.
- Bennett, M., and James, P. (2000). "The Green Bottom Line". In M. Bennett & P. James (Ed.). *The Green Bottom Line: Environmental Accounting for Management Current Practice and Future Trends*. Greenleaf Publishing, pp. 30-60.
- Bouma, J. J. and Van der Veen, M. V. D. (2002), "Wanted: a theory for Environmental Management Accounting", In Bennett, M., Bouma, J. J. and Wolters, T. (Ed.). *Environmental Management Accounting: Informational and Institutional Development*, Kluwer Academic, Dordrecht, pp. 279-90.
- Burritt, R., Hahn, T. and Schaltegger, S. (2002), Towards a comprehensive framework for environmental management accounting: links between business actors and environmental management accounting tools, *Australian Accounting Review*, Vol. 12 No. 2, pp. 39-50.
- Chung, L. H. and Parker L. D. (2008), Integrating hotel environmental strategies with management control: a structuration approach, *Business Strategy and the Environment*, Vol. 17, pp. 272-286.
- Davidson, G. (2011), *Waste Management Practices*, Office of Sustainability, Dalhousie University.
- Drury, C. (2006). *Management and Cost Accounting*, Thomson Learning Business Press, London.
- Enquist, B., Johnson, M. and Skalen, P. (2006), "Adoption of corporate social responsibility – incorporating a stakeholder perspective", *Qualitative Research in Accounting & Management*, Vol. 3 No. 3, pp. 188-207.
- Environmental Protection Agency (EPA). (1995), *An Introduction to Environmental Accounting as a Business Management Tool: Key Concepts and Terms*, EPA, Washington.
- Fresner, J. (1998), Cleaner production as a means for effective environmental management, *Journal of Cleaner Production*, Vol. 6 No. 3-4, pp. 171-179.
- Golafshani, N. (2003), Understanding reliability and validity in qualitative research, *The Qualitative Report*, Vol. 8 No. 4, pp. 597-607.
- Gunarathne, A. D. N. and Fonseka K. B. M. (2013), *Environmental Management Accounting in the Listed Hotel Sector in Sri Lanka*, working paper, Postgraduate Institute of Management, Colombo.

- Gunarathne, N. and Lee, K. (2013), Adopting and Implementing Environmental Management Accounting (EMA) Practices in the Hotel Sector: A Sri Lankan Case, A paper presented at the EMAN Global Conference, Gold Coast, Queensland.
- Henri, J. F., and Journeault, M. (2008), Environmental performance indicators: an empirical study of Canadian manufacturing firms, *Journal of Environmental Management*, Vol. 87 No. 1, pp. 165-176.
- Herzig, C., Viere, T., Schaltegger, S. and Burritt, R. L. (2012), *Environmental Management Accounting: Case studies of South-East Asian Companies*, Routledge, London.
- International Federation of Accountants (IFAC), (2005), *International Guidance Document: Environmental Management Accounting*, IFAC, New York, NY.
- Jalaludin, D., Sulaiman, M. and Ahmad, N. N. N. (2011). Understanding Environmental Management Accounting (EMA) adoption: a new institutional sociology perspective. *Social Responsibility Journal*, Vol. 7 No. 4, pp.540-557.
- Jasch, C. (2003). The use of Environmental Management Accounting (EMA) for identifying environmental costs. *Journal of Clean Production*, Vol.11 No. 6, pp.667-676.
- Kim, J. D. (2002), "A guideline for measurement and reporting of environmental costs", In Bennett, M., Bouma, J. J. and Wolters, T. (Ed.). *Environmental Management Accounting: Informational and Institutional Developments*, Kluwer, Dordrecht, pp. 51-65.
- Kjaerheim G. (2005), Cleaner production and sustainability, *Journal of Cleaner Production*, Vol. 13 No. 4, pp. 329-339.
- Kokubu, K. and Kurasaka, T. (2002). "Corporate Environmental Accounting: A Japanese Perspective", In Bennett, M., Bouma, J. J. and Wolters, T. (Ed.). *Environmental Management Accounting: Informational and Institutional Developments*, Kluwer, Dordrecht, pp. 161-173.
- Kotler, P. (2011), *Marketing Management*, Prentice Hall, NJ.
- Lee, K. (2011). Motivations, barriers, and incentives for adopting environmental management (cost) accounting and related guidelines: a study of the Republic of Korea. *Corporate Social Responsibility and Environmental Management*, Vol. 18, pp. 39-49.
- Lucas M. T. and Wilson M. A. (2007). Tracking the relationship between environmental management and financial performance in the service industry. *Service Business*, Vol. 2 No. 3, pp. 203-218.
- Lukka, K. and Kasanen, E. (1995), Methodological themes: the problem of generalizability: anecdotes and evidence in accounting research, *Accounting, Auditing & Accountability Journal*, Vol. 8 No. 5, pp. 71-90.
- Moreno, E. C., Lorente, J. S. and Jimé' Nez, J. D. B. (2004). Environmental strategies in Spanish hotels: contextual factors and performance. *The Service Industries Journal*, Vol. 24 No. 3, pp. 101-130.
- Setthasakko, W. (2010). Barriers to the development of environmental management accounting - an exploratory study of pulp and paper companies in Thailand. *Euro Med Journal of Business*, Vol. 5 No. 3, pp. 315-331.
- Seuring, S. (2003), "Cost Management in the Textile Chain: Reducing Environmental Impacts and Costs for Green Products", In Bennett, M., Rikhardsson, P. and Schaltegger S. (Ed.). *Environmental Management Accounting - Purpose and Progress*, Kluwer, Dordrecht, pp. 233-256.

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Soonawalla, K. (2006), "Environmental Management Accounting", In Bihami, A. (Ed.), *Contemporary Issues in Management accounting*, Oxford University Press; New York, pp. 380-406.

United Nations Division for Sustainable Development. (2001), *Environmental Management Accounting, Procedures and Principles*, United Nations Publications, New York and Geneva.

United Nations Environmental Programme (UNEP) (2014), Cleaner production, retrieved on 12.02.2014 via <http://www.unep.fr/scp/cp/>.

Yin, R. (2009), *Case Study Research: Design and Methods*, 4th ed., Sage, Thousand Oaks, CA.

Appendix 01

Summarized list of interview themes

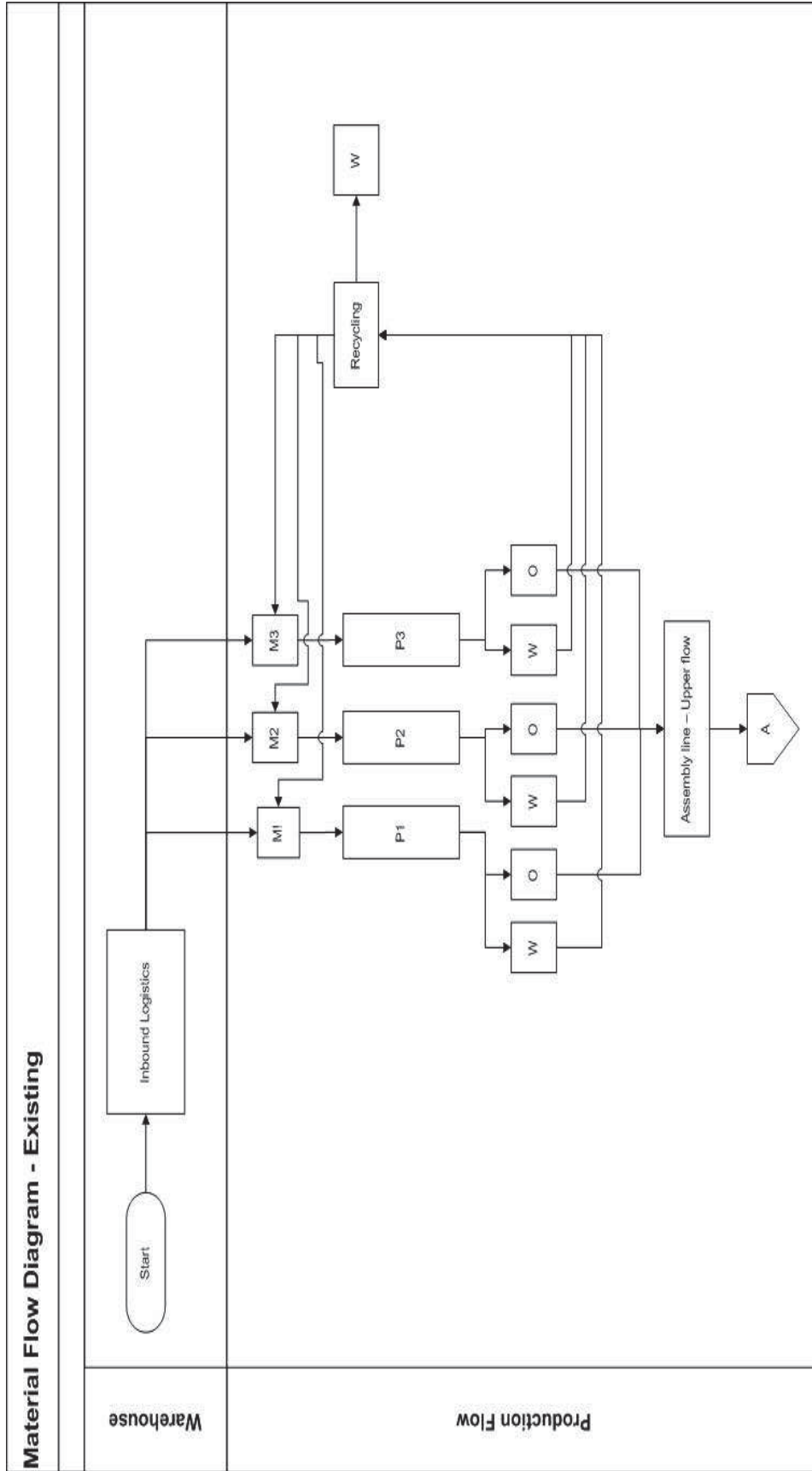
Regarding the current practices:

- How do you identify waste in production?
- What is your costing method of waste?
- How do you manage waste?
- What are the other environmentally oriented practices?
- To what extent do you follow the 3R concept in waste management?

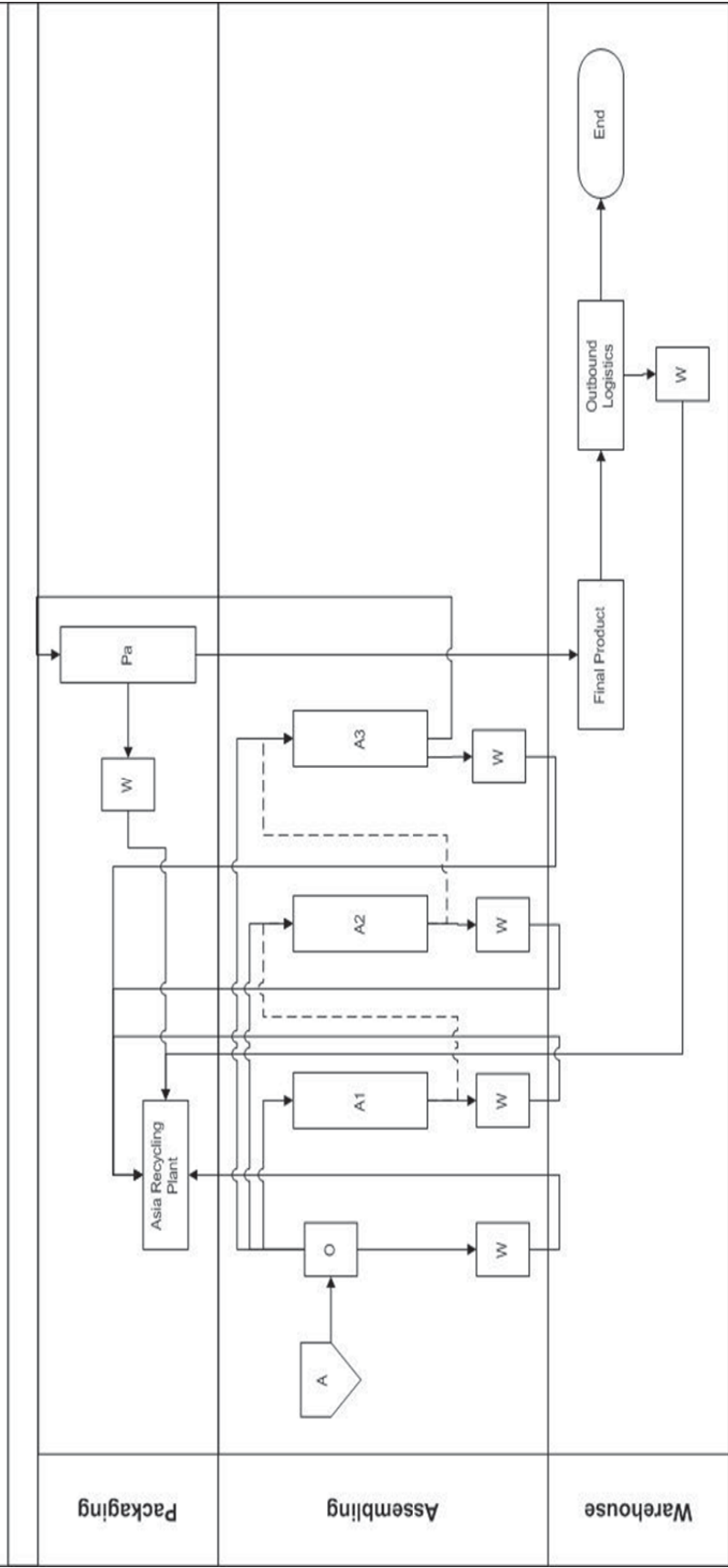
Regarding the employee support and the challenges:

- How do you get the employee support for the practices?
- What are the challenges you face?
- What are the improvements you plan to make?
- What are the future plans?

Appendix 02 – Material Flow Diagram



Material Flow Diagram – Existing contd'



- Abbreviations**
- M - Raw Materials, Auxiliary materials, Water, Energy, other materials
 - P - Production
 - O - Output
 - W - Waste
 - A - Assembling
 - Pa - Packaging