

**The Role of Management Accounting in Responding to Environmental
Management Issues in Listed Companies: A Survey in the Sri Lankan
Context**

By

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Abstract

Decades ago environmental costs were not identified or accounted for by businesses, and businesses assumed that environmental costs were very low. However, in recent times, due to environmental concerns, there has been a steep rise in environmental costs, which has raised many environmental issues along with related costs, revenues and benefits that are now of an increasing concern to many countries around the world. Although environmental costs lead to societal and economic issues, this study focuses only on economic issues. There remains a lack of research, particularly in developing countries, focusing on management accounting (MA) and its contribution to managing environmental costs. The main purpose of this study is to investigate the nature and extent of MA practices and their contribution in addressing environmental management (EM) issues in listed companies in Sri Lanka.

The study makes use of a Mixed Method Research approach. Using a multi-stage purposeful sampling method, 42 companies were selected from five industry sectors: food and beverages, chemicals, diversified, manufacturing, and plantation. All these represent manufacturing and manufacturing-related industries. Data were collected mainly through a questionnaire survey, followed by interviews and discussions with officials of the selected companies. The main tools of analysis were bar charts, frequency tables, Fisher's exact test, thematic analysis and content analysis.

The findings indicate that traditional MA techniques remain popular among listed companies in Sri Lanka, rather than modern MA techniques, even though all companies make use of both types of techniques to a satisfactory level. They operate with sufficient resources and well-equipped staff needed for effective adoption of modern MA techniques, such as Activity Based Costing (ABC) and the Balanced Scorecard (BSC). However, in some instances companies choose not to adopt modern MA techniques, since they are satisfied with the performance of their existing MA systems. Our findings conclude that Sri Lankan listed companies are capable of adopting any of the most appropriate MA techniques, either traditional or modern, in accordance with their own purposes, the specific nature of their businesses, the conditions prevailing in the industry sector, and the markets served. Hence there are differences between the approaches followed and influences considered by individual companies or industry sectors in their MA practices. In most instances, they have made changes or modifications to MA systems to achieve their intended outcomes. But they also pay less attention to the issue

as a whole – whether the techniques adopted are traditional or modern – because they can achieve their targets satisfactorily through such MA practices as they already use.

In respect to environmental aspects, all listed companies currently take required measures to prevent and control pollution by complying with legislation and standards institutionalised in Sri Lanka. As far as the contribution of MA practices in addressing EM issues is concerned, no company in the sample has established an environmental management accounting (EMA) system, and thus they all depend on both MA and financial accounting (FA) systems by making adjustments to them as and when required. However, these latter accounting systems have been designed to predominantly focus on routine business activities, not on environmental costs. This practice thus leads to lower potential and presents challenges for the management of most companies in responding to EM issues with their existing MA systems.

The findings show that, even though it is necessary to take EM initiatives to prevent and control pollution, MA systems of most companies have not been improved to incorporate environmental costs and related performance measures required by a business entity to address EM issues effectively. Compared to other sectors, the plantation sector has demonstrated a greater ability and higher performance, mainly due to the specific nature of businesses, influences from international collaboration and application of ABC and activity based budgeting (ABB) by the whole sector.

It concludes that, in taking EM measures, listed companies in Sri Lanka tend to give priority to conforming to environmental legislation, standards and procedures, all of which are more concerned with the quality of output than with associated cost impacts, and thus they pay less attention to managing environmental costs by incorporating them within MA systems or by establishing appropriate accounting systems, such as EMA systems.

This study thus recommends the development of a suitable MA/EMA system for Sri Lankan companies that is capable of addressing EM issues effectively, in addition to assisting with routine planning and control decisions. Moreover, it is vital to improve awareness among staff of companies about environmental impacts, possible control measures and the procedures to be followed in applying such measures, and practicality of MA systems in handling environmental issues that are of global concern.

Declaration

“I, Indrani Mawelle Withanawasam, declare that the PhD thesis entitled *The Role of Management Accounting in Responding to Environmental Management Issues in Listed Companies: A Survey in the Sri Lankan Context* is no more than 100,000 words in length including quotes and exclusive of tables, figures, appendices, bibliography, references and footnotes. This thesis contains no material that has been submitted previously, in whole or in part, for the award of any other academic degree or diploma. Except where otherwise indicated, this thesis is my own work”.

Signature:

Date:

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List of Abbreviations

ABB	Activity Based Budgeting
ABC	Activity Based Costing
ARR	Accounting Rate of Return
BOI	Board of Investment
BM	Benchmarking
BSC	Balanced Scorecard
CA	Cost Accounting
CEA	Central Environmental Authority
CEO	Chief Executive Officer
CF	Conceptual Framework
CHEM	Chemicals & Pharmaceuticals
CSE	Colombo Stock Exchange
CSR	Corporate Social Responsibility
CV	Co-efficient Covariation
DGM	Deputy General Manager
DOL	Department of Labour
DVS	Diversified Holdings
EFL	Environmental Foundation Limited
EIA	Environmental Impact Assessment
EM	Environmental Management
EMA	Environmental Management Accounting
EMAS	European Eco-Management and Audit Scheme
EMD	Environment Management Department
EMS	Environmental Management System
EPL	Environmental Protection License
F & B	Food Beverage & Tobacco
FA	Financial Accounting
FAS	Financial Accounting System
GM	General Manager
GRI	Global Reporting Initiatives
HREC	Human Research Ethics Committee
IEE	Initial Environmental Examination
IFAC	International Federation of Accountants
ISO	International Standards Organization
JIT	Just-in-time
KPI	Key Performance Indicators
LA	Local Authorities

LDC	Less Developed Countries
MA	Management Accounting
MAS	Management Accounting Systems
MENR	Ministry of Environment & Natural Resources
MM	Mix Methods
MMR	Mixed Methods Research
MNF	Manufacturing Sector
MoE	Ministry of Environment
MoLLR	Ministry of Labor and Labor Relations
NCSD	National Council for Sustainable Development
NE	National Environmental
NEA	National Environmental Act
NEAP	National Environmental Action Plan
NGRS	National Green Reporting System
NPV	Net Present Value
PAA	Project Approving Agency
PE	Performance Evaluation
PLT	Plantation
QUAL	Qualitative
QUAN	Quantitative
R & D	Research and Development
ROI	Return on Investment
ROS	Return on Sales
SBU	Strategic Business Unit
SD	Sustainable Development
SD	Standard Deviation
SLAB	Sri Lanka Accreditation Board
SLSI	Sri Lanka Standards Institution
SM	Senior Management
SME	Small and Medium Enterprise
SWML	Scheduled Waste Management License
TCAS	Traditional Cost Accounting System
TEC	Technical Evaluation Committee
UNSD	United Nations Division for Sustainable Development
ZBB	Zero-based Budgeting

Chapter 1 Introduction

1.1 Background of the Study

Decades ago environmental costs were very low and thus it seemed wise to include them in an overhead account for simplicity and convenience. This was indeed the case for overheads in themselves, and which activity based costing (ABC) could address satisfactorily. Of late the steep rise in environmental costs has raised many environmental issues – along with the related costs, revenues and benefits – which are now of increasing concern to many countries around the world (International Federation of Accountants-IFAC 2005). Environmental costs lead to societal and economic issues that are both internal and external to the organization. Economic issues are concerned with the high costs and type of resources consumed, which result in high wastage and the high costs of environmental protection and management, and ultimately increased costs of production and related price levels. Societal issues mainly arise as a result of wasted water, fuel and material; emissions; landfill of goods after their usage; extraction of natural resources such as forestry, natural gas, coal, oil, gold and other minerals; human activities and machine operations. Societal issues are generally concerned with pollution of the air, water, marine environment and land used to live and to grow, and increasing noise or vibration. All of these may have greater impact on human lives (health problems), their working conditions and living conditions (quality of life).

However, there is a growing consensus that conventional accounting practices simply do not provide adequate information for environmental management (EM) purposes (IFCA 2005). Supporting this view, Vasile and Man (2012) express that traditional accounting methods do not offer a suitable framework that is capable of identifying all the necessary data, as they generally focus on the costs of resources employed and their aggregation without paying attention to activities. Consequently, many potential costs related to the environment will be ‘lost’ within the indirect costs. To fill this gap, the emerging field of Environmental Management Accounting (EMA) has been receiving increasing attention (IFCA 2005). In the early 1990s, the United States (US) Environmental Protection Agency was the first national agency to establish a formal program to promote the adoption of EMA. Since that time, organizations in more than 30 countries have begun promoting and implementing EMA for many different types of

environment-related management initiatives (United Nations Division for Sustainable Development-UNSD 2001). Many internal and external stakeholders have shown increasing interest in the environmental performance of organizations, particularly private sector companies (IFAC 2005).

The types and intensities of environmental pressures can vary widely from country to country and among different industry sectors. However, such environmental pressures force many organizations to look for new, creative and cost-effective ways to manage and minimize environmental impacts. Environmental pressures at the international level include: supply chain pressure; disclosure pressure; financing pressure; regulatory control pressure; environmental tax pressure; and cap and trade pressure (IFAC 2005). For an organization to effectively manage the environmental pressure, and costs and benefits, it needs expertise in different areas, such as environmental, technical, accounting and finance, marketing and public relations and general management. Accountants have a special role to play in resolving this issue because of their access to the relevant monetary data and information systems, their ability to improve or verify the quality of such information and their skills in using that information to help make sound business decisions in areas such as investment appraisal, budgeting and strategic planning (IFAC 2005).

In this respect, Wilmshurst and Frost (2001) state that decisions that may have environmental impacts also have a financial impact and hence accountants should be encouraged to evaluate these decisions and become involved in the environmental management system (EMS). According to Bennett, Schaltegger and Zvezdov (2011) environment and sustainability are relatively new issues for business that are now recognized as pressing and urgent issues for humanity generally, and perhaps the single most important issue of this generation. This can affect business in a number of ways, in particular, through government policies and stakeholder pressures. The emergence of such a major new strategic variable in the strategic context of business does not, on its own, necessarily mean that accountants need to be involved. However, there is relatively little scope for accountants to participate significantly, as their role is usually restricted to supporting the processes by which companies choose to publish reports on their environment performance to the outside world in ways that influence and reassure key external stakeholders. In these situations, skilled accountants and the extended use of the central accounting systems can assist businesses to manage their environmental

and sustainability performances (Bennett et al. 2011). In this sense, it is clear that taking care of the environment has become an enormous preoccupation worldwide, and accounting for the environment and related issues is taking on increasing importance (Savage & Jasch 2005).

Social and environmental accounting research has paid considerable attention to enhance understanding of reporting practices and their contribution to the environmental agenda (Parker 2005). Gray (2010) emphasises that emergence of sustainable development through which social and environmental issues must be addressed has had a growing influence in the accounting literature. According to Young and Tilley (2006), empirical evidence of EMA is still sparse, nevertheless, these assertions were made ten years ago. There remains a lack of empirical research focused on management accounting (MA) and its contribution to the social and environmental agenda (Adams & Larrinaga-González 2007; Parker 2005).

Supporting these views, Parker (2011), analysing and criticising 21 years of contemporary research in social and environmental accounting, reveals that national regulations and practices are leading research topics, with external disclosure, theoretical frameworks, and attitudinal studies also attracting significant attention. Parker also points out that the social and environmental accounting research community is active in these contexts. This research attempts to fill this gap in the accounting literature. Directing attention to the MA practices of Sri Lankan listed companies and to the interplay between MA practices and EMS, this research can help understand the nature and extent of MA practices and their contribution to resolving EM issues in listed companies in the Sri Lankan context. Accordingly, this is an exploratory study to gain general insights into MA approaches in relation to environmental issues.

This study applies a Mixed Method Research (MMR) approach to enable the researcher to obtain a rich dataset from selected Sri Lankan listed companies, essential for competently addressing the research questions. This approach supports the researcher in analysing both quantitative and qualitative data to obtain meaningful findings, and hence reach sound conclusions. Accordingly, the researcher conducted a questionnaire survey with the finance managers/officers of listed companies. This was followed by interviews and discussions with the same personnel and further with environmental managers/officials, where possible, to gather the required data together with justifications and examples of the phenomena under investigation. In this process, the

researcher visited all companies in the sample in order to obtain a sound response rate (100%) and ensure maximum validity and reliability of data.

Chapter one describes the research problem addressed in the thesis, the associated research objectives, the scope of the study and its significance, and the conceptual framework. The chapter concludes by providing the chapter organization for the thesis.

1.2 Research Problem

Unlike Financial Accounting (FA), MA primarily focuses on satisfying the information needs of internal management. Although there are accepted good practices in the realm of MA, these practices are generally not regulated by law (IFAC 2005). As there is no regulatory framework in relation to the practices of MA and EMA, adopting MA and EMA practices for business entities is mostly flexible, unaudited and voluntary in nature. However, as Burritt, Hahn and Schaltegger (2002) say, MA systems should be designed to satisfy the needs of different managers seeking different types of information, including environmental information, as the pressure increases on managers to comply with tighter environmental legislation and to be aware of corporate environmental impacts on stakeholders (Schaltegger & Burritt 2000). In this view, the adoption of MA and EMA by Sri Lankan business entities is also not bound by legislation, and as a result, those entities may adopt MA and EMA according to their particular interest and requirements in a voluntary manner, and hence their use is flexible and unaudited. Accordingly, it is vital to investigate MA practices and their contribution in responding to EM issues in manufacturing firms in Sri Lanka. The primary research question of this study is ‘how and to what extent do listed companies in Sri Lanka adopt MA practices, and respond to EM issues through their MA practices?’ This primary research question is operationalized by subdividing it into specific research questions (RQs) as follows:

- i. How and to what extent do listed companies adopt MA practices to facilitate decision-making processes, particularly in relation to routine planning and control activities?
- ii. Do listed companies concentrate on EM issues in their business processes and if so, why?

- iii. In which stages of the business process do environmental impacts sensibly occur, and what are current EM activities undertaken in these stages to mitigate such impacts?
- iv. How and to what extent do listed companies identify and respond to EM issues through their MA practices?
- v. To what extent does management of listed companies confront challenges or problems with their MA systems in identifying and responding to EM issues and in performing routine planning and control activities?
- vi. What are the perceptions of managers of listed companies regarding the impact of internal and external factors on MA practices and on MA and EM challenges or problems faced by them?

1.3 Objectives of the Research

The main objective of this research is to investigate the nature and extent of MA practices in Sri Lankan listed companies, and their responses to EM issues through these practices. This objective leads to the following specific objectives:

- i. Examine the nature and extent of MA practices adopted by listed companies to facilitate decision-making processes, particularly in relation to routine planning and control activities;
- ii. Ascertain the motivating factors for concentrating on EM issues by listed companies in their business process;
- iii. Distinguish between the stages of the business process in which environmental impacts sensibly occur, and current EM activities undertaken in these stages to mitigate such impacts;
- iv. Analyse the manner and the extent to which listed companies identify and respond to EM issues through their MA practices;
- v. Investigate the extent to which listed companies confront challenges or problems with their MA systems in identifying and responding to EM issues, and in performing routine planning and control activities;
- vi. Identify internal and external factors that affect the MA practices and MA and EM challenges or problems faced by listed companies.

1.4 Scope of the Study

This study clarifies whether business entities apply particular MA techniques in their decision-making processes and, investigates the nature and extent of such practices to find whether there has been a relationship between MA practices and the way businesses address their EM issues.

By applying mainly the multi-stage purposeful random sampling technique, this study focuses on 42 selected listed companies that represent five industry sectors out of a total of 20 sectors. According to the Colombo Stock Exchange (CSE) on 30th April, 2012, these five sectors represent 101 companies. Accordingly, the sample consists only of manufacturing and manufacturing-related industries, as the practices of these five sectors have been considered as more relevant for this study than other sectors such as telecommunications and banking. Relating to MA practices, this study is confined to selected traditional MA techniques: budgeting, standard costing, product costing, product pricing, transfer pricing and performance evaluation (PE); and modern MA techniques: ABC, activity-based budgeting (ABB), target costing, Kaizan costing, the balanced scorecard (BSC), benchmarking (BM) and Just-in-time (JIT) systems.

In this context, authors have used various terms to describe modern MA techniques including: *modern MA techniques; contemporary MA tools; and recently-developed MA practices*. For instance, Waweru, Hoque & Uliana (2005) defined these MA techniques as either traditional or modern; Sulaiman, Ahmad and Alwi (2004) termed them as traditional or contemporary tools; and Chenhall and Langfield-Smith (1998) used the terms of traditional and recently-developed MA practices. In consideration of this variety of terms, this study adopted the terms: *traditional and modern* to describe these MA techniques.

Pertaining to environmental issues and concerns, although environmental costs relate to both social issues and economic issues, this study concentrates only on economic issues and related costs. Also, EM issues and their related importance to the society that are internal and external to the entity may vary between organizations, depending on the nature of activities. In that sense, to ensure that the selected EM issues are appropriate, organizations should review the categories in the light of known EM issues. Taking this opinion into consideration, this study investigates certain EM issues and related information categories pertaining to the economic impact of the business firms, based

on the EM-related cost categories outlined by IFAC (2005)¹ except for (6) less tangible costs, (See section 2.3.1 for details).

As presented by IFAC (2005), these cost categories are not meant to be prescriptive in any way. However, they are meant to be comprehensive, representative of international practice and can provide a common language for discussion in this context. Thus, focusing on listed companies from selected manufacturing and related industry sectors in Sri Lanka, this study investigates the economic (internal) impact of environmental issues based on the specified categories. The societal (external) impact of EM issues is not examined in this study, because such an examination would require further investigation through a survey beyond the companies selected.

Collection of data in this study is limited to a questionnaire survey, supported by interviews and discussions with selected officials of listed companies who are involved in MA practices and handling EM issues and related activities, as indicated in Table 5.3 and Table 5.4. Thus, interviews and discussions are not related to all companies in the sample in the same manner and same extent as the questionnaire survey, so that the number and timespan of those interviews and discussions will vary from person to person and company to company, depending largely on situations and information requirements identified in the survey. Moreover, such information mostly relates to descriptive information pertaining to environmental issues and concerns and, to a certain extent, to MA practices. Also, the analysis of data is limited to selected tools: Frequency tables, Bar charts, Pie charts and Fisher's exact test for quantitative data, and thematic analysis and content analysis techniques for qualitative data. The findings, interpretations and conclusions are also confined to listed companies in the manufacturing and manufacturing-related industry sectors in Sri Lanka.

¹ **EM-related cost categories:** (1) Material costs of product output (2) Material costs of non-product output (3) Waste and emission control costs (4) Prevention and other EM costs (5) Research and development (R&D) costs; (6) Less tangible costs (IFAC 2005, p. 38).

1.5 Significance of the Study

This section highlights theoretical implications and practical contributions of this research.

1.5.1 Theoretical Implication

The literature review reveals that the least attention has been paid to investigating MA practices and their incorporation into addressing EM issues. There are several studies on MA practices in companies of developed countries (Ax & Bjornenak 2000; Chenhall & Langfield-Smith 1998; Drury, Braund & Osborne 1993; Hiromoto, Toshiro 1991; Johnson & Kaplan 1987) and some studies on developing countries like South Africa and Greece (Angelakis, Theriou & Floropoulos 2010; Waweru et al. 2005). The least attention has been given to MA practices and their integration into environmental decision making and control (e.g. Wilmshurst & Frost 2001; Albelda 2011).

The literature indicates that many companies have developed EM and auditing systems and altered their social and environmental disclosure practices. These developments have resulted in the growth of research focusing on the analysis of information disclosed by companies. Most of these studies have been based on data from industries in the UK, Australia and the USA. Nevertheless, empirical evidence on EMA remains limited (Young and Tilley 2006). Although some research has been undertaken relating to EMA practices, there is a gap in the literature on the integration of MA practices and EM considerations: in other words, how do business firms address EM issues through their MA practices particularly in a situation where adopting EMA and MA practices for business entities is not mandated by legislation? Thus this study will contribute to the literature by providing evidence for academics and researchers to gain a better understanding on several aspects:

- 1) Applicability and/or modes of application of MA techniques for business firms operating in different organizational/industrial contextual influences and social structural influences;
- 2) The implications of the economic impact of EM activities on MA practices;
- 3) Development of a theoretical framework for investigating EMA and MA practices, and challenges or problems faced by business firms in implementing EMS; and

- 4) Areas or problems relating to EMA, MA and EMS to which future researchers should pay more attention.

Accordingly, this study makes a considerable contribution to the literature by examining types of environmental costs that could be identified relating to industrial activities, and ways of managing them through incorporation into MA systems. This study also provides insights into the application of the MMR approach for MA research, which represents combination of quantitative and qualitative characteristics by means of required data, data sources and analytical tools. The MA literature does not include such understanding about the application of MMR approach. Therefore, this study helps researchers understand modes of presenting, analysing and interpreting quantitative and qualitative data in the context of the MMR approach so as to provide a complete descriptive analysis and substantial findings, and hence reach sound conclusions on the phenomena under investigation.

1.5.2 Practical Contribution

This research contributes to knowledge of MA practices and their involvement in addressing EM issues in business firms in the context of a developing country, Sri Lanka. This research provides directions to business entities with justification and examples from differing industry sectors on the significance of examining the applicability or non-applicability of certain MA techniques: if applicable, then exploring different ways or approaches to be followed, and factors needing to be considered in making decisions on such applications in accordance with their own purposes, the nature of businesses and the conditions of the industry sector and markets served; and, if not applicable, identifying reasons for non- applicability of such techniques and searching for alternative information sources and ways of making such decisions to rectify the situation.

Further, its significance lies in providing an initial contribution to business firms to facilitate effective EM activities that will provide sound economic grounds. Accordingly, this study will help business firms identify various aspects or stages in the business process (as noted in Table 6.3) that may have environmental impacts, and also EM measures to be applied in order to mitigate such impacts within the frame ratified by environmental legislation, i.e., the National Environmental Act (NEA) of Sri Lanka, and by International Standards Organisation (ISO) standards, i.e., SLS ISO 14001 EMS

certification and accreditation. It also helps those entities to notify influencing factors behind such initiatives, such as complying with legislation, and ensuring sustainability of businesses with a good image, given the self-motivation for business firms to do the same.

Moreover, this study provides insights into and motivations for management of companies to improve their existing MA/ FA systems, considering EM costs, or to establish EMA systems that could enable them to manage environmental costs properly. It also convinces them of the increasing importance of considering EM issues and taking action to resolve them, emphasizing their implications for the business entity in terms of savings costs, earning revenues, improving product quality, and improving environmental performance, and hence ensuring survival of the business.

Furthermore, it will help establish and enhance the relationship between environmental managers, accountants, technical personnel, executives and other relevant parties by eliminating the differences between them in knowledge, information access and structures that are essential in managing environmental costs properly. It also urges business firms to provide information for internal and external reporting purposes about the environmental impact of the entity and control measures initiated for protecting the environment. Accordingly, this information will be immensely beneficial for environmental and other personnel of business firms to make business decisions in a manner that reduces environmental costs and related impacts, thereby leading to survival of the business.

Ultimately, this study could help business firms provide the nation with green products, ensuring the sustainability of the businesses with its reputation enhanced. Moreover, it will provide guidance to public authorities and policy makers in prescribing policies, procedures and regulations for the sustainable development of the country through green businesses. Research on Sri Lankan listed companies is vital to Australia too, as these two countries enjoy warm bilateral relations, underpinned by trade and investment flows, education, immigration and other people-to-people links and development cooperation (<http://srilanka.embassy.gov.au/files/clmb/Australia>).

Overall, findings of this study form the foundation and directions for the future, with required information and explanations to undertake further research on the phenomena under consideration.

1.6 Conceptual Framework

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. According to Laurinkeviciute and Stasiskiene (2006), the approach to reduce environmental costs and improve economic situation of a company is EMA. They broadly define EMA as the identification, collection, analysis and use of two types of information, physical information and monetary information, for internal decision making.

According to Wilmshurst and Frost (2001), accounting and accountants can play a significant role in the successful implementation of the EMS and the EMS could incorporate accounting mechanisms. Growth in community concern, legislation and regulation suggests that serious consideration should be given to environmental performance evaluation. Waweru et al. (2005) also suggest, through a survey of MA practices in South African firms, that, using modern MA techniques, together with the traditional MA techniques, business firms have been striving to reduce waste in their production processes and to move towards eliminating non-value added activities and hence waste reduction.

According to IFAC (1998) analysis, the leading-edge practice of MA has shifted beyond information provision to focus on the reduction of waste and the generation of value through the effective use of resources. It further states that both MA and EMA share many common goals, regardless of structure and format, and eventually EMA approaches will support the leading-edge practices of MA. Also, most EMA initiatives in place today do not cover social issues, and in the real world EMA ranges from simple adjustments to existing accounting systems through to more integrated EMA practices that link conventional physical and monetary information systems. It further indicates that most companies, particularly small and medium-sized ones, do not have an independent MA system; they simply use data initially developed for FA purposes for internal decision making as well as for external reporting, perhaps with a few minor adjustments (IFAC 2005).

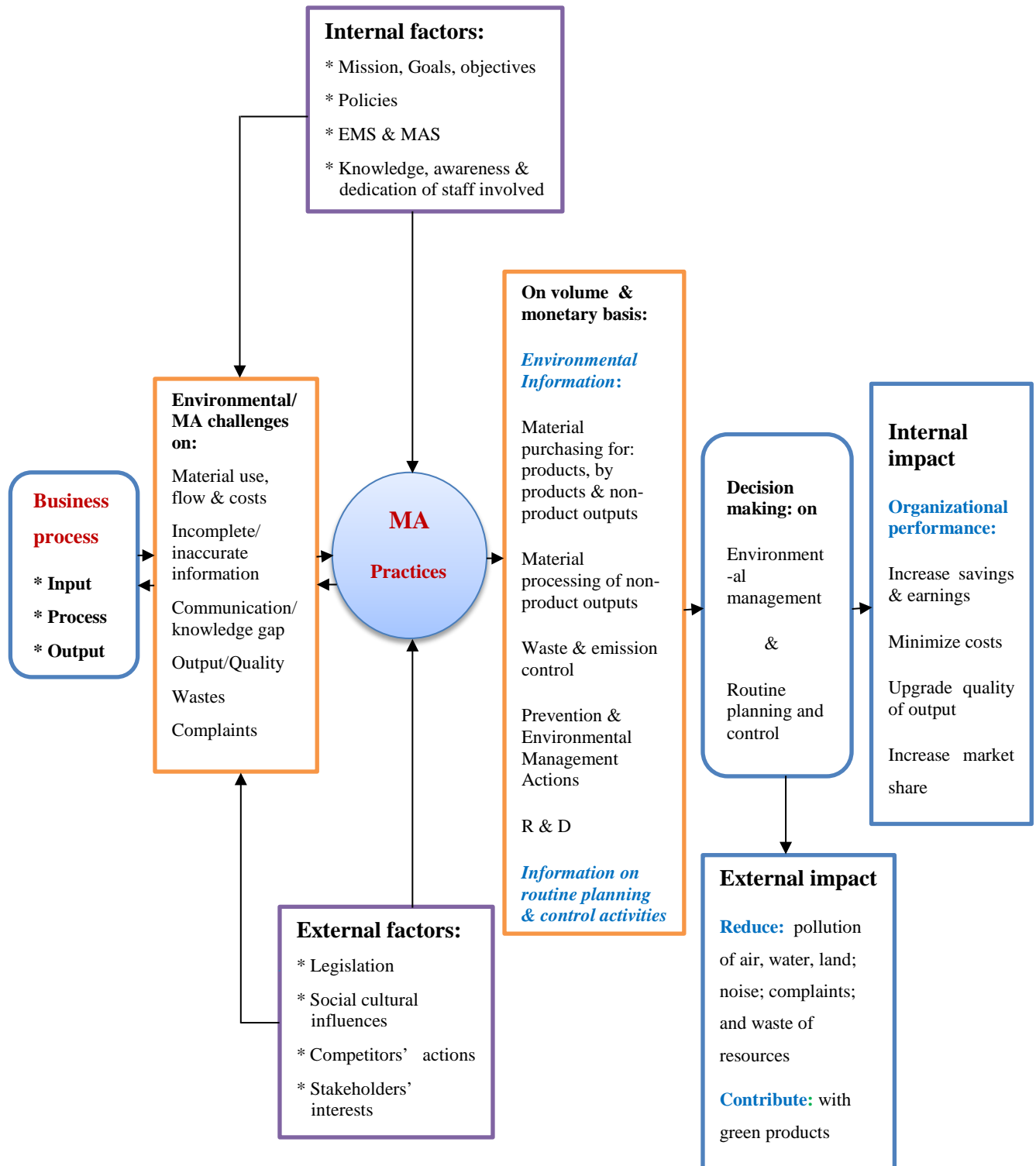
The terms EM, MA and EMA are used throughout the thesis in the following contents. Firstly, EM refers to managing the environmental costs associated with industrial activities that can be identified as per the environmental related cost categories outlined

by IFAC (2005, p. 38). Accordingly, this study investigates all these cost categories except for less tangible costs (see chapter two, pp. 37-38 for details). Secondly, MA is considered as an information system that can assist the management of companies in making decisions on routine planning and control activities as well as environmental-related activities, to help them identify and manage environmental costs, while improving organizational performance. In this setting, MA can provide insights into new ways for managers to save money, reduce costs, increase earnings and improve quality of outputs, and hence increase market share whilst creating a good image for the entity. Thirdly, in this study EMA is considered as a system that can assist company managers to not only solve their existing environmental problems but also identify new opportunities for cost savings and environmentally related earnings that improve financial and environmental performances.

Thus, taking these views into consideration, and mainly based on the EMA International Guidance document (IFAC 2005), the researcher has developed a conceptual framework (CF) for this study to demonstrate the integration of MA practices and EM issues of a business firm, as shown in Figure 1.1.

This also identifies several challenges to and limitations of conventional MA systems and practices that make it difficult to effectively collect and evaluate environment-related data, and which leads to making decisions based on missing, inaccurate or misinterpreted information. In this concern, Russell, Skalak and Miller (1994) suggest that the traditional cost accounting system has failed to assign environmental costs to the specific products or processes that generate them. Consistent with these interpretations, Vasile and Man (2012) realise that traditional accounting methods do not provide a suitable framework that is capable of identifying all the necessary data, which results in many potential environment-related costs being lost within indirect costs. The CF developed for this study therefore elaborates certain environmental and MA challenges and their implications for business process and MA practices, as affecting each other.

Figure 1.1 Integration of Management Accounting Practices and Environmental Management Issues



Those MA practices and challenges, and the success of EMS and its challenges, depend on several internal and external factors, such as management style, company goals and operating environment, culture, stakeholders, economy, legislation (Nawrocka & Parker 2009). Hassan, Maelah and Amir (2013), based on evidence from the Malaysian construction industry, suggest that both internal and external factors influence the adoption of EMA, which subsequently results in a high environmental and economic performance in organizations. Hassan et al. (2013) identified EMA as a relatively new environmental management tool, initially designed to trace and track environmental costs. Accordingly, these authors presented a research framework to examine both the factors that influence adoption of EMA, and the relationships between EMA and environmental and economic performance.

Therefore, this study investigates the impact of both *internal factors* (mission, goals and objectives; policies; EMS and management accounting system (MAS); knowledge, awareness and dedication of staff involved) and *external factors* (legislation; social and cultural influences; competitors' actions; and stakeholders' interest in MA practices and EM/MA challenges faced by business entities) on such MA practices and challenges, and the success of EMS and its challenges. According to Wilmshurst and Frost (2001), companies already have the basic structure for recording environmental information and include environmental information within existing MA information and control systems. At an internal level, this implies that a number of specific environmental issues are already being incorporated within many companies' accounting systems.

Considering these views and environmental-related cost categories outlined by IFAC (2005), the CF demonstrates that MA could provide, on a volume and monetary basis, environment-related information and information on routine planning and control activities, assisting management to make decisions in both phases.

Considering the ultimate results of this process that incorporates MA practices, EM issues and controlling measures of a business entity, the CF suggests that it may have internal impacts on organizational performance in terms of minimizing costs, increasing savings and earnings, upgrading quality of products and increasing market share, and also the external impacts in terms of reducing pollution of air, water and land, noise, complaints and waste of resources, and thereby contribute to the society with green products (IFAC 2005; Melnyk, Sroufe & Calantone 2003; Wilmshurst & Frost 2001).

However, this study does not focus on assessing the external impacts that are beyond the scope of this study and need to be considered in future research. Accordingly, the views of internal management only will be considered. In this investigation, by applying MMR approach, this study could provide a rich dataset from selected Sri Lankan listed companies, whereby a combination of questionnaire survey and interviews with selected finance managers are juxtaposed with interviews with environmental managers/officials to determine the impact of MA tools on EM activities.

1.7 Chapter Organization

This thesis consists of seven chapters.

Chapter One provides an overview, stressing the background of the study, the research problem, the objectives, scope and significance of the study, and demonstrating the areas and key variables considered and their incorporation diagrammatically in the CF that helped design the research project and address the research questions.

Chapter Two presents the literature review, aiming at constructing a strong theoretical foundation and directions for the study in main aspects such as MA practices, EM issues and EMS, and their integration. It also identifies a gap in the field through focusing on previous studies and their weaknesses, all of which lead to identify areas for future research.

Chapter Three considers environmental considerations of the Sri Lankan context with a view to familiarizing the reader with the context on which the research is based and initiatives made through legislation, standards, policies and strategies towards protecting the environment.

Chapter Four discusses the research methodology to be applied; focusing mainly on research design phases, and justifies the pertinence of the chosen approach: MMR.

Chapter Five presents an analysis and discussion of findings relating to MA practices of Sri Lankan listed companies by reviewing the nature and extent of application of traditional and modern MA techniques.

Chapter Six describes EM measures initiated by listed companies and motivation for such actions in the Sri Lankan context. It then presents an analysis and discussion of findings on the ability of management to respond to EM issues through their MA practices, associated challenges or problems, and factors affecting them. Finally, it evaluates overall performance of all these engagements.

Chapter Seven provides conclusions and recommendations for the study in an overview, presenting important findings and conclusions, and recommendations for business entities. It also presents implications of the thesis, and suggestions for future research focusing on the study's limitations. Finally it provides overall conclusion and recommendation.

Chapter 2 Literature Review

2.1 Introduction

This chapter aims to construct a strong theoretical foundation and direction for the study on ‘investigating the nature and extent of MA practices and their responses to EM issues in listed companies in Sri Lanka’ by reviewing and analysing previous studies and their findings. With this in mind, this chapter reviews theoretical and empirical literature relating to MA practices, EMSs, and the interplay between EMSs and MA practices and related issues. It also identifies a gap in the field through this review of literature.

Initially, the evidence of MA practices is considered, with particular attention to: the use of traditional *versus* modern MA techniques; adoption and benefits of MA practices; and changes in MA practices. The chapter then deduces EMS conceptions and considerations within the organizational context, focusing on emergence of environmental costs, and identifying environmental costs and related issues. The chapter further explores the integration between EM and MA, opening up reviews to incorporation of EM into MA, integration of FA, cost accounting (CA), MA and EMA, and environment-related MA practices. Finally, it concentrates on the contribution of MA practices in addressing EM issues, and related issues and challenges focusing on the role of accounting and accountants in implementing EMS, factors affecting MA practices and EM activities, motivation for adopting MA and EMA, challenges for MA practices and EM activities. The chapter concludes with a summary, deriving the research gap on which the primary research question is based for this study.

2.2 Management Accounting Practices

Focusing on traditional *versus* modern MA techniques, this section reviews via the literature the nature and extent of MA practices adopted by companies in different countries. It encompasses detailed analysis of those practices in relation to specific MA techniques, adoption and benefits of MA practices, and the changes of MA practices made by business firms in order to survive in a changing competitive business world.

2.2.1 The Nature and Extent of MA Practices-Traditional versus Modern MA Techniques

This section first elaborates a general view of MA Practices and then presents detailed analysis of MA practices with regard to specific MA techniques.

2.2.1.1 Overall View of MA Practices

Abdel-Kader and Luther (2004), through a questionnaire survey, examined the status of MA practices in UK companies, which represented the Food and Drink industry sector, and they suggest that MA systems employed in many UK companies are not particularly sophisticated. The findings reveal that budgeting for planning and controlling costs, product profitability analysis and performance evaluation based on financial measures are shown to receive greatest emphasis, demonstrating that traditional MA is very much alive. They further suggest that, of the more sophisticated techniques, increased use may be expected in relation to information concerning the cost of quality, non-financial measures regarding employees, and analysis of competitors' strengths and weaknesses.

In contrast, Sulaiman et al. (2004) in a literature review examine to what extent traditional MA tools are used, such as traditional budgeting, standard costing and variance analysis, cost-volume-profit analysis, performance measurement, product profitability analysis. They also review use of contemporary MA tools, such as ABC, BSC and target costing. Their review of four Asian countries, Singapore, Malaysia, China and India, suggests that traditional MA techniques are seen to be less useful in the present manufacturing environment.

However, they suggest that, to succeed in the present dynamic business environment, tools or strategies such as JIT systems, ABC, total quality management, process re-engineering, life cycle assessment and target costing would greatly enhance the ability of corporations to meet global competition. The main objective of this study is to identify and highlight MA practices, and then provide a comparative analysis of MA techniques used in the four countries. Overall, the evidence reviewed suggests that the use of contemporary MA tools is lacking, while the use of traditional MA tools remains strong in these four countries (Sulaiman et al. 2004). For example, according to Joshi (2001), in India the benefits accruing to traditional MA practices are high, and thus future emphasis is also on traditional MA techniques, which is probably because Indian

managers generally avoid risk and are quite conservative and tend to be less innovative, so that Indians are taking a longer time to adopt new MA tools. Another factor may be the high costs involved in implementing contemporary MA techniques because Indian companies perceive that it is rather expensive to implement new MA tools (Joshi 2001). Similarly, in Singapore there is an increasing use of cost-volume-profit analysis, standard costing and traditional budgeting over the period from 1987 to 1996 (Sulaiman et al. 2004).

Waweru, et al. (2005), in a survey of MA practices in 52 listed companies in South Africa focusing on budgeting process, standard costing, product cost measurement, inventory management, pricing decisions, transfer pricing, capital investment appraisal, divisional performance measurement and managerial performance measurement and other issues of MA, including MA change, present somewhat different ideas that modern accounting techniques such as ABC and balanced scorecard-type performance measures are used together with the traditional MA techniques, such as budgeting and standard costing.

Further, the high emphasis on cost management and the widespread use of flexible budgets for control purposes show that those South African firms are striving to reduce waste in their production processes, and increased use of ABC and emergence of ABB suggest a move towards the elimination of non-value adding activities and hence waste reduction. The study also recognizes that the MA practices advocated in the recent accounting literature are being applied in South African firms, indicating an increased use of MA practices in the sampled firms in South Africa. Thus there does not appear to be a significant gap between the theories of MA and practice. Waweru et al. (2005) therefore suggest, supporting the perception of the cited study in India (Joshi 2001), that an important factor limiting the implementation of more sophisticated MA systems is their unaffordable costs.

Lin and Yu (2002) Investigated the 'responsibility cost control system' operating at an iron and steel manufacturing company in China. The results show that the company does not apply western MA techniques, such as ABC and JIT, mechanically; in fact, it has integrated a series of important MA procedures and techniques, such as standard costing, flexible budgeting, responsibility accounting, internal transfer pricing, performance evaluation, and incentive programs for cost control throughout the entire responsibility chain. Lin and Yu (2002) reveal that the cost control system of the

company, aimed at effective cost reduction and meeting responsibility standards, is working well with desirable outcomes, raising the firm's productivity and profitability continuously.

Lin and Yu (2002) realize that the effective operation of the cost control system depends upon sound incentive programs associated with the system and the key is to set a direct link (e.g., bonus rewards and penalties) between the implementation outcomes of responsibility standards and income or other benefits for managers and workers. They conclude that MA or management-oriented accounting measures and procedures can play a positive role in Chinese business management. Further, they suggest that this experiment of employing MA techniques, as well as encouraging the active participation of all internal units and workers in cost management, could be a useful reference point for other enterprises in China and other less developed countries (LDCs).

A comparative analysis of MA practices between European and Asian countries was undertaken by Wijewardena and De Zoysa (1999) through a questionnaire survey in large manufacturing companies in Australia and Japan. They identify differences in major emphasis of MA practices: the MA practices of Australian companies emphasise cost control tools, such as budgeting, standard costing and variance analysis at the manufacturing stage, while those of Japanese companies devote a much greater attention to cost planning and cost reduction tools based on target costing at the product planning and design stage.

Of the MA tools considered, Australian companies place greater emphasis on budgets, standard costing and historical accounting statements, suggesting that their greater attention is on accounting tools that are basically used for planning and controlling costs, and preparing financial statements. By contrast, Japanese companies concentrate more heavily on target costing, cost-volume-profit analysis and budgets, suggesting that their attention is more on cost management that leads to cost reduction at the planning and design stage of a new product. Other significant differences in MA practices of those two countries were identified by Wijewardena and De Zoysa (1999) as follows:

- i) ABC appears to be more popular among Australian companies, but it is rarely used in the Japanese companies.

- ii) As a percentage of total assets, the inventory levels are considerably lower in Japanese companies for finished goods and raw materials, consistent with the Japanese concept of JIT inventory systems. By contrast, Australian manufacturers operate with higher inventory levels in respect of those two inventories, which may weaken their competitiveness and profitability, because tying up of large sums of funds in inventories can restrict investments and increase acquisition and carrying costs.
- iii) More Australian companies use a return on investment (ROI) measure in evaluating divisional performance, while most Japanese companies use return on sales (ROS) for the same purpose in order to overcome the limitation where ROI leads managers to place excessive emphasis on short-term profitability, which in turn brings less attention to research and development (R & D) investment, with a corresponding restriction on innovation.
- iv) In relation to major participants in new product cost estimation, the study confirms the view that the product designer plays a greater role in the product cost estimating process than the cost accountant, particularly in Japanese manufacturing enterprises, where target costing is widely used. In this function, the highest percentage participation (84%) is by accountants, among others, i.e., product designers, production managers and purchasing managers in Australian companies, as opposed to the highest participation (69%) by product designers in Japanese companies.
- v) With regard to costing systems, Australian companies indicate a higher percentage use of standard costing systems (69%) than Japanese companies (31%); on the other hand, Japanese companies indicate a higher percentage use of actual costing systems (48%) than their Australian counterparts (31%).
- vi) The percentage of surveyed Australian companies that made changes to their costing systems is lower (64%) than that of Japanese companies (92%) over the last two decades, supporting the view that the Japanese companies have introduced more timely changes to MA practices than their Australian counterparts (Wijewardena & De Zoysa 1999).

Hopper, Tsamenyi, Uddin & Wickramasinghe (2009) evaluating 75 empirical MA studies in LDCs reveal that most research is on financial accounting, and that it is unfortunate, as MASs play an important role within development: e.g., central planning requires iterative budgeting between state organs and enterprises, and current market-

based policies are predicated upon private interests fostering more efficient controls. As Hopper et al. (2009) argue, MASs embrace processes, structures and information for organizational decisions, governance, control and accountability. Paying particular interest to MAS and culture, Hopper et al. (2009) suggest a necessity to identify how local cultural attributes are reproduced in distinctive forms of accounting and accountability. Only then can MASs be adapted to local circumstances and preferences. Research concentrates on large organizations, often foreign-owned, and neglects indigenous small and micro-organizations, where culture may be more collectivist and inclined to informal trust. Thus they recognize the necessity of ascertaining whether the latter's MASs incorporate local cultures, not least regarding familial values, rights and obligations and their effects (Hopper et al. 2009).

As shown by Wallace (1990), this review further reveals that many accounting problems in LDSs are socio-economic and political, not technical. They identify no MAS unique to LDSs and neither does this review prescribe any MAS for LDSs; rather it seeks understanding and systems that aid dialogue and choice within local political processes. Hopper et al. (2009) conclude that research is growing, especially in state-owned and privatised enterprises, but more is needed on small and micro enterprises, agriculture, non-governmental organizations and transnational institutions.

Wickramasinghe, Hopper and Rathnasiri (2004), based on a Sri Lanka telecommunications company which was recently partially privatised and a major Japanese company became responsible for its management, investigated how modes of production and MA and controls in LDCs are related, and are transformed in an unpredictable and often unexpected fashion due to cultural, economic and political factors. The findings reveal that 'new' accounting and controls systems replaced bureaucratic management controls with positive commercial effects. The privatization of Sri Lanka Telecommunications was transparent, with no apparent malpractice, and placed management in the hands of minority private shareholders. They changed management control systems consistent with the predictions of supporters of privatization. Bureaucratic and commercially ineffective controls based on government rules and regulations were replaced by detailed business plans, regular monitoring and accountability, individual performance evaluation and rewards, and computerized information systems. More organic organizational structures evolve, and budgeting concentrates mainly on physical measures and makes efforts to link supply and demand.

Overall, these changes constitute a new MA and control system. However, the new calculative practices and organizational language of accounting resided with the chief executive officer (CEO) and engineers rather than with accountants in isolation.

Wickramasinghe et al. (2004) further indicate that the reversion to rule-bound bureaucracy destroys the operational rigour of the 'new' MA and control systems, and this turnaround is driven by political intervention. They also realize that the MASs' changes are not an organizational phenomenon; their roots are social and historical. The role of conventional MASs is relatively minor, due to the nature of business, which required careful scrutiny of capital investments and operational control through physical budgets and evaluation schemes. Nevertheless, it realises that sound accounting and effective management controls are exercised, and these are accepted and welcomed by trade union leaders, managers, and younger skilled workers habituated with capitalist modes of production and modern cultures (Wickramasinghe et al. 2004).

2.2.1.2 Detailed Analysis of MA Practices in Relation to Specific MA Techniques

Through the review of MA practices, we can identify different structures and levels of using specific MA techniques by different firms in different countries, as described below.

Costing Systems (Traditional vs. ABC Systems)

In relation to South African firms, Waweru et al. (2005) find a widespread use of simple cost allocation methods, regardless of the high proportion of indirect costs, which contrasts with that in developed countries, where a high proportion of indirect costs has resulted in the widespread use of activity-based cost allocation methods. In this respect, most South African firms use subjective methods based on managerial experience to classify these costs, and also use incremental costs with regard to decision making. But it is not clear whether the respondents understood the short run or long run implications of costs classification.

Wijewardena and De Zoysa (1999) also find somewhat similar situations in Japanese and Australian firms, in that, despite the decreased labour components in manufacturing cost structure, manufacturing companies in both countries seem to allocate factory overheads mainly on the basis of direct labour. On average, direct labour percentages of

total manufacturing costs are 16.3% and 22.1% in Japanese and Australian firms, respectively. Finally, they suggest that further research is needed to examine what MA practices in these countries have changed in the recent past and in what direction they are moving at the present time.

Regarding the costing systems applied, Abdel-Kader and Luther (2004) state that the separation of costs into variable/incremental and fixed/non-incremental is acknowledged as an important task by most of companies, but application of this distinction is often or very often seen at almost half these companies. In contrast, a small fraction indicates a high usage of three techniques – plant-wide, multiple rate or ABC – for allocating overheads to cost objects, suggesting that variable costing is much more common than various forms of absorption costing.

Expressing different views, Sulaiman et al. (2004) state that recent surveys have reported the increasing use of ABC, particularly amongst Western enterprises; in Asian countries percentage use of ABC is lower. However, amongst foreign firms and foreign-partnered joint-venture firms, ABC usage is much higher. Thus, Sulaiman, et al. (2004) suggest that an interesting area to address in future research is the obstacles to ABC implementation in Asian firms.

Budgeting

Abdel-Kader and Luther (2004) find that, although almost all companies use budgeting for planning and control, a high proportion does not flex or amend their budgets for changes in volumes or other factors. They work only with fixed budgets, applying ‘What if’ analyses fairly frequently. Although ABB is considered as important or moderately important by a majority of respondents (63%), only a smaller number (19%) uses it often or very often. The study further identifies that all companies which reported high level of usage for ABC did the same for ABB, assuming that companies start implementing ABC and then they use the activities analysis performed during ABC implementation to prepare their budgets. However, it is interesting to reveal that ABB is seen to be noticeably more important and frequently used than ABC, supporting their general finding that budgeting is more valuable than costing. Also, most respondents (83%) identify budgeting as an important part of their long-term strategic planning.

Similarly, comparing the results of studies in Australia and Japan, Wijewardena and De Zoysa (1999) state that budgeting is considered an equally important MA tool for planning and controlling product costs in both countries. Almost all Australian companies prepare budgets such as profit and loss statements, balance sheets, operating budgets, cash budgets and capital expenditure budgets, just like Japanese companies. But the considerable difference between the two countries is that the balance sheet and capital expenditure budget seems to be less popular in Japan. Also, the frequency of budget preparation indicates that annually prepared budgets are more popular in Australia, as opposed to biannually prepared budgets in Japan. When taken as a whole, preparation of monthly budgets is at a moderate level, while quarterly budgets are to be seen less important in both countries. Least importance is given to budget preparation beyond one year, showing 4% in Japan but a considerably higher level of 15% in Australia. But this does not suggest that Japanese companies are not engaging in long-term planning. In relation to preparation of long-term plans, more concentration is given by Japanese companies (95%) than their Australian counterparts (83%).

Capital Investment Appraisal

Wijewardena and De Zoysa (1999) reveal that, comparing Australian and Japanese companies, the accounting rate of return (ARR) appeared to be used most by Japanese companies, while the lowest usage was by Australian companies. Australian companies consider the payback period as the most important method, which is the second-highest ranking by Japanese companies, and then net present value (NPV) and ARR, respectively. Also, they find that Japanese companies report the greater use of the non-discounted cash flow approach than Australian companies do in appraising capital expenditure projects.

Performance Evaluation

Abdel-Kader and Luther (2004) state that over three-quarters of companies consider financial measures of performance to be fully important, and also non-financial measures of performance are highly important, especially in connection with customer satisfaction, but, despite that importance, 40% of respondents never or rarely actually used non-financial measures of performance in connection with customers, operations, innovations or employees. Also, they report an impression that the BSC is more talked

about than applied, and conclude that performance measurement is still very much dominated by financial figures.

Sulaiman et al. (2004) also emphasize that PE is an important function of MA, particularly in companies with a divisionalised organizational structure. In measuring divisional performance, they suggest that relying on accounting-related measures, i.e., ROI, economic value added (EVA) is not enough, and thus proponents of the BSC argue that non-financial measures should also be used. Consequently, many companies are currently focusing on both accounting and non-financial related measures. For example, according to Joshi (2001) study in India, all respondents used ROI, variance analysis and divisional profit to measure performance, and a considerable proportion (53%) of respondents also focused on non-financial measures, i.e., customer satisfaction, product quality. In addition, a high proportion (80%) of companies report that they evaluate performance based on customer satisfaction. However, Sulaiman et al. (2004) reveal that financial-based performance measures remain the favoured techniques as far as Indian companies are concerned.

Concentrating on views and usage of BSC in the four countries considered, Sulaiman et al. (2004) state that the BSC has gained increasing popularity since its introduction by Kaplan and Norton, and that scholars and practitioners similarly have argued that relying solely on accounting metrics to evaluate performance may not be adequate. With this in mind, introducers (or inventors) of the BSC have focused on four perspectives of a business: the internal business process, learning and growth, customers and financial aspects. Thus they assume that, in order to achieve a balance, firms need to focus on all these perspectives.

Sulaiman et al. (2004) further report that Atkinson et al. (1997) argue that the BSC may be regarded as one of the most significant developments in MA, and Hoque and James (2000) find that there is a positive relationship between size and BSC usage: the bigger the company, the more practical it is to use BSC to support strategic decision making. Sulaiman et al. (2004) also state that Joshi (2001) study to some extent supports this contention: he finds that large companies tend to use newly developed MA techniques to a greater extent than medium-sized enterprises. Sulaiman et al. (2004) find that in Malaysia very few (13%) companies use BSC, whereas in India usage is higher (40%) than in Malaysia, and surveys in Singapore and China did not examine the BSC.

Target Costing

Sulaiman et al. (2004), through their literature review, report that target costing is said to provide companies with a competitive edge, as it provides continuous improvement both at the design and production stage. Consequently this will help companies, particularly Japanese companies, to maintain their competitiveness (Sakurai, 1989). In India, target costing has shown potential, but in terms of its benefits, the survey ranked it fourth; however, in terms of its future emphasize, it was ranked first, indicating a possible increase in its use in the future. In Malaysia, according to Tho, Md. Isa and Ng (1998) study, 41% of respondents have implemented target costing and 4% would implement it in the next five years (Sulaiman et al. 2004).

Standard Costing and Variance Analysis

Consistent with the literature review by Johnson and Kaplan (1987), Waweru et al. (2005) find that the variance investigation is mainly carried out for control purposes. However, it identifies a decline in the use of this practice amongst the South African firms considered, because the majority of respondents have abandoned the standard costing system mainly due to rapidly changing business environment, as they revealed that changing circumstances usually cause standards to be irrelevant.

Use of MA Information for Decision Making and Other Purposes

Considering the use of cost accounting data for a series of management activities (decision making; budgeting and budgetary control; cost management; product pricing; preparation of financial statements; and performance evaluation), Wijewardena and De Zoysa (1999) reveal that there is no statistically significant difference in responses of both countries on the use of cost accounting data for decision making purposes, although it appears first in Australia and fourth in Japan in the ranking of the management activities cited above. However, cost management and product pricing were ranked by the Japanese companies as the most important uses of cost accounting data, against a similar ranking of decision making and budgeting and budgetary control by Australian companies. Also, both countries have similar ranking of importance (less importance) on the use of cost accounting data for financial statement preparation and performance evaluation purposes.

In regard to the purposes in using standard costing, Wijewardena and De Zoysa (1999) reveal that the most important purpose of Australian companies is product costing, which is given a lower ranking by Japanese companies because of their greater emphasis on target costing in relation to product costing. Despite the generally held view in Western countries that standard costing is used primarily for cost management, Australian companies assign a lower ranking to this function because they consider standard costing to be more useful for other functions, such as product costing, budgeting, inventory valuation, and management control. Japanese companies also assign a lower ranking for the cost management function, which is considerably lower than that for cost control, because of their more extensive use of target costing rather than standard costing for cost reduction. The most important uses of standard costing by Japanese companies are for budgeting and cost control purposes. The reason may be that, even though they use target costing exclusively for cost reduction at the pre-production stage, they may use standard costing for cost control at the production stage (Wijewardena and De Zoysa 1999).

Waweru et al. (2005) suggest that most firms use subjective methods based on managerial experience to classify their costs, and use incremental costs with regard to decision making.

2.2.2 Adoption and Benefits of MA Practices

In this section, the attention is given to similar studies by Chenhall and Langfield-Smith (1998) in Australian manufacturing firms (either strategic business units or companies in their own right), by Hyvönen (2005) in Finnish firms at the business unit level, which consists mainly of large firms operating in three industries in Finland (forestry, metals and electronics), and by Angelakis et al. (2010) in large Greek manufacturing companies listed on the Athens Stock Exchange and non-listed companies. Focusing on budgeting, performance evaluation with financial and non-financial measures, benchmarking, capital budgeting, long-term forecasting, product profitability analysis, BSC, cost volume profit analysis, absorption costing, variable costing, shareholder value analysis, ABB, ABC, activity-based management, target costing, and product life cycle analysis, these similar studies termed this 'adoption and benefits of MA practices'. They mainly investigated three aspects of MA practices: i) extent of adoption of certain traditional and recently developed MA practices, ii) the degree of benefits received from the adoption of those MA practices over the last three years, and

iii) the degree of emphasize the business unit will place on each MA practice over the next three years.

Chenhall and Langfield-Smith (1998), through a survey focusing on the relative adoption and benefits obtained from both traditional and recently developed MA practices in large Australian manufacturing firms, reveal that, although the adoption rates for many recently-developed MA practices such as ABC are higher than those reported in surveys from other countries, overall the adoption rates of traditional MA practices are higher than those of recently developed MA techniques. Also, the benefits obtained from traditional MA techniques are higher than those of new MA techniques. However, many firms intend to place greater emphasis on newer MA techniques in future, particularly on activity-based techniques and benchmarking.

The findings also suggest that financial performance measures such as budgeting for controlling costs, budget variance analysis, ROI and divisional profit, indicated high adoption rates and showed high benefits, and that the majority of large Australian manufacturing firms have adopted a range of MA techniques that emphasize non-financial information, i.e., BSC, customer satisfaction, employee attitudes, team performance, qualitative measures, and ongoing supplier evaluation. Those measures may emphasize and be used to monitor areas of strategic importance so that they take a more strategic focus. The findings ultimately suggested that financial performance measures continue to be an important aspect of MA; however, these are being supplemented with a variety of non-financial measures.

Hyvönen (2005) reveals that all the MA techniques considered have been adopted by the majority of respondents, and the three most beneficial MA practices are traditional financial measures, including divisional profit in performance evaluation, budgeting for controlling costs and variable costing. Future emphasis will be on product profitability analysis, budgeting for controlling costs and qualitative measures in performance evaluation. This also indicates that financial measures are going to be important in the future, although the greater emphasis is going to be placed on newer practices.

In comparison with the findings reported by Chenhall and Langfield-Smith (1998), Hyvönen (2005) reveals that Finnish firms put greater emphasis on recently developed non-financial measures than do Australian firms. It is further stated that the recently developed techniques are relatively more adopted in Finland than in Australia, and this

trend may be partly because of the different sample period in the studies. As was indicated, the time of the survey is likely to influence the results of that survey.

Angelakis et al. (2010), conducting the same survey in large Greek manufacturing firms, reveal that the majority of the practices considered are implemented by most organizations and that, on average, their findings are most similar to those of Chenhall and Langfield-Smith (1998): while the implementation rates for many currently developed MA practices are at a high level or similar to those presented in other countries, in total, traditional MA practices are found to be marginally more highly implemented than those recently developed. However, according to Angelakis et al. (2010), there is an increasing trend for firms in the future to place greater emphasis on currently developed MA techniques, particularly on performance evaluation techniques instead of traditional ones. Comparing the findings of this study with the similar, earlier study in Finland by Hyvönen (2005), this indicates that, as in Finland, financial measures will be important in the future and also great emphasis will be focused on currently developed techniques. Angelakis et al. (2010) conclude that Greece is behind Finland in practising various MA techniques.

2.2.3 Changes in MA Practices

It is generally believed that, in responding to a changing business environment, business firms should change their strategies, policies, procedures and management systems in order to sustain themselves in a competitive market. In this endeavour, it is vital to make changes to the MA practices of business firms in order to facilitate all managerial functions by providing most relevant timely information that could better respond to the changes made or to be made in the business processes. Thus, it is important to investigate whether business firms have concentrated on this issue and, if so, how changes in MA practices took place in business firms to respond to a changing business environment.

Focussing on Japanese MA systems, Abdul-Rahman, Omar and Taylor (2002) present a supportive assessment showing that for decades, as Japanese firms recognized, international competition requires the best intelligent MA systems to collect, analyse and interpret data. Thus, like Japanese firms, organizations should adopt strategic management accounting (SMA) practices, i.e., MA designed to support a competitive business strategy, and MA systems should not be confined to internal variables. In order

to respond to increasing competition, organizations should consider external and global factors, such as strategy and corporate structure, and thus MA systems should be designed to support these variables.

Hiramoto (1991), using four case studies at successful Japanese manufacturing firms in several major industries, including automobiles, semiconductors, and consumer electronics, reveals that business activities are carried out in a mixture of optimization and innovation, but earlier MA lost its balance because it overemphasized supporting static optimization and helping managers plan and control optimal behaviour. Hiramoto (1991) states that, in the past, the primary concern of management accountants was to see that materials, existing plant and equipment were used in an optimal manner and that employees worked in a way to use those facilities most efficiently, and thus MA used to be recognized as '*accounting to facilitate a superior's optimal decisions*'. However, today when continuous innovation is the source of global competitiveness, the key resource to manufacturing excellence is creative people so that here MA should be recognized as '*accounting for getting people to do the desired jobs well*', and thus, the most basic element of today's MA must have a behavioural focus (Hiramoto 1991, p.14).

Wijewardena and De Zoysa (1999), comparing MA practices in Australia and Japan, provide supportive argument on Japanese MA systems. Confirming the view that Japanese companies have introduced more timely changes to MA practices than Australian companies, Wijewardena and De Zoysa (1999) reveal that the percentage of surveyed Australian companies that made changes to their costing systems is lower (64%) than that of Japanese companies (92%) over last two decades.

Tuanmat and Smith (2011) find that the level of changes of MA practices in small and medium companies is similar to those in large companies, so that there are no significant differences in changes in MA practices in large, small and medium companies. As a result, the challenges for small and medium companies are greater compared to large companies, as the former are forced to compete not only among themselves, but also with large companies, both locally and internationally. Thus, their business management must be on a par with that in large companies in order to remain competitive.

Waweru et al. (2005) find that there has been a significant change in MA practices in South African companies during the last 17 years, both in the introduction of modern MA techniques and the way of using such techniques, which may be attributable to the rapid increase in competition locally and internationally. Also, they reveal that the MA practices advocated in the recent accounting literature are being applied in South African firms, so that there does not appear to be a significant gap between the theories of MA and practice.

Analysing the changes in the accounting system of a large Malaysian enterprise before and after its privatization, Abdul-Rahman et al. (2002) reveal that there has been substantial improvement in the accounting system, particularly relating to the component of budgeting.

Tuanmat and Smith (2011), in a survey of 171 manufacturing companies which were incorporated before 2003 and representing 21 industry sectors in Malaysia, also investigated how changes in MA practices took place in response to a changing business environment and the effect of changes on performance over the five-year period from 2003 to 2007, particularly because Malaysia has moved towards global competitiveness. The findings confirm that both traditional and advanced MA practices in Malaysian manufacturing companies have changed very greatly in that five-year period, suggesting that these changes in MA practices might be due to the changes in business environment, especially changes in the competitive environment and manufacturing technology. The results also demonstrate that both traditional and advanced MA practices appeared to be equally important and that manufacturing companies in Malaysia rely on both techniques in order to cope with significant changes in the business environment.

Tuanmat and Smith (2011) further investigated whether advanced MA practices should be used to complement or substitute for traditional MA practices, which is an important issue because business firms have to make suitable changes in their MA practices to maintain effectiveness. Firms recognize that, as technology becomes more advanced, existing MA practices need to be replaced with new techniques that can cope with the changes in production processes as well as cost structures. The findings illustrate three different types of changes of MA practices that have frequently taken place in Malaysian manufacturing companies:

- i) Introduction of new MA practices in parallel with the existing techniques;
- ii) Replacement of existing practices with a new one; and
- iii) Modification of the use of existing MA practices.

The findings reveal that those companies largely change both traditional and advanced MA practices either as a replacement, a new introduction or a modification of the use of an existing system. This implies that advanced and traditional MA practices can potentially be perceived as both complements and substitutes for each other, and thus they recommend using both advanced and traditional MA practices as complements and as substitutes.

They further suggest that, in situations where the traditional system is inadequate in providing sufficient information, but still able to provide useful information, an advanced system should be adopted to provide more information for decision making purposes. However, once the traditional systems are no longer able to cope with changes in information requirements, and fail to provide useful information, then they should be replaced with more advanced systems (Tuanmat & Smith 2011).

Considering local and foreign companies, Tuanmat and Smith (2011) indicate somewhat different views compared to Abdul-Rahman et al. (2002) findings that foreign companies often use more advanced MA practices and local companies are still largely using traditional methods, that both local and foreign manufacturing companies in Malaysia increasingly used advanced MA practices. Tuanmat and Smith emphasize that this result is interesting because local companies need to be more aggressive in managing their business in order to compete globally.

Tuanmat and Smith (2011) state that the findings of the study support the suggestion of Laitinen (2006): changes in MA practices are associated with good financial performance, highlighting that there is further well-established empirical evidence for an association between MA practices and performance. For example, Baines and Langfield-Smith (2003) find that firms with a greater reliance on non-financial accounting information improved their performance. And Ittner and Larcker (1995), Mia and Clarke (1999), and Sim and Killough (1998) similarly find a positive interaction between MA information and performance.

Tuanmat and Smith (2011) emphasize that, as the business environment has been changing continuously, it is critical to ensure that an appropriate MA system is practised in organizations. This is important because effective MAS can help managers to better coordinate business activities and provide useful information for them to make decisions, and this process will ultimately improve organizational performance. Thus, the results of this study provide helpful insights and useful guidelines to organizations facing with these changes, especially those managers who are responsible for making sure that their companies move in an appropriate direction (Tuanmat & Smith 2011).

Considering the literature above altogether, it can be revealed that most companies in different countries adopt both traditional and modern MA techniques, *but level and importance they have given for each technique is different*, i.e., attention is more on traditional MA or less on modern techniques, or the reverse of this, or equally for both. In general, Western countries pay greater attention to modern techniques such as ABC and BSC than do Asian countries, but in future most Asian countries intend to pay more attention to adopting modern techniques too. In this regard, more attention will be seen to be on non-financial measures also in the future.

Further, there seem to be significant differences on the major emphasis of MA practices, i.e., cost control, cost planning and reduction, and on purposes of using MA techniques by different firms. In regard to changes in MA practices, business firms have recognized the necessity of making changes to their MA systems in order to compete in a changing business world, and different ways of making changes considering traditional *versus* modern MA techniques. Also, irrespective of business activities being carried out in a mixture of optimization and innovation, in the past MA overemphasized supporting static optimization and helping managers plan and control optimal behaviour. However, today it is realized that the key resource to manufacturing excellence is creative people, so that MA should be recognized as '*accounting for getting people to do the desired jobs well*' (Hiromoto 1991, p.14), and thus the most basic element of today's MA must be a behavioural focus.

Kattan, Pike and Tayles (2007), investigating the impact of external environmental uncertainty on the design and implementation of MA systems of a very large stone-cutting and finishing company in a developing economy, Palestine (where uncertainty stems from political fluctuations), over a period of ten years which involved considerable environmental changes, find that the management accounting and control

systems used are more mechanistic in times of environmental and political stability, but become more organic in periods of greater uncertainty. They reveal that during periods of particularly high political turbulence, and hence high uncertainty, the emphasis is upon management of cash flows, with little reference to budgets and standards, and the accounting department spends most of its time concentrating on traditional financial accounting and transaction recording activities rather than producing management information. In this circumstance, decision making depends heavily on the intuition (perception) and judgement of the owner-manager without reference to the reports of the accounting department.

Kattan et al. (2007) further identify important factors that led to change in management accounting and control systems as ISO certification, the expansion of operations and the availability of computers. They concluded that MA in developing economies cannot be understood without reference to the wider political, cultural and economic factors of the countries concerned, and in less developed economies this embraces cultures, capital markets, bureaucracies and regulation. Thus, companies operating in those markets are influenced by and need to react to such changes.

At the same time, it is important to investigate how and to what extent business firms could respond to environmental costs and related issues in their MA systems, because there seems to be an increase in environmental costs and related issues in business firms. Thus, the next section focuses on identifying environmental costs, related issues, EMS, and interaction between EMS and MA practices.

2.3 Environmental Management Systems: Conceptions and Considerations

This section reviews conceptions and considerations by responsible authorities, legal bodies and researchers on emerging environmental costs and related issues.

2.3.1 Arising Environmental Costs and Related Issues

Concentrating on increasing environmental costs of organizations and related environmental regulations, UNDSO (2001) reveals that the costs for industry of environmental protection, including pollution reduction, waste management, monitoring, regulatory reporting, legal fees and insurance, have increased rapidly in the past 20 years with increasingly stringent environmental regulations.

At the same time, UNDSO identifies environmental issues that may arise with conventional MA systems. Conventional MA systems attribute many of those environmental costs to general overhead accounts, so that product and production managers have no incentive to reduce environmental costs, and also executives are often unaware of the extent of environmental costs. The aggregation of environmental and non-environmental costs in overhead accounts results in their being 'hidden' from management. Thus, there is substantial evidence that management tends to underestimate the extent and growth of such costs. However, by identifying, assessing and allocating environmental costs, EMA allows management to identify opportunities for cost savings (UNDSO 2001).

Supporting this view, IFAC (2005) also states that, although environmental issues, along with the related costs, revenues and benefits, are of increasing concern to many countries around the world. There is a growing consensus that conventional accounting practices simply do not provide adequate information for EM purposes. It is further shown that, to fill in the gap, the emerging field of EMA has been receiving increasing attention (IFAC 2005).

What are environmental costs?

Jasch (2003) emphasises that the main problem is lack of standard definition of environmental costs, so that, depending on various interests, they include a variety of costs by different groups e.g., disposal costs or investment costs, and sometimes external costs, (i.e., costs incurred outside the company, mostly to the general public). This is also true for profits of corporate environmental activities (environmental cost savings). Supporting the views of UNDSO (2001) and of IFAC (2005), Jasch (2003) further reveals that most of these costs are usually not traced systematically and attributed to the responsible processes and products, but simply summed up in general overheads. As a result, organizations often lead to distorted calculations for improvement options and achieved savings, as environmental costs are not fully recorded, and hence environmental protection projects are not recognized and implemented to prevent emissions and waste.

Jasch (2003) identifies that environmental costs comprise both internal and external costs and relate to all costs incurred in relation to environmental damage and protection. Environmental protection costs include costs for prevention, disposal, planning, control, shifting actions and damage repair that can occur in companies, governments or people.

However, the amount of corporate environmental protection expenditure is not directly related to the environmental performance of a company.

Jasch (2003) further states that environmental protection expenditures are only one side of the coin in relation to internal calculation of environmental costs for a company, and the costs of waste and emissions include much more than pollution prevention or treatment facilities. In her study, waste is a general term for solid waste, waste water and air emissions, and thus it comprises all non-product output. Materials include water and energy. Thus, this identifies waste as a sign of inefficient production. Jasch, in calculating environmental costs, considers three aspects: wasted material purchase value; production costs of waste and emission; and disposal fees.

Based on the environmental cost assessment scheme developed for the UNDSO EMA working group, Jasch (2003) identified and analysed environmental costs of a company in Austria under five categories: *i) waste and emission treatment, ii) prevention and environmental management, iii) material purchase value of non-product output, iv) processing costs of non-product output, v) environmental earnings (p.670)*. The study reveals that the particular company has been assessing environmental costs since 1999 and participated in the pilot testing for the EMA scheme for UNDSO. The analysis of the results reveals that, among the environmental cost categories considered, the highest environmental costs percentage (80.4%) is given to the material purchase value of non-product output.

IFAC (2005) also presents almost similar environmental-related cost categories, savings and earnings on which this study is based, as indicated below.

Costs:

- i) Material costs of product output (purchase costs of natural resources such as water and other materials that are converted into products, by-products and packing)
- ii) Material costs of non-product output (costs of energy, water and other materials that become waste and emissions)
- iii) Waste and emission control costs (costs for handling, treatment and disposal of waste and emissions; remediation and compensation costs related to environmental damage; and any control-related regulatory compliance costs)

- iv) Prevention and other EM costs (costs of preventive EM activities, i.e., cleaner production projects, and other EM activities, such as environmental planning and systems, environmental measurement, environmental communication, and other relevant activities)
- v) Research and development (R&D) costs related to environmental issues
- vi) Less tangible costs (internal and external costs related to less tangible issues, i.e. liability, future regulations, productivity, company image, stakeholder relations, externalities).

Earnings:

From sales of scrap or waste (for reuse by another organization); subsidies; sales of excess capacity of waste treatment facilities; insurance reimbursement for environmental-related claims; higher profit margins due to environmentally benign products etc.

Savings:

From decrease of materials use and waste generation (as a result of efficiency improvements by implementing preventive EM activities, i.e., on-site recycling, extended producer responsibility, cleaner production, green research and design, green purchasing; and improvements in environmental planning and systems).

Jasch (2003) reveals that the basis of environmental performance improvements and for assessing the amounts and costs of non-product output is the recording of material flows in kilograms by an Input-Output Analysis. Jasch (2003) also indicates here that the purchased input is cross-checked with the amounts produced and sold, as well as the resulting waste and emissions, which aims at improving efficiency of material management both economically and environmentally.

In this respect, Jasch (2003) further reveals that the core part of environmental information systems is material flow balances in physical units of material, water and energy flows within a defined system boundary. The system boundaries can be undertaken at the corporate level, and further directly be undertaken relating to cost centres, production processes, specific machinery or products. It would then become the task of process technicians, and not necessarily accountants, to address and trace the

necessary data. The study also explains that the input-output balance at the corporate level is drawn up on an annual or a monthly basis, and should be linked to the book keeping, cost accounting, storage and purchasing systems, and all material flows should be listed with their values and amounts per year.

Laurinkeviciute and Stasiskiene (2006), developing an EMA model integrating corporate information systems of a Lithuanian textile company, identify water pollution as the major environmental problem caused by a great amount of water and dyes (synthetic and natural) involved in a manufacturing process in the textile industry, and also air pollution and solid waste as other problems associated with this industry. They find that environmental impacts of the companies affect their economic situation, because of increasingly stringent environmental regulations and of expenditure relating to purchase value of materials, which become a part of waste, waste water or emissions.

2.3.2 EMS, EMAS and ISO 14001 Conceptions and Considerations

According to Albelda (2011), the growing importance of sustainability and sustainable development is changing business (IFAC 2011; United Nations global Compact - UNGC 2010) and more and more voluntary initiatives to integrate social and environmental issues into business emerge nowadays. As sustainability is being recognised as a source of competitive advantage, organisations move into achieving sustainable economic, social and environmental performance, although economic growth remains at the core of business (Hart & Milstein 2003; Porter & Kramer 2006). Thus, business sustainability efforts are mainly directed towards expanding markets and maintaining business as usual. According to Hart and Milstein (2003), a sustainable enterprise is one that contributes to sustainable development by delivering simultaneously economic, social and environmental benefits.

Since the middle-1990s, the implementation of an EMS according to a voluntary certification scheme – such as the International Standard ISO 14001, which was launched in September 1996 or the European Eco-Management and Audit Scheme (EMAS) – has been a common practice used by organisations to show their commitment to environmental issues and to sustainable development. An EMS aims at encouraging organizations to control their environmental impacts and to enhance continuous environmental improvements: it is intended to evaluate report on and improve organizations' environmental performance (Albelda 2011). Honkasalo (1998)

also states that EMAS is an environmental management standard that seeks to assist firms in evaluating, reporting and improving their environmental performance.

According to ISO 14001, environmental sustainability is one of the biggest challenges we face in our global community. Organizations are conducting businesses within complex legal structures, while stakeholder demands are increasing and environmental performance expectations are becoming more onerous. To operate effectively in this environment, organizations are now required to demonstrate proactive management of the environmental impacts of their business activities. Effective EM involves incorporating environmentally responsible practices into everyday business processes (ISO 2000).

According to ISO 14001, an EMS is a framework that can be integrated with existing business processes to identify, measure, manage and control environmental impacts effectively and hence environmental risks. An EMS is a part of the overall management system, and it establishes the means for improving performance and moving towards environmental sustainability through best practice such as ISO 14001 (ISO 2000).

EMAS is a voluntary management tool available for any kind of organisation aiming to improve its environmental and financial performance, and communicate its environmental achievements to stakeholders and society in general. Examining the value of an EMAS to an organization, Albelda (2011) states that EMAS is not only regarded as a system to reduce the organisation's environmental impacts, but it is also perceived as a scheme that signals environmental friendliness to internal and external stakeholders, and that could become a means of integrating environmental concerns into an organisation's collective values.

Similarly, Staniskis and Stasiskiene (2006) state that there is a growing consensus among Lithuanian policy makers, practitioners and industrialists that environmental policy must move from a reactive stance to a more proactive, sustainable development approach. As a result, many companies are increasingly interested in the application of economic incentives, at least as supplements to or reinforcement of environmental standards.

Supporting the views of Tilt (1997) and Staniskis and Stasiskiene (2006), Bracke, Verbeke and Dejonckheere (2008) reveal that responding proactively to growing

environmental pressure is a widespread trend among companies. They further emphasize that EMAS is a voluntary scheme, and thus participation decisions will follow a comparison of the monetary and non-monetary costs and benefits. Moreover, pointing out differences between EMAS and ISO 14001, they reveal that, as EMAS is perceived as being more demanding than ISO 14001, it may present a better picture of environmental responsiveness. EMAS is public regulations to which companies can voluntarily subscribe, and thus it can be situated at the junction between voluntary initiatives and public regulations, while ISO 14001 is considered as a voluntary private sector initiative.

Kollman and Prakash (2002) and Watson and Emery (2004) also present similar views that EMAS is considered the standard of environmental excellence and is more stringent and demanding than ISO 14001. As a result, it can be expected that implementing EMAS is more costly than ISO 14001, and consequently the number of EMAS-registered companies is rather small compared to the number of ISO 14001-certified ones.

Expressing somewhat similar ideas, Watzold (2009) indicates that EMAS is slightly more demanding than ISO 14001 in terms of requirements for improving legal compliance. EMAS requires, in addition to an EMS, a valid environmental statement to inform the public. However, legal compliance is not a necessary condition for ISO 14001 certification, and thus less costly than EMAS, as it does not require an environmental statement, which generates on average only a few benefits. Companies derive higher net benefits from ISO 14001, as its participation cost is lower and because it is an international standard. Also, ISO 14001 is an internationally recognized standard, whereas EMAS is only for European firms. Giving EMAS preferential treatment, therefore, leads to higher costs and foregone benefits for EMAS participants (Watzold 2009).

On the other hand, highlighting similarities, Watzold (2009) also indicates that ISO 14001 and EMAS are based on the same principle, and both are EMS standards which define certain requirements that ought to be met by a company through its EMS. Also, ISO 14001 provides for companies an alternative to EMAS. Although it is expected there will be a minimum level of environmental performance by organizations implementing an EMS according to ISO 14001 or EMAS, there are no commitments setting specified levels of environmental performance to be attained, and these are

treated in essence as procedural requirements. Thus, once meeting these requirements, the particular company may apply to external bodies for certification of ISO 14001 or registration of EMAS and then, with this certification or registration, the company can use this recognition for its external and internal communication (Watzold 2009).

Melnyk et al. (2003), supporting this view, indicate that the ISO 14001 EMS standards are a process, not performance standards: these standards do not mandate a particular organization's optimum environmental performance level but describe a system to help an organization achieve its own environmental objectives.

As cited by Albelda (2011), on the other hand, it should be kept in mind that the ISO 14001 standard and the EMAS are adaptable for different organisational needs and therefore the development and implementation of EMS cannot be considered homogenous or unambiguous (Matthews, Christini and Hendrickson 2004; Yin and Schemidler 2009) and domestic factors are also indicated as significant drivers of their adoption (Delmas 2002; Kollman & Prakash 2002; Wagner 2009).

Melnyk et al. (2003) conducting a survey of North American managers (plant-level experts) and their attitudes towards EMS and ISO 14001, reveal that with the introduction of ISO 14001, attention has turned to corporate EMS assuming that such a system is critical to a firm's ability to reduce or eliminate waste and pollution created by the fabrication, use and disposal of a product while improving overall performance (environmental and operations) at the same time.

Melnyk et al. (2003) further state that basically a formal EMS does play a critical role in improving overall performance (environmental and operations) and it also affects the frequency with which various environmentally related options are used. Furthermore, certification of these systems (EMS certification) does have a significant incremental impact on performance and on the reactive options the plants involved in the firm adopt than happens in firms not having EMS certification. In addition, experience with these systems over time has a greater impact on the selection and use of environmental options. They conclude that the EMS is important, because it is not only at the heart of the ISO 14001 certification process, but is also integrated within operations management, and, further, the certification, as embodied within the ISO 14001 environmental standards, brings with it real benefits.

Furthermore, analysing the four aspects of EMAS (EMS) that act as catalysts for change through the development of intangible assets that improve environmental performance, Albelda, PE, Correa-Ruiz and Carrasco-Fenech (2007) suggest the following intangible assets in relation to each aspect of EMS: i) training and awareness building, with two critical intangible assets – the awareness of employees, and their environmental knowledge, skills and expertise; ii) continuous environmental improvement, with two intangible assets – the integration of environmental issues in the strategic planning process and the use of management accounting practices; iii) integrating stakeholders' interests; and iv) organisational learning, with five intangible assets related to these two aspects – the environmental knowledge, skills and expertise of employees, the commitment of managers, cross-functional coordination and communication, the integration of environmental issues in the strategic planning process, and the use of MA practices.

Further, they suggest that, although the study does not intend to generalize, it would help other organizations to identify key intangible assets that contribute to improve their environmental performance, by providing insights into the interface between EMSs and MA and the implication of this for organizational change and environmental performance. In addition, their study identifies the more advanced use of MA practices as a key intangible asset for further environmental embeddedness and improving environmental performance.

Nawrocka and Parker (2009), through a meta-study involving a pool of 23 research articles which connected environmental performance to EMS, find that, although the number of studies regarding this connection is increasing, the results of these appears to be inconclusive: some authors claim that EMS leads to improving environmental performance, while others show that there is no such connection, at least not in the areas selected for the investigation. They notice that those evaluations are dealing with different industrial sectors, companies of different sizes and, last but most importantly, different preconceptions of what environmental performance are, and firms apply different approaches to discuss the environmental performance of EMS. Two main reasons are identified behind such mixed conclusions: i) there is no agreement as to what environmental performance is or how to measure it, and ii) there is neither clarity nor agreement on how or why EMSs are expected to aid performance.

Therefore, Nawrocka and Parker suggest that definition of performance must be clearly stated in any study, albeit varied or subjective, and that it has to be recognized that all research methods have their own strengths and limitations. Also, they suggest that it is more fruitful to research how EMSs affect performance, rather than whether they do so or not, because if someone asks whether EMSs leads to improve performance, the answer will quite likely be ‘it depends’, whereas if someone asks how EMS affects performance, this will at least generate useful insight into improving the systems. Finally, these various results support a hypothesis that the effects of EMS are not general but dependent on other factors, such as the management style and goals of the particular company, its operating environment, culture and stakeholders.

Focusing on attempts towards EM consideration and its success in Sri Lanka, Zubair (2001) argues, through a review of over 500 environmental impact assessment (EIA) and initial environmental examination (IEE) reports in Sri Lanka, that the introduction of EIA to Sri Lanka has been successful and robust, and the EIA process is well understood throughout the government and by the public. Also, the EIA process has succeeded in introducing a mechanism for transparency and public review of projects. The drives behind this achievement are the initiatives taken to ensure success of the EIA process, such as training programs by the Ministry of Environment (MoE), the Central Environmental Authority (CEA), and the University of Peradeniya (which has produced over 200 trained personnel in the government, private sector, NGOs and academia), in addition to including it in planned courses at postgraduate level in several universities. He concludes that in Sri Lanka the EIA process has succeeded in integrating environmental and other public concerns into the project planning process while recommending legal, policy, administrative and technological measures for the process to avoid any shortcomings identified.

The interpretations above provide evidence that an EMS is considered part of a management system, and there has been a significant relationship among EMS, MA practices and organizational overall performance, including environmental performance. This also provides insight into the interface between EMSs and MA, and the implication of this for improving organizations’ economic and environmental performance. Thus, the next section investigates how this link has developed over the years.

2.4 Integration between Environmental Management and Management Accounting

This section focuses on views, findings and suggestions by different statutory bodies and authors in their discussions and studies, relating to incorporation of EM into MA, integration of FA, MA, CA and EMA, as all these disciplines seem to be inter-related functions in accounting that can be adopted by any kind of firm in achieving performance targets and hence goals, and environment-related MA practices.

2.4.1 Incorporation of EM into MA

By reviewing the International Federation of Accountants' statement on *Management Accounting concepts* -1998 it can be realised how the field of MA has evolved over time and how MA has incorporated EM opinions gradually into its developments (IFAC 1998). It identifies four recognizable stages in which MA has evolved, with a different focus in each stage:

- *stage I* (prior to 1950): the focus was on *cost determination and financial control*, through the use of budgeting and cost accounting technologies;
- *stage II* (by 1965): the focus had shifted to the *provision of information for management planning and control*, through the use of such technologies as decision analysis and responsibility accounting;
- *stage III* (by 1985): attention was centred on *the reduction of waste in resources used in business processes*, through the use of process analysis and cost management technologies;
- *stage IV* (by 1995): the focus had shifted to the *generation or creation of value through the effective use of resources and through the use of technologies*, which examine the drivers of customer value, shareholder value and organizational innovation

According to the IFAC (2005) analysis, the leading-edge practice of MA has shifted beyond information provision to focus on the reduction of waste (the reduction of resource loss) and the generation of value (the effective use of resources). In other words, leading-edge MA centres around the use of resources, which are defined as 'monetary and physical' resources, as well as information itself, along with the other resources an organization creates and uses, such as 'work processes and systems,

trained personnel, innovative capacities, morale, flexible cultures, and even committed customers' (p.13). In organizations where actual MA practices have kept pace with these trends, the role of management accountants has evolved accordingly – from information tracking to more strategic roles in policy and planning (IFAC 2005).

Abdel-Kader and Luther (2004) investigating the status of MA practices in the UK food and drink industry, operationalise the IFAC (1998) statement on MA concepts and its description of the evolution of MA. They interpret the four stages as four levels of sophistication of MA systems, with stage I representing a lack of sophistication and stage IV the highest level of sophistication. The results, based on views of practising management accountants, suggest that MA employed in many UK industrial companies is not particularly sophisticated. They reveal that about 19% of firms are in stage I of evolution, 41% in stage II, 30% in stage III but only 13% in stage IV. Accordingly, this study concludes that MASs in many UK food and drink companies are moving, but only slowly, from a simple or naive role of cost determination and financial control towards a more sophisticated role of creation of value through effective resource use.

Waweru et al. (2005), analysing the four stages of MA evolution outlined by IFAC (1998), reveal that, although the four stages are recognisable, the process of change from one to another has been evolutionary. Consequently, each stage is a combination of the old and the new, with the old reshaped to fit with the new in addressing a new set of conditions in the management environment. Accordingly, MA is seen, in the first stage, as a technical activity necessary for the pursuit of the organizational objectives, while in the second stage, it is a management activity performing a staff role to support the line management through the provision of information for planning and control. In the third and fourth stages, MA is seen as an important part of management process. Waweru et al. (2005) stress that, with improved technology, information is available in real time to all levels of management; therefore the focus shifts from the provision of information to the use of the available resources to create value for all the stakeholders.

By reviewing the evolution of MA outlined by IFAC (1998) and interpretations of that in the studies above, it can be suggested that, particularly in the third and fourth stages of the evolution of MA, there has been striving to incorporate EM into MA practices by focusing on the reduction of waste in resources used in business processes and also generation or creation of value through the effective use of resources and through the use of technologies. It further seems to be that attempts taken in these two stages relate

to the economic impact of EM issues and also to EM-related cost categories, earnings and savings described by IFAC (2005).

2.4.2 Integration of FA, MA, CA and EMA

Jasch (2003) states that in practice many companies do not have a separate cost accounting system, but produce required information on the basis of the FA data from book keeping. The main difference between the conventional MA and EMA is that the latter stresses the importance of environmental costs and supplies information on material flows, which helps to improve economic and environmental performance (UNSD 2001). Staniškis and Stasiškienė (2002) suggest that modification of existing MASs can be relatively inexpensive if they generate significant financial and environmental benefits, and obviously environmental issues should also be reflected in existing FA systems.

With a view to satisfying information needs of internal management, MA focuses on both monetary and non-monetary information (i.e., cost drivers, such as labour hours, quantities of raw materials purchased) that inform management decisions and activities such as planning and budgeting, ensuring efficient use of resources, performance measurement and formulation of business policy and strategy. The collective goal of all these is to create, protect and increase value for an organization's stakeholders. Thus, MA activities include data collection, as well as routine and more strategic analysis of the data via various techniques (such as capital investment appraisal) designed to address specific management needs (IFAC 2005).

Jasch (2003) identifies EMA as a combined approach that provides for the transition of data from FA, CA and material flow balances to increase material efficiency, reduce environmental impact and risk and reduce costs of environmental protection. EMA metrics for internal decision making includes both physical metrics for material and energy consumption, flows, and final disposal, and monetarized metrics for costs, savings and revenues related to activities with a potential environmental impact. Jasch (2003) further states that EMA is performed by private or public corporations, but not nations, and consists of both financial and physical components.

Supporting this view, IFAC (2005) states that most EMA initiatives in place today do not cover social issues. Jasch (2003) also states that EMA has been developed from conventional expenditure for waste treatment facilities, disposal fees, environmental

protection and management costs and related issues, and further adds a significant cost factor: the purchase value and production costs of all non-product output (which is vital for internal calculation, as a decision basis for investment projects and for current product pricing). This indicates that waste is expensive not because of disposal fees, but because of wasted material purchase costs.

Jasch (2003) further reveals that all these costs actually occur in the company, but they are normally not traced and transparent, and therefore they are neglected in decision making. However, the focus of the UN EMA methodology is on making them visible. It indicates that, focusing on improving a company's information system and decision basis, EMA in its current approach has been developed for a company's internal decision making and therefore it focuses on tracing all real environmental and material efficiency loss expenditure for a given year.

According to Jasch (2003), the most important goal of using EMA is to make sure that all relevant, significant costs are considered when making business decisions. In other words, 'environmental' costs are just a subset of the bigger cost universe that is essential for good decision making. 'Environmental' costs are a part of an integrated system of material and money flows throughout a corporation, and not a separate type of cost altogether. Incorporating MA and EMA, Jasch (2003) interprets that 'Doing EMA is simply doing better, more comprehensive management accounting, while wearing an *environmental hat* that opens the eyes for hidden costs'(p. 670).

However, according to IFAC (2005), 'environment accounting' is a broad term used in a number of different contexts, such as:

- Assessment and disclosure of environment-related financial information in the context of *financial accounting and reporting*;
- Assessment and use of environment-related physical and monetary information in the context of *EMA*;
- Estimation of external environmental impacts and costs, often referred to as *full cost accounting*;
- Accounting for stocks and flows of natural resources in both physical and monetary terms, that is, *natural resource accounting*;

- Aggregation and reporting of organization-level accounting information, natural resource accounting information and other information for *national accounting* purposes; and
- Consideration of environment-related physical and monetary information in the broader context of *sustainability accounting*.

Further, even within a particular subset of environment accounting such as EMA, terminology differs among organizations and countries. For example, EMA has been variously called environment accounting, EMA, environment cost accounting, full cost accounting, and total cost assessment. Thus IFAC (2005) emphasizes that, in discussing any type of environment-related accounting within an organization or elsewhere, it is important to clarify the definitions and language being used.

However, at the organization level, environment accounting takes place in the context of both MA and FA, and most companies, particularly small and medium-sized ones, do not have an independent MA system; they simply use data initially developed for FA purposes for internal decision making, as well as for external reporting, perhaps with a few minor adjustments (IFAC 2005).

Wilmshurst and Frost (2001) state that, in the corporate decision process, accountants provide financial information required to plan and evaluate the performance of the organization. Also, decisions that may have an environmental impact have a financial aspect and thus are not different from other decisions, and hence accountants would be encouraged to evaluate these decisions and be involved in the EMS.

Staniškis and Stasiškienė (2002) identify the concept of environment accounting, dividing it into two areas: financial environment accounting – emphasizing the analysis and reporting component of internal costs and liabilities related to environmental matters; EMA supports the internal management and decision making process through various techniques of cost allocation, performance measurement and business analysis. It also reveals that EMA is interdisciplinary in scope: on the one hand, it helps to identify internal and external costs; on the other, it can be used to allocate these costs within existing and emerging environmental and sustainability accounting frameworks.

Considering the importance of applying EMA, Staniškis and Stasiškienė (2002) reveal that EMA not only helps to reduce corporate operating costs, but also to save natural

resources. Application of EMA which integrates two of the main principles of sustainable development, environmental protection and economics, can help organizations to significantly improve corporate decision making. EMA systems have a dual purpose of managing and improving the financial and environmental performance of a company (Staniškis & Stasiškienė 2002). EMA represents a combined approach that provides for the transition of data from financial accounting and cost accounting to increase material efficiency, reduces environmental impacts and risk, and cuts the costs of environmental protection (UNSD 2001).

Laurinkeviute and Stasiskiene (2006) state that, by identifying, assessing and allocating environmental costs, EMA would assist management of companies to solve their existing environmental problems, to identify new opportunities for cost savings and to improve environmental performance.

UNSD (2001) states that EMA data support EMSs and decision making with regard to improvement targets and investment options, and the linked financial and environmental performance indicators are important for controlling and benchmarking purposes. Expressing the same ideas on this view, Laurinkeviute and Stasiskiene (2006) suggest that, since the Lithuanian textile industry experiences strong competition from Third World textile companies, improvement of economic and environmental performance through the EMA would help increase its competitiveness. Moreover, regarding EMA as an approach to reduce environmental costs, and to improve economic situation of a company, they emphasize that EMA should be integrated into corporate information systems of textile companies in order to organize, to manage, and to perform regular monitoring of the EMA information flow.

According to the interpretation of IFAC (2005), EMA, a subset of environment accounting, is a relatively new tool in environmental management. As a tool, EMA can be used for sound product, process or investment project decision making. Thus, an EMA information system will enable management to better evaluate the economic impacts of the environmental performance of their businesses. By identifying and controlling environmental costs, EMA systems can help environmental managers justify cleaner production projects, and identify new ways of saving money and improving environmental performance at the same time (IFAC 2005).

Further, it identifies that EMA is valuable particularly for internal management initiatives with a specific environmental focus, and also EMA-type information is increasingly being used for external reporting purposes. Thus, EMA is not merely one EM tool among many; rather it is a broad set of principles and approaches that provides the data essential to the success of many other EM activities. Also, since the range of decisions affected by environmental issues is increasing, EMA is becoming more important, not only for EM decisions, but also for all types of management activities (IFAC 2005). In support of these opinions, Vasile and Man (2012) induce that although the EM activities of an economic entity give rise to certain costs, they can also bring benefits and savings. As EMA is used to register and analyse these elements, it becomes increasingly important not only for environmental management, but also for other routine managerial activities such as: planning of processes and products; allocation and control of costs; capital budgeting; supply processes; pricing policies; and performance evaluation (Vasile and Man 2012).

According to the IFAC's (1998) statement *Management Accounting concepts*, EMA is 'the management of environmental and economic performance through the development and implementation of appropriate environment-related accounting systems and practices' (IFAC 2005, p.19). In the real world EMA ranges from simple adjustments to existing accounting systems to more integrated EMA practices that link conventional physical and monetary information systems. But, regardless of structure and format, it is clear that MA and EMA share many common goals. And it is hoped that EMA approaches eventually will support leading-edge practices of MA (IFAC 1998).

2.4.3 Environmental Related MA Practices

Defining environmental-related MA practices as 'the generation, analysis, and use of financial and non-financial information in order to improve corporate environmental and economic performance', Bennett and James (1997, p. 3-4) argue that environment-related MA can be effective in improving management efficiency by i) demonstrating income statement and balance sheet impact, ii) identifying cost reductions and improvements, iii) prioritizing environmental actions, iv) guiding product pricing, mix and development decisions, v) enhancing customer value, vi) future-proofing of investment and other decisions with long-term consequences, and vii) assessing the eco-efficiency and/or sustainability of a company's activities. The environment-related

MA is primarily focused on provision of information to internal management to support managerial decision making and other purposes, rather than reassuring external stakeholders about the company's financial and environmental probity, which is the focus on financial accounting and environmental reporting, respectively. However, the high degree of external attention to corporate environmental performance means that outside stakeholders also have an interest in this concern.

Further, Bennett and James (1997), considering environment-related MA as just one component of introducing sustainable development and strengthening EM within business, suggest that it needs to be supplemented by many other measures, and conclude that sustainability is about far more than economics, just as business encompasses many elements other than income statements and balance sheets. This indicates that environment-related MA can make a contribution to both business success and sustainable development and it is also noted there is emerging consensus that practical environment-related MA is closely related to the development of ABC, which is likely to be more widely adopted in coming years.

Based on a survey directed to Chief Financial Officers of Australian listed companies, Frost and Wilmshurst (2000), by identifying industries as more environmentally sensitive and less environmentally sensitive, investigated whether the environmental-sensitivity of the industry would influence the firm's development of environmental-related MA. The results find that, although environmental reporting is more likely to occur in environmentally sensitive firms, the adoption of environmental-related MA procedures does not appear to be driven solely by the environmental-sensitivity of the industry. This study confirms, consistent with prior research on reporting practices, that a significantly greater number of firms in environmentally sensitive industries reported environmental information.

In contrast, Tilt (2001), considering the relationship between corporate environmental policies of Australian public companies and subsequent reporting and disclosures in their annual reports, reveals that, while companies appeared to be reporting on the environment internally, they placed a low priority on providing environment performance data to external parties. She also finds that Australian companies were surprisingly behind other countries in environmental reporting trends, and there were some major differences between the content of their environmental policies and their disclosures.

Thus, Frost and Wilmshurst (2000) suggest that the argument ‘environmentally sensitive firms are more likely to develop environmental-related MA procedures’ is only supported for activities that are associated with significant environmental-related issues for the specific industries (p. 360). But, in situations where issues are of general in nature, it appears that these firms are no more likely to develop such accounting practices. Therefore, the study suggests that further research is needed to identify factors affecting the firms to adopt environmental-related MA procedures.

Further, as cited by Frost and Wilmshurst (2000), the adoption of environmental-related MA by companies has been widely documented: for example, Bennett and James (1998a), Ditz, Ranganathan and Banks (1995), Epstein (1996); and a number of studies have observed that such practices have resulted in cost savings (Schroeder & Winter, 1997) and competitive advantage (Porter & van der Linde 1995). Supporting this view, IFAC (2005) indicates that EMA is valuable particularly for internal management initiatives with a specific environmental focus, and EMA-type information is also increasingly being used for external reporting purposes.

In view of the connection between internal environmental-related MA and external environmental reporting, Jonäll (2008) also states, based on a theoretical study, that although this study did not focus on external disclosure, external financial or environmental reporting, such issues come up in connection with the focus on internal accounting, MA. Jonäll (2008), through a theoretical study based on research results of 16 articles in academic journals, searched whether EM or EA were included within MA or FA that could support decision making in companies for better environmental performance. Of the sample, 14 studies were likely to be related to MA and two studies to FA. This theoretical study concludes that EMA can probably support decision making in companies for better environmental performance today, through structured cost assessment that supports effective decision making, better environmental performance, more effective and future-proofed product mixes, strategies and investments.

Thus, the interpretations and findings of previous studies reveal that EM conceptions and considerations were incorporated into MA in its evolution, particularly in the third and fourth stages. It also reveals that, in practice, EM-related activities integrate with other related disciplines, such as FA, MA, CA and EMA, and these implications provide strength for organizations in enhancing both environmental and economic

performance, although they have faced some difficulties in different situations. Thus, the next section focuses on investigating the role of MA in resolving EM issues, the factors affected, and the motivations and challenges in performing these practices in different organizational contexts in different countries.

2.5 Contribution of MA in Addressing EM issues

This section concentrates on the role of accounting and accountants in implementing EMS, factors affecting MA practices and EM activities, motivation to adopt MA and EMA, and challenges for MA practices and EM activities.

2.5.1 Role of Accounting and Accountants in Implementing EMS

Considering EMSs as embedding mechanisms for facilitating organizational change, Albelda et al. (2007) suggests that, among other intangible assets, the use of MA practices could play an important role in improving environmental management and performance.

Albelda (2011), conducting semi-structured interviews at six Spanish factories, assessed the potential role of MA practices in enhancing environmentally responsible business. The study analysed how four MA practices commonly used at operational level, investment appraisals, costing systems, budgeting and performance measures, may reinforce the EM and guarantee the maintenance of an EMS according to EMAS. The findings suggest that, although two of the four MA techniques (budgets and performance measures) are better reinforced, overall these four MA practices might operate as a facilitator mechanism for the environmental management by reinforcing the four EMAS significant elements as follows:

- i) Commitment to the continual improvement of the environmental performance – reinforced by these four MA practices
- ii) Compliance with environmental legislation – had greater impact from investment appraisals and environmental performance measures
- iii) Communication with interested parties – easier supported by costing systems, budgets and performance measures; and
- iv) Employee involvement had a stronger effect by budgets and performance measures.

This means that these four aspects that characterize EMAS are enhanced by the use of these MA practices.

Albelda (2011) also identifies that accounting serves a double function: as a facilitator mechanism for the environmental management by enhancing the four distinctive features of EMAS, and as a barrier for a further accountability-based environmental management.

Based on a survey of chief executive officers and chief financial officers from 500 listed companies in Australia, Wilmshurst and Frost (2001) examined the management attitudes towards environmental accounting and the level of involvement of the accountant in the company's EMS. They suggest that accounting and the accountant can play a significant role in the successful implementation of the EMS by bringing the traditional functions of accounting to the EM process. These skills include those of measuring, recording, monitoring and verifying financial data. The EMS could incorporate accounting mechanisms that deal with the valuation of environmental impact, environmental performance evaluation, flow of financial information and the monitoring of the success of implementation of environmentally related actions. Linked to other management systems this could be expected to enhance the quality of decision making (Wilmshurst & Frost 2001).

Also they indicate that the role for accountants does not imply that they need to be 'environmental experts' and accountants are trained in skills required for the development and operation of appropriate EMSs that result in the recording, reporting, disclosure and verification of a firm's performance, including its environmental performance. The accountant can assist in identifying environmental information relevant to decision making, in assessing the reliability of measures and in organizing an EMS that enhances the communication of results in an understandable form (Wilmshurst & Frost 2001).

Wilmshurst and Frost (2001) emphasize the need for mechanisms that are able to incorporate financial information, as well as qualitative data relating to the environment because the growth in community concern, legislation and regulation suggests that serious consideration should be given to environmental performance evaluation. Such mechanisms may include tools such as life cycle analysis, activity based costing and

cost-benefit analysis, which could be utilized to incorporate environmental impact into business decision making and performance evaluation.

Wilmshurst and Frost (2001) further indicate that accountants can also play a pivotal role in monitoring environmental performance positioning as part of the audit team by providing input regarding the verification of financial data, cost-benefit analysis, compliance status and the design and implementation of an EMS to capture the required environmental information. Also, the role of accountants can be seen as two-dimensional: involvement in the internal operations of the company, focusing on performance and compliance concerns, and in the external dimension relating to the disclosure of economic information to external report users. It is a function of accounting to ensure that users are provided with relevant and reliable information about the performance of the firm. In this respect, the accounting information system can provide a framework for the preparation of environmental information to enable management to meet this accountability obligation.

Wilmshurst and Frost (2001) identify that, although there is a general belief that environmental issues are important, many respondents did not recognize a role that accounting and the accountant could play within EM. They argue that environmental reporting is important to annual report users, and such information should be prepared and quantified, but there is significant opposition to it being a mandatory component of the annual report.

Wilmshurst and Frost (2001) suggest that an accountant has a role to play in assessing whether environmental goals have been achieved, and how this compares with the past performance of the firm, and this will provide the basis for planning future goals of the firm; also, the accountant should be able to identify appropriate means to measure and present this information. There would seem to be significant role for the accountant in planning an environmental policy.

According to the attitudes of senior executives towards the role of accountants on EMS, they believe that the environment is an important issue, and they recognize the need for a business response; however, it appears that limited participation of the accountant in the EMS might reflect a lack of understanding of the potential role that accounting and the accountant could play as a member of the EMS (Wilmshurst & Frost 2001). The results ultimately conclude that both chief executive officers and chief financial officers

identified the roles that accounting and the accountant could undertake as part of an EM team within the company; however, as yet there is no active involvement in EM by accountants in many companies, although a role can be prescribed and the actual environmental accounting techniques identified, may be due to limited motivation from accountants to become involved in EM, believing that it is to be external to their role.

Accordingly, these findings contribute to understand the interactions between MA practices and EMS within manufacturing firms, and the role of accounting and accountants towards enhancing both economic and environmental performance and hence increase competitiveness.

2.5.2 Factors Affecting MA Practices and EM Activities

As indicated in the literature on business and the environment, Tilt (1997) identifies the development of corporate environmental policies as an important step in becoming environmentally aware, and through a survey of publicly listed Australian companies reveals that Australian companies appear to be continuing an interest in the environment, developing corporate environmental policies. Thus, investigating some of the major influences on developing corporate environmental policies by those companies, the author found that environmental law (or the threat of environmental law) appears to be a major influence on companies' policy development and environmental activities. Linked to these views, Kokubu and Nashioka (2005) state that, Ministry of Environment guidelines that stress the need for environmental accounting reporting in Japan would strongly influence Japanese companies.

According to Tilt (1997), this emphasis on reporting internal to the organization, rather than externally disclosing, indicates that companies are taking a proactive stance in striving to prevent external pressures by implementing a corporate environment policy and using it to improve their environmental performance. Kokubu and Nashioka (2005), however, reveal that Japanese corporate environmental accounting was oriented to external reporting rather than internal management function.

In this respect, Schaltegger and Burritt (2010, p. 378) ascertain six factors that may encourage managers to establish an accounting system that provides information for assessing corporate actions on sustainability issues: i) Greenwashing; ii) Mimicry and industry pressure; iii) legislative pressure, stakeholders pressure and ensuring the 'licence to operate'; iv) self-regulation; v) corporate responsibility and ethical reasons;

and vi) managing the business case for sustainability. However, Schaltegger and Burritt (2010) recognise legislation as one of the six main factors that influence management to consider sustainability issues. They further state that apart from the ethical arguments of corporate responsibility, all six points are concerned with either corporate benefit or avoidance of detriment.

Further, Jalaludin, Sulaiman and Ahmad (2011) found that accountants from manufacturing companies in Malaysia agreed that they were pressured by their customers, shareholders, head office and the government, in terms of environmental performance. This pressure then influences company policies and MA practices including EMA adoption (Jalaludin et al. 2011). Staniski and Stasiskiene (2006), observing this substance from a somewhat different angle, stress that common and closed collaboration between employees, academics, research institutions and environmental organisations both nationally and internationally would be an important factor in EMA development and implementation.

Factors influencing changes in Chinese MA practices were examined by Wu and Boateng (2010) in a questionnaire survey in two types of firms: state-owned enterprises and joint ventures. This survey involved senior financial managers of 179 companies, covering the period 2006-2010 and five MA practices (product cost systems, budgeting and PE systems, planning and control, decision support systems, and responsibility accounting), but did not investigate recently developed techniques, such as benchmarking, BSC and shareholder value analysis, because these were initially revealed through a pilot survey as not widely used by the majority of Chinese accountants.

Wu and Boateng (2010) emphasize that this study represents one of the few attempts to identify factors influencing the changes in MA practices in Chinese state-owned enterprises and joint ventures with partners from Western countries. The results suggest four factors that have a positive influence on the changes in MA practices in Chinese joint ventures: i) a foreign partner; ii) size of the firm; iii) the level of training or knowledge of senior management; and iv) accounting employees. In contrast, in regard to Chinese state-owned enterprises, two factors have a positive influence on the changes in MA practices: i) the size of the state-owned enterprises, and ii) the level of knowledge of senior managers. The results offer no support for the level of knowledge of accounting staff as a factor influencing the adoption of MA practices in state-owned

enterprises, suggesting that senior managers continue to dominate the decision making process in state-owned enterprises, despite decades of reform in China.

Nawrocka and Parker (2009) argue that results obtained in the study support a hypothesis that the effects of EMS are not general but dependent on other factors, such as the management style and goals of the particular company, its operating environment, culture and stakeholders. This further suggests that the question to research which will be most fruitful is not whether EMS improves performance, but how, when and why, depending on goals, culture, economy, legislation and so on.

Sulaiman et al. (2004) also suggest that future studies should attempt to examine specific factors as to why firms in Asia (with the exception of Japan) are not adopting newly developed MA tools such as ABC and target costing.

2.5.3 Motivations for Adopting MA and EMA

Tuanmat and Smith (2011) highlight that there is well-established empirical evidence for an association between MA practices and performance. For example, Baines and Langfield-Smith (2003) find that firms with a greater reliance on non-financial accounting information improved their performance; Ittner and Larcker (1995), Mia and Clarke (1999) and Sim and Killough (1998) similarly find a positive interaction between MA information and performance. The findings of Tuanmat and Smith's study support the suggestion of Laitinen (2006) that changes in MA practices are associated with good financial performance. As the business environment has been changing continuously, it is critical to ensure that an appropriate MA system is practised in organizations. This is important, because effective MAS can help managers to better coordinate business activities and provide useful information for them to make decisions, and this process will ultimately improve organizational performance. Thus, the results of this study provide helpful insights and useful guidelines to organizations facing with these changes, especially those managers who are responsible for making sure that their companies move in an appropriate direction (Tuanmat and Smith 2011).

Wilmshurst and Frost (2001) suggest, considering environmental information included within existing MA information and control systems, that the most common inclusions relate to risk assessment, capital budgeting and investment appraisal decisions, and within the internal reporting systems, and thus such involvement would indicate the recognition of probable environmental costs and risks that may be incurred with capital

expansion. It appears that somewhat lesser inclusions relate to budgeting systems, plant maintenance or overhaul, costing systems, and performance measurement and appraisal. These results suggest that companies are focusing on reducing the possibility of engaging in activities that may increase environmental risks.

Further, Wilmshurst and Frost (2001) identify major areas in which specific environmental accounting practices have already been adopted and developed, such as accounting for energy usage, rehabilitation/restoration, and the need to address the possible cost of legal requirements, contingent liabilities and waste. System implementation is also undertaken for waste and environmental costs as part of product costing. On an internal level, the findings suggest that a number of specific environmental issues are already being incorporated into many companies' accounting systems. However, motivation for adoption is likely either to be directly related to regulatory requirements or to areas of potential cost savings.

Also, cost-benefit analysis is most commonly undertaken by many companies by incorporating environmental concerns to assist in decisions relating to the efficient use of energy, waste management and minimization of pollution, and site clean-up and contamination. Cost savings are possible in many of these areas as a result of careful monitoring (Wilmshurst & Frost 2001).

Vasile and Man (2012) express that EMA displays not only the data about the costs required to estimate the financial impact of EM initiatives of an entity, but also the data about physical consumption (the use of raw materials and their renewal rates), that help management identify the manner such activities are likely to influence the environment.

Laurinkeviciute and Stasiskiene (2006), identifying EMA as an approach to reduce environmental costs, and to improve the economic situation of a company, find that EMA is very beneficial for the textile industry, because, by better identifying, assessing and allocating environmental costs, this allows the management to discover and solve the main existing environmental problems affecting the economic situation of the company, and also motivates them to search for a more efficient resource usage, to control pollution more effectively and to increase competitive ability.

According to Kurniati, Rahadi and Danial (2010), the basic concept of EMA is that eco-efficiency rules can be used to preserve the sustainability of company businesses. These authors measure eco-efficiency through comparing environmental performance

indicators (EPIs) with financial performance indicators (FPIs). Based on a case study conducted in a sugar cane factory of Indonesia, Kurniati et al. (2010) conclude that the company had a relatively low eco-efficiency status that was caused by a high environmental performance together with a low financial performance resulting from the high costs of large amounts of material loss and solid wastes.

Moreover, exploring the effects of EMA use on innovation in relation to large Australian businesses, Ferreira, Moulang and Hendro (2010) found that although EMA use has a positive association with process innovation, it has a negative association with product innovation. This implies that economic benefits may be realised by using EMA while enhancing environmental performance. Other benefits that an organisation may experience from EMA use are identification of new opportunities, and improvements in reputation and decision making. However, considering the response rate and the level of EMA use by companies, these authors suggest that Australian businesses have a slow rate of adoption for EMA, which represents an early stage of EMA development. This is consistent with the assessment of Schaltegger et al. (2006) who found that sustainability accounting techniques, such as EMA, are in the process of evolution (Moulang et al. 2010).

Bennett and James (1997) state that, as a result of the increasing relevance of environmental issues and their potential impact on economic performance in the 1990s, more attention began to be paid to environmental issues and how this kind of information could be measured, evaluated or used for decision making. Identifying potential cost savings, considering environmental issues in product pricing, or prioritising environmental actions are some of the issues pointed out to explain the advantages of adopting EMA.

As shown in case studies undertaken by investigating the current state of EMA practices in Lithuanian small and medium enterprises (SMEs), Staniskis and Stasiskiene (2006) indicate that companies using EMA as a part of their integrated management system are provided with accurate and comprehensive information for the measurement and reporting of environmental performance. Also, in developing an EMS for a company, initial efforts should focus on EM techniques for measuring performance, followed by development of an auditing system and by publication of environmental reports to communicate with stakeholders.

Through a study by Staniskis and Stasiskiene (2002), identifying the need for upgrading the business decision making process by including information on material flows and related costs to account for efforts of sustainable development, Staniskis and Stasiskiene (2006) argue that decisions are increasingly affected by environmental costs. Application of EMA, which integrates two of the main principles of sustainable development, the environment and economics, can help firms to significantly improve corporate decision making. EMA is becoming increasingly important, not only for environmental management decisions and development of EMS, but also for all types of routine management activities, such as product and process design, cost allocation and control, capital budgeting, purchasing, product pricing and performance evaluation.

Staniskis and Stasiskiene (2006) stress that, even though there are obvious differences in case studies from different industries, review of the results indicates that there are many similarities in what improvements can be suggested for environmentally concerned companies, both in terms of environmentally sound operation and for reporting of EMA information.

Staniskis and Stasiskiene (2006) also suggest that accurate measurement is essential to identify problems and possible improvements in a company's performance, including its environmental performance. They further show that effective cost accounting requires effective materials flow accounting, i.e., understanding materials and energy flows of the production system is a prerequisite to identifying and tracking environmental costs and other types of inefficiencies. Materials and energy flow balances are the most important bases for analyses of cost-related information and therefore should be done precisely.

Further, they suggest that governmental institutions should take an active role in promotion of EMA, and design and coordination of corporate reporting requirements to promote the use of environmental accounting for reporting will also promote its use for internal management purposes (Staniskis & Stasiskiene 2006). Finally, they conclude that EMA is still in a developmental stage and its concepts, tools, processes and potential benefits to both Lithuanian industry and government are not clearly recognised. Therefore, common and close collaboration between them, and with academic, research institutions, and environmental organizations nationally and internationally, will be an important factor in EMA development and implementation (Staniskis & Stasiskiene 2006).

Wilmshurst and Frost (2001) reveal that recognition of environmental accounting issues may be fostered in two ways: through a greater recognition within the accounting education system; and from a more proactive response by accounting regulations. Such an approach would help to identify for accountants the role that they can play in EM, both in assisting in the internal decision making process, and meeting external accountability obligations. In addition, this would assist in overcoming the apparent hesitancy of some senior management and accountants to become involved in EM. Accordingly, Wilmshurst and Frost (2001) emphasize that for a company to be proactive in their EM there must be leadership by senior management, recognition of the importance of environmental concerns and encouragement for the adoption of environmental accounting within the corporate EMS.

Qian, Burritt and Monroe (2011) applied an exploratory case study method to the EMA practices and the motivations for those practices in the context of local government waste management, interviewing 12 New South Wales government organizations in Australia. The results reveal that, contrary to prior research, in the local government investigated, an increasing amount of EMA information is being made available. Also, they find two main motivations encouraging the development of EMA in local government: i) *social structural influences*, such as regulatory pressures from environmental regulatory bodies, environmental expectations from local communities, and pressure from peer councils, and ii) *organizational contextual influences* reflecting situational needs in the organizational contexts, such as complex waste operations and service design, changes and uncertainties in waste and recycling management, and the council's strategic position on waste management.

However, they suggest that a moderate level of EMA information is being used for waste management by those local councils in New South Wales, and that when the scope of EMA information becomes broader, from direct to indirect and from internal to external, the levels of EMA become lower. They also suggest that, if EMA information is viewed as a useful tool to cope with various challenges facing local government and thereby help to achieve or maintain efficiency and output performance, it is more likely to be adopted by that government (Qian et al. 2011).

Burritt et al. (2002) developed a comprehensive framework for EMA, linking business actors and EMA tools, to provide a structure for managers to understand and assess the variety of EMA tools that have been developed to date, with the intention of

encouraging their adoption. The development of a comprehensive framework of EMA is offered as a way forward for management seeking to adopt EMA systems. They suggest that such a foundation will facilitate understanding what EMA is, and to realization which EMA tools meet the requirements of, and would be useful for, different business actors and in different decision contexts. They highlight three dimensions of EMA tools: i) timeframe – the period being addressed by different tools (e.g., past, current or future); ii) length of timeframe – the duration of the period being addressed by the tool (e.g., short term *versus* long term); and iii) routineness of information (*ad hoc* as against routine gathering of information). They integrated two major components of EMA into their framework: monetary EMA and physical EMA.

They expect, as a major benefit experienced by corporate managers with this proposed comprehensive framework, that it considerably clarifies the concepts and applicability of EMA and related tools. Burritt et al. (2002) suggest that, once managers have a clear picture of the classification of monetary EMA and physical EMA tools, promotion and adoption will be easier for them, such that they will be more likely to adopt the appropriate tools in a particular decision making or internal accountability setting in which environmental aspects play a part.

Burritt et al. (2002) stress that there are several motivating factors behind the development of this comprehensive framework: lack of common terms describing EMA in the literature; a conceptual separation between internal and external accounting is based on the fact that the level of details and aggregation of information and the extent of confidentiality differ between management and other stakeholders' needs; different types of managers rely on and have their performance assessed using either or both of physical or monetary types of information.

2.5.4 Challenges for MA Practices and EM Activities

Organizations are surviving in various economic, social, legal environments with different structures, goals, strategies, values, skills, abilities and knowledge, and thus the literature review has shown that, although adoption of MA practices and integration of MA and EM activities are vital to business firms in improving their economic and environments performance, such practices cannot be seen to a greater extent in the practical world. Thus, it is important to research the challenges faced by business firms in these respects.

In this regard, Waweru et al. (2005) suggest that an important factor limiting the implementation of more sophisticated MA systems is their unaffordable costs.

Sulaiman et al. (2004), in their literature review based on Tho et al.'s (1998) findings, indicate the reasons for still widely using traditional MA practices by developing countries: i) lack of awareness of new techniques; ii) lack of expertise; and iii) perhaps more importantly, lack of top management support. Additional factors include: i) the high cost of implementation; and ii) the fact that there simply is 'no reason to change' from the traditional techniques to new techniques. It is observed that traditional MA has no ability to adequately monitor and allocate costs associated with environmental activities. The aggregation of environmental and non-environmental costs in overhead accounts results in their being 'hidden' from management. Thus, there is substantial evidence that management tends to underestimate the extent and growth of such costs. However, by identifying, assessing, and allocating environmental costs, EMA allows management to identify opportunities for cost savings (Frost & Wilmshurst 2000; UNDSD 2001).

Staniskis and Stasiskiene (2002) show that many companies include all environmental protection costs into their overheads, along with top management salaries, advertising costs, and all other costs that are not traced back to individual production processes. In situations where environmental compliance costs were marginal and profit high this might have been reasonable, but with increased environmental awareness, stronger competition and the need to improve production efficiency (especially with regards to materials and energy), the costs of tracking materials and energy flows throughout the company are by far outweighed by the improvement potentials identified and realised.

Further, Staniskis and Stasiskiene (2006) emphasize that, in conventional costing, most environmental costs are mixed with non-environmental costs and are usually allocated to overheads. But within such a cost accumulation and allocation system, those environmental costs are 'hidden' from management, and as a result, this fails to provide environmental cost data required to formulate corporate environmental policy for waste minimisation or prevention.

Further, as cited by Wilmshurst and Frost (2001), it is suggested that traditional cost accounting systems have failed to assign environmental costs to the specific products or processes that generate them. This could mean that environmental costs are aggregated

into cost pools and allocated to products on the bases of measures of production volume, such as machine or labour hours, or, alternatively, they may be subtracted in a lump sum from operating income (Russell et al. 1994). Furthermore, traditional accounting systems can under-estimate the cost of producing an item that generates a significant amount of waste, or, on the other hand, over-estimate the cost of an item that generates little waste, and in addition potential financial liabilities and legal costs for violation of environmental regulations are often not accounted for (Wilmshurst & Frost 2001). Vasile and Man (2012) also demonstrate that traditional accounting methods do not offer a suitable framework that is capable of identifying all the necessary data, and hence, many potential environment- related costs are likely to be covered within indirect costs.

Abdul-Rahman et al. (2002), based on Japanese MA systems, reveal that the accounting department continues to face several difficulties as its function has been confined to narrow procedural aspects of budgeting, accountability and performance appraisal, and also the department is unable to penetrate into the 'value' of non-accounting managers and professionals, such as engineers, due to factors such as knowledge gaps, complexity and unavailability of reports, and communication barriers between the accountants and the engineers.

Thus, in order to overcome these, their study suggests that accounting reports should be made as simple and easy to understand as possible, the accountants must design the reports in such a way they are useful and used by non-accounting managers, and these reports must be available in meetings and during other periodic review. They also suggest, emphasising the need for improving communication skills of accountants, particularly in situations where they are to be more influential within the organization, that the use of on-line computer systems would definitely help accountants in providing useful and timely information, and for greater accessibility of that information other media such as bulletin boards and television can be used.

Supporting these findings, Jasch (2003), using case studies, reveals that the environmental manager rarely has access to the actual cost accounting documents of the company and is only aware of a tiny fraction of the aggregate environmental costs. On the other hand, the controller has most of the information but is unable to separate the environmental part without further guidance. In addition, his or her thinking is limited

within the framework of existing accounts, and thus the two departments tend to have a severe communication problem.

Focusing on the challenges faced by EMA, Burritt (2005) recommends that to achieve broad dissemination to a wide range of organisations, EMA systems need to be relevant to the issues at hand, available at low cost, provide simple integration with existing MA systems or EMSs, and be reliable. Burritt further reveals that some challenges with EMA can be linked directly back to problems of conventional MA. Other challenges are added through the incremental adaptation of conventional EMA for environmental issues such as how environmental costs should be defined. Burritt concludes that progress in addressing these challenges continues.

In relation to such challenges, Alewine (2010) pinpoints, through a survey of research methods employed in extant environmental accounting literature, that relative to traditional accounting information, environmental accounting information comprises a lower level of user familiarity that can hinder the effective processing of these non-traditional data. Thus, Alewine (2010) proposed a model by providing factors to be considered in designing more effective environmental accounting information systems. This model considers the impact of an environmental strategy on the implementation of environmental information systems, which in turn influences the effective evaluation of decisions based on environmental accounting information. This model was expected to support researchers in conducting experimental environmental accounting research designed to advance efforts in the creation of sustainable environmental accounting information systems (Alewine 2010).

This review of the literature realizes that effective MA systems can help managers by providing useful information to make sound decisions regarding all functions of management and hence improve organizational performance. It also reveals that MA practices might operate as a facilitator mechanism for EMA, and EMA as a part of an integrated management system is provided with accurate and comprehensive information for the measurement and reporting of environmental performance. Further, it confirms that the accountant can play a significant role in the successful implementation of the EMS by bringing the traditional functions of accounting to the EM process.

However, in practice, it indicates that most business firms are still using traditional MA practices, particularly in developing countries, though they have realized that traditional cost accounting systems have failed to assign product costs more accurately and also to track environmental costs precisely, hence making it difficult to assign them properly to the specific products or processes that generate them. Several internal and external factors may affect this problematic situation. It further reveals that different factors may affect this situation in different ways and different levels in each and every business firm, depending largely on different industrial, economic, legal, organizational and country backgrounds. Thus, business firms are facing challenges in performing the role of MA effectively, and in responding to EM issues, and all these ultimately affect adversely organizations' economic and environmental performance.

2.6 Summary and Implications

The literature review reveals that least attention has been paid to investigating MA practices and their incorporation into addressing EM issues. Some research focused on investigating MA practices in developed countries, e.g., Wijewardena and De Zoysa (1999) and Chenhall and Langfield-Smith (1998), and least attention was on developing countries. For the latter, Waweru et al. (2005) in a survey of MA practices in South Africa suggest that by using modern MA techniques, together with the traditional MA techniques, business firms have been striving to reduce waste in their production processes and to move towards eliminating non-value added activities and hence waste reduction. Also, three similar surveys undertaken in the same area, 'adoption and benefits of MA practices', based on companies in Greece (Angelakis et al. 2010), Finland (Hyvonen 2005) and Australia (Chenhall & Langfield-Smith 1998), report similar findings. There is another theoretical study by Sulaiman et al. (2004) on MA practices in selected Asian countries, focusing on Singapore, India, Malaysia and China. Furthermore, a few MA-related studies are found in the literature, i.e., changes in MA practices (Tuanmat & Smith 2011; Wu & Boateng 2010) and EMA practices (Jasch 2003; Qian et al. 2011; Staniskis & Stasiskiene 2006). However, there are very few studies related to MA practices and their contribution in addressing EM issues (e.g., Frost & Wilmshurst 2000; Wilmshurst & Frost 2001; Albelda 2011). By referring to all these, it is further realized that none of them is based on Sri Lankan use of MA /EMA practices or contribution of MA practices in addressing EM issues.

Further, Waweru et al. (2005) emphasize that industries in other developing countries differ from their South African counterparts, probably because of legal and regulatory constraints and economic, policies or structures that might differ between countries, so that further investigation is needed for other developing countries. Hyvonen (2005) also indicates that the trend in the MA practices may be partly because of the different sample period in the studies, and the time of the survey is likely to influence the results, because in certain economic situations some of the practices are likely to be emphasized and therefore further research of the MA practices is needed.

Taken as a whole, it can certainly be said that there is a gap in the literature on the role of MA in responding to EM issues: in other words, how and to what extent MA practices could assist in addressing EM issues in business firms in developing countries, particularly in Sri Lanka. Thus, this study will provide a considerable contribution to the literature on the nature and extent of MA practices of listed companies and their involvement and motivations in addressing EM issues in a developing country, Sri Lanka. It also provides insights into understanding the level of integration of MA practices and environmental issues, and the problems or challenges associated with it, in different organizational contextual influences and social structural influences. The next chapter explains the Sri Lankan environment in terms of associated laws, regulations, standards policies and procedures, and the initiatives taken towards protecting the environment by complying with such legislation and standards.

Chapter 3 Environmental Consideration of Sri Lankan Context

3.1 Introduction

The previous chapter describes the literature on MA practices, EM considerations and their integration encompassing the research topic. This chapter aims to recognise Sri Lanka's initiatives towards protecting the environment through formulating strategies and taking actions in terms of laws, regulations, standards, policies and procedures, structured particularly for development projects and industrial activities. Overall, this chapter is associated with the second part of the primary research question. With a view to answering RQ II and RQ III in particular, and assisting in responding to other RQs exclusive of RQ I, this study investigates whether listed companies in Sri Lanka concentrate on EM issues, and if so, it examines motivating factors (i.e., complying with legislation, standards, ensuring sustainability of the business) for such considerations and actions for protecting the environment (RQ II). It also descriptively explores current EM initiatives by those entities in different stages of the business process to control and prevent environmental pollution, which typically involve complying with legislation and standards applicable for individual companies and the industry sector (RQ III). Thus, this chapter provides background information and an understanding with directions in answering mainly RQ II and RQ III. Besides, in answering other RQs except for RQ I, this chapter provides certain insights regarding the EM issues and concerns of the Sri Lankan listed companies/industries explored.

This chapter first delineates the term 'environment pollution' and its impact on the society, and secondly it recognises general environment principles and the importance of complying with them in protecting the environment. Thirdly, the chapter incorporates multilateral environmental agreements and the Sri Lankan legal system, which comprises a number of environmental laws, provisions and guidelines, and associated authorities. Fourth, it elaborates on the strategies formulated and actions taken for the prevention and control of environment pollution, mainly by CEA under the MoE empowered through the NEA, and also through the National Environmental Action Plan (NEAP) implemented towards sustainable development (SD) of Sri Lanka. Fifth, it reviews the strategies formulated and actions taken by institutions that are dealing with environmental matters in industry sectors through standards, accreditations, laws and concerns. Finally, the chapter concludes with a summary

overseeing all steps taken by authorities over the years towards protecting the environment of Sri Lanka.

3.2 Environment, Environmental Pollution and Their Impact on Sri Lankan Society

Sri Lanka, formally known as Ceylon, is recognised as a developing country in the South Asian Region. This section focuses on the term ‘environment’ and its importance for human survival and wellbeing. It then describes the nature of the Sri Lankan environment in particular and the associated challenges and issues it faces today in terms of degradation and pollution and their impacts on the survival and wellbeing of the society.

3.2.1 Environment

Definition: Section 33 of the National Environment Act No. 47 of 1980 of Sri Lanka defines the environment as ‘the physical factors of the surroundings of human beings, including the land, soil, water, atmosphere, climate, sound, odours, tastes, and biological factors of animals and plants of every description’ (NEA 1980, p.15). The NEA approach encompasses human beings and their surroundings (anthropocentric) and animals and plants (bio-centric) factors. The environment consists of all of the external non-living (abiotic) and living (biotic) factors, conditions and influences that affect the life, development and survival of an organism or a community (Allaby & Park 2013). Thus, the environment is anything outside an organism in which the organism lives. The environment is a complex system of living and non-living components which interact with each other and respond to change in order to survive – individually, and in total. It consists of many elements, both living and non-living, and natural and man-made. According to Environmental Foundation Limited (EFL), the environment is dynamic and constantly changing, and environmental changes occur as a result of natural processes, as well as through human interventions and actions (EFL 2006).

Importance of preserving the environment

Our environment is the basis of our survival and prosperity and all aspects of the environment work together to ensure our livelihood and survival. In that sense, we rely

on the environment for our daily lives and will continue to do so in the future (EFL 2006). The environment provides us with far more than our basic requirements in terms of various goods, such as food, fuel and building materials, and services, such as erosion control, waste treatment, water supply, climate regulation, pollination, and recreation that supports and regulates our wellbeing. In providing these goods and services, the environment interacts with various living and non-living components, through a complex series of relationships and processes. These ecosystem goods and services are usually referred to as 'ecosystem services' (De Mel & Sirimanne 2009; EFL 2006). Thus, preserving the environment is of the utmost important for any society for its wellbeing and survival.

3.2.2 Sri Lankan Environment

Sri Lanka has an unusually rich natural environment, encompassing a wide range of plants, animals and ecosystems, many of which are unique to this island nation. The country also includes coral reefs and coastlines, wet lands and grasslands. It ranges from the dry lowland plains to the fertile highlands and mountain areas. These diverse environments provide valuable goods and services to the human population – including fish, natural resources, tourism, and agricultural products, upon which the economy depends, as well as the life-support functions that are essential to underpin them, such as ample clean water, productive fishing grounds, rich soils and green surroundings (EFL 2006).

Humans have been using, modifying and converting Sri Lanka's environment for thousands of years. However, over the last century, the rate and impact of these changes have grown immensely as technologies have advanced and human needs have increased within and outside the country. For example, Sri Lanka builds large cities to live in, converts thousands of acres of land to farms, commences a variety of industries to cater for increasing demand for goods and services, develops road networks to facilitate travel, and constructs dams to supply water and generate electricity (EFL 2006). In this process, a number of environmental challenges have been created due to inadequate enforcement of laws, corruption and population growth (De Mel & Sirimanne 2009). Thus, it appears that Sri Lanka's natural and built environments are being degraded (EFL 2006).

3.2.3 Environmental Issues/ Challenges Facing Sri Lanka and Underlying Reasons

In many cases such human activities have had a devastating impact on the Sri Lankan environment. Accordingly, the major issues and associated human activities or factors can be identified as follows.

Destruction and conversion of natural habitats: Destroying forest to create farms, destroying coral reefs to provide building materials, diverting and damming rivers to create reservoirs and hydropower dams (EFL 2006).

Loss of Species, biodiversity and deforestation: Caused by overharvesting and destruction of valuable and unique plants and animals, including wild relatives of crops, and other commercial species. Thus, populations of wild animals that depend on these natural habitats have been devastated, and many rare species have become extinct. The exotic plants and animal species that have been introduced have taken over natural habitats and destroyed native plant and animal species. Biodiversity means the variability among living organisms, including diversity within and between genes, species and ecosystems (EFL 2006).

Land degradation: Due to over-intensive farming and cultivation in unsuitable areas, such as on steep slopes and on poor quality land, thereby exhausting the soil and reducing its fertility. Land degradation can also occur due to a myriad of human activities, such as mining, deforestation and irrigation, leading to various forms of land degradation, such as soil erosion, coastal erosion, landslides and salinization (EFL 2006). According to Stocking (2000) cited by De Mel & Sirimanne (2009), land degradation is the temporary or permanent decline in the productive capacity of land. Large-scale land degradation began with the introduction of commercial plantations in the hill country.

Unusual extraction of natural resources: Includes extraction of mineral resources such as mineral oil, metals, natural gas, salt, sand, stone, and other energy minerals such as uranium and thorium, iron ore and limestone. In Sri Lanka, gem mining and mining of river sand have raised environmental concerns due to excessive and destructive mining practices. The impacts of all kinds of mining include land degradation, soil erosion and sedimentation, water pollution and loss of biodiversity (De Mel & Sirimanne 2009).

Impaired water flow: Caused by over- extraction of water for human consumption. At the same time, clearance and degradation of important watershed areas have led to changes in downstream water flow. As a result, dry season water shortages are becoming more common and wet season flooding is intensifying (EFL 2006).

Poor solid waste management: Solid wastes consist of solid materials discarded from industrial, commercial mining (withdrawals) or agricultural operations and of materials discarded from community activities, also known as garbage, refuse or rubbish (Allaby & Park 2013). Piles of garbage lining the streets, overflowing dumps and mountains of solid waste are indicators of one of the most visible and serious environmental issues facing the society today. Apart from the eyesore these create, more serious implications are the health hazards created by improper disposal of waste. All forms of human activity result in generation of waste which can harm the environment, but careful management and minimisation of waste can limit the damage to the environment while conserving scarce resources (De Mel & Sirimanne 2009).

Pollution: Air, water, land and soil, coastal and marine, are all becoming polluted with harmful and toxic products, including industrial and agro-chemical wastes and also noise and visual pollution are increasing, especially in towns and cities, all of which have substantial impact on the natural environment and its productivity, as well as on human health (EFL 2006).

Climate change: Burning of fossil fuels and accumulation of greenhouse gases in the atmosphere, together with the depletion of stratospheric ozone, are leading to a process of climate change. As a result, weather, rainfall and temperature patterns are changing, and sea levels are rising. At the same time, loss of the forests and other ecosystems that naturally store carbon are worsening these problems (EFL 2006).

Degradation of the built environment: The environment that humans have created is becoming degraded and uninhabitable. Streets and residential areas are being littered and spoiled, parks and open spaces are being encroached upon, unauthorised and unplanned construction is taking place throughout the country, people are having to put up with blocked drains, malfunctioning sewers, power and water shortages and traffic jams; and home gardens, traditional paddy fields and irrigation systems that sustain biodiversity are being degraded (De Mel & Sirimanne 2009; EFL 2006).

Consequently, EFL (2006) argues, Sri Lanka's rich and valuable environment is being rapidly destroyed. Irrespective of the value the Sri Lankan environment has, and that many people and businesses are aware of those environmental issues and the impacts they cause for the environment, it is a minority that adheres to environmentally friendly practices, environmental laws and standards. In that sense, translating environmental knowledge to environmentally friendly behaviour continues to be a challenge (De Mel & Sirimanne 2009; EFL 2006).

3.2.4 Environmental Degradation and Pollution and Their Impact on the Society

Environmental degradation refers to the depletion of potentially renewable resources such as air, water, soil, forest or wildlife by using it at a faster rate than it can be naturally renewed (Allaby & Park 2013). Such degradation affects the goods and services we rely on, and this cost is borne by other people, by the environment and wider society, and by future generations. Forces contributing to environmental degradation include: direct destruction due to actions of individuals, groups of individuals and businesses; much wider institutional, policy and legal factors; weak enforcement of environmental laws, coupled with the failure of relevant agencies to perform their duties adequately; misuse of the environment and breaking of environmental laws, actions which are allowed and encouraged by widespread corruption and political patronage; and changing consumption patterns and demands, increasing market integration and globalisation, land pressure and population growth, which all influence how people use and interact with their environment. Global and national pressures often encourage 'development' to take place in ways that are unsustainable both in environmental and economic terms (De Mel & Sirimanne 2009; EFL 2006).

Pollution is defined in the law as 'any direct or indirect alteration of the physical, thermal, chemical, biological or radioactive properties of any part of the environment by the discharge, emission or the deposit of waste so as to affect any beneficial use adversely or to cause a condition which is hazardous or potentially hazardous to public health, safety and welfare, or to animals, birds, wildlife, aquatic life or to plants of every description' (EFL 2006, p. 18). Pollution normally stems from poor quality water, soil, air and excessive sound in a society, creating an unhealthy environment for people, plants, animals and marine lives. Standards for water quality, air quality and noise levels were enumerated by EFL (2006), so that any activity which does not conform to

these standards is classified as unacceptable pollution, and is illegal in Sri Lanka (EFL 2006).

However, it is obvious that the health of our planet cannot be separated from our own health. Our environment is the basis of our survival and prosperity and all aspects of the environment work together to ensure our livelihood and survival. On the other hand, environmental degradation and pollution can affect human wellbeing and have serious health implications (De Mel & Sirimanne 2009; EFL 2006). When one person degrades the environment, his or her actions affect others, so that the effects of environmental degradation are felt by everyone, regardless of who they are or where they live.

It is clear that many forces at all levels influence environmental status in Sri Lanka and thus environmental degradation is the sum of many different forces and conditions, which are individual, local, national and global in origin, and which involve many different actors. In turn, achieving a healthy environment requires actions at all levels, in response to all of these different causes of degradation (EFL 2006). Thus, it is a must and the responsibility of all humans individually, as groups of the society, institutions and the government, to protect, manage and enhance the environment of Sri Lanka. To ensure that this endeavour succeeds, it is vital to establish certain basic norms, requirements, laws and regulations and make all people aware of them and to take necessary initiatives through regulatory bodies to ensure environmental protection while minimising pollution.

Considering all this, general environmental principles must be acknowledged as necessities, with particular emphasis on the concept of SD, both nationally and globally by all nations in their day-to-day tasks, businesses and development activities.

3.3 General Environmental Principles

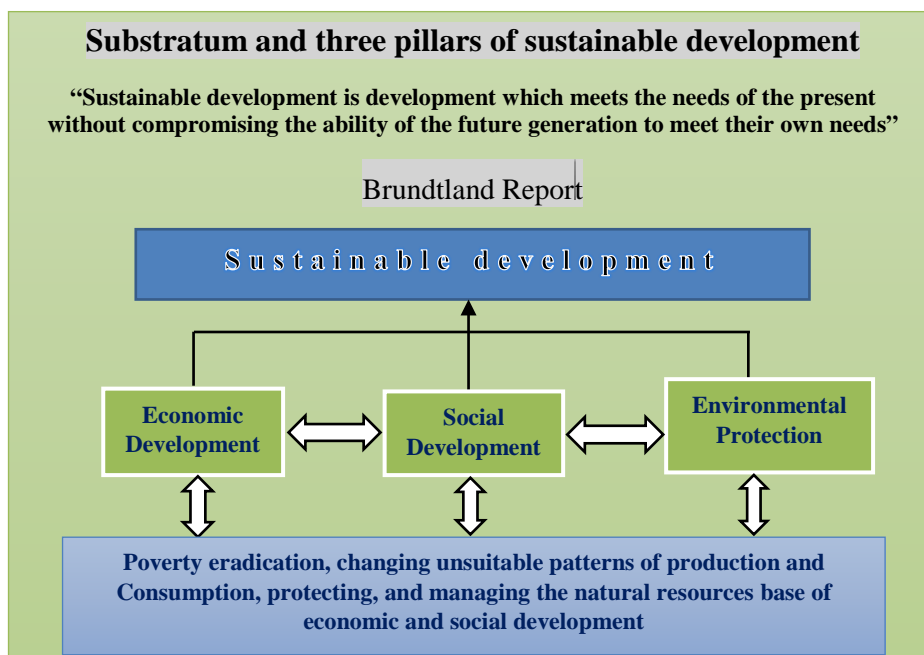
According to MoE (2012) and De Mel and Sirimanne (2009), six environmental principles are identified, as outlined below.

1) Sustainable Development

The most widely used definition of SD is the one by the ‘World Commission on Environment and Development’. Bruntland (1987) defines sustainable development as ‘development that meets the needs of the present without compromising the ability of

future generations to meet their own needs’ (cited by MoE 2012, p. 1). SD has emerged as a new paradigm of development, integrating economic growth, social development and environmental protection as interdependent and mutually supportive elements of long-term development, as shown in Figure 3.1(MoE 2012).

Figure 3.1 Integration of the economic, social and environmental pillars into sustainable development



Source: Sri Lanka’s Middle Path towards Sustainable Development, MoE 2012, p.1

The idea of sustainability emerged in the 1970s, with the UN Stockholm Conference on the Human Environment being the first major international meeting that considered how human activities were harming the environment and were putting humankind at risk (Bruntland 1987). The environment and development must be viewed as being the same side of the coin, rather than being two sides of that coin. New technologies and innovations have already shown that development can occur with minimum impact on the environment and in this respect renewable energy, cleaner production and green building are just a few concepts which illustrate this (De Mel & Sirimanne 2009).

Renewable energy is energy that is obtained from sources that are for all practical purposes inexhaustible, i.e., moving water (hydroelectric power, tidal power and wave power), biomass, solar energy, wind energy, geothermal energy (Allaby & Park 2013).

Renewable energy sources will play a key role in reducing greenhouse emissions, and in the stabilisation of the global climate (De Mel & Sirimanne 2009).

Cleaner production is the continuous application of an integrated preventative environmental strategy introduced in the areas of production process, products and services in order to generate an eco-friendly output and reduce risk to humans and the environment (cited by De Mel & Sirimanne 2009). Cleaner production promotes the application of pollution-free production in industrial companies. It focuses on reducing the natural resources consumed per unit of product or service, and minimises the impact on pollutants. This results in enhanced revenues and profitability as well as lower costs of production. It is a win-win-win approach where industry, the environment and society benefit equally (cited by De Mel & Sirimanne 2009).

Green building or sustainable building is ‘the practice of creating structures and using processes that are environmentally responsible and resource-efficient throughout a building's life-cycle from siting to design, construction, operation, maintenance, renovation and deconstruction’. Green buildings are designed to reduce the overall impact of the built environment on human health and the natural environment by: efficiently using energy, water, and other resources; protecting occupant health and improving employee productivity; and reducing waste, pollution and environmental degradation (cited by De Mel and Sirimanne (2009)).

However, global and national pressures often encourage ‘development’ to take place in ways that are unsustainable, both in environmental and economic terms. The wish for short-term gains, and a dominant development imperative that ignores environmental sustainability, are undermining the ability of the natural environment to provide the goods and services that are so essential for our daily lives and long-term prosperity (EFL 2006). Meeting the delicate balance between growth and environmental protection is a universal challenge that needs to be addressed by every developing nation (Central Bank of Sri Lanka 2013). Yet the principle of sustainable development has been recognised in Sri Lankan law and policy for many years (De Mel & Sirimanne 2009; Ministry of Environment & Natural Resources - MENR 2002).

2) Precautionary principle

This principle is based on the premise that it is better to prevent environmental degradation in the first place rather than allow it to occur and then tries to repair the

damage. It basically imposes a duty to foresee and assess environmental risks, to warn potential victims of such risks and to act in ways that prevent or mitigate such risks (cited by De Mel & Sirimanne 2009; Nanayakkara & Karunaratne 2009).

3) Polluter-Pays principle

This principle establishes that the costs of pollution should be borne by the person responsible for causing the pollution and therefore the polluter-pays principle seeks to avoid this result, as well as the injustice caused by it, by obliging the polluter to bear the costs of pollution control to 'internalise' such costs, and thus this is a method of internalising externalities (cited by De Mel & Sirimanne 2009; Nanayakkara, R & Karunaratne 2009).

4) Principle of preventive action

This principle imposes an obligation on states to prevent damage to the environment, and to reduce, limit or control activities which may cause risk or damage to the environment. The state may implement this obligation through regulatory, administrative and other such measures. It is best supported by domestic environmental protection legislation, which should establish authorities, procedures and processes for implementing this principle. Such legislation should ideally integrate international environmental standards, provide access to environmental information to the public, and ensure environmental impact assessment where necessary. Prevention is also linked to the notion that disincentives such as penalties and civil liability will cause persons to take greater care in their behaviour and avoid polluting activities. Also, the notion of pollution prevention includes the concept that pollution may be prevented or reduced at its source, by changing raw materials, production techniques, or technologies (cited by De Mel and Sirimanne 2009).

5) Principle of accountability

According to the constitution, not only the State but also every person in Sri Lanka, including all bodies, institutions and organisations that have been vested with legal personality, are responsible for the protection and conservation of the environment. Greater responsibility in respect of environmental issues is imposed on the executive and its officers (cited by De Mel and Sirimanne 2009).

6) Principle of inter-generational equity

Inter-generational equity focuses on the rights of future generations, while recognising the rights of the present generation to exploit natural resources. As reflected in international agreements, this principle is one of the four key elements of sustainable development: 'preserving natural resources for the benefit of future generations'. It further affirms that the right to development must be pursued so as to equitably meet development and environmental needs of present and future generations (cited by De Mel & Sirimanne 2009; Nanayakkara, & Karunaratne 2009).

3.4 Multilateral Environmental Agreements and the Sri Lankan Legal System

A substantial body of international environmental law has emerged over the years as a result of international and regional treaties and conventions, judgments of the International Court of Justice and customary international law (Shaw 2003). The United Nations has been a major catalyst in the development of international environmental law and has conducted several significant global conferences to facilitate international consensus on environmental matters. Countries which have ratified these conventions and agreements are bound by international law to adopt domestic standards in accordance with the applicable international norms (Nanayakkara & Karunaratne 2009). A broad range of environmental problems is now governed by Multilateral Environmental Agreements. A Multilateral Environmental Agreement is an international treaty, which legally binds a number of states on matters pertaining to the environment. Multilateral Environmental Agreements are a key tool in international environmental governance. According to the United Nations Environmental Programs (UNEP), there were over 500 international agreements and other documents relating to the environment (Shaw 2003).

Being a signatory to the Multilateral Environmental Agreement, attempts were made to incorporate provisions into Sri Lankan law in order to ensure the implementation of the principle of sustainable development. Thus, much of Sri Lanka's environmental obligations are being fashioned by international environmental law (Nanayakkara, R & Karunaratne 2009). Sri Lanka actively participated in the global-environmental partnerships and has ratified 36 Multilateral Environmental Agreements over the years

(MoE 2012). In addition, Sri Lanka has adopted major Declarations in the field of environment that include the Stockholm Declaration, the Nairobi Declaration, the Rio Declaration, and the Washington Declaration. Sri Lanka also recognises the Charter of the United Nations and the Statute of the International Court of Justice. Moreover, Sri Lanka is an active member of the South Asian Co-operative Environment Program, South Asia Association of Regional Cooperation and South Asia Regional Seas Program as well (MoE 2012).

3.4.1 Environmental Law

Environmental law is defined as ‘a body of law, which is made up of a series of complex and interlocking statutes, common law, treaties, conventions, regulations and policies which, very broadly, operate to regulate the interaction of humanity and the rest of the biophysical or natural environment, for the purpose of reducing or minimising the impacts of human activity, both on the natural environment and on humanity itself’ (De Mel & Sirimanne 2009, p.22). It is necessary for laws that seek to protect the environment and conserve natural resources to anticipate and cater for the challenges of the future. In doing so, the primary aim and motive of such laws must be to strike a prudent balance between development and environmental protection, taking into account the current state of the environment (De Mel & Sirimanne 2009).

Environmental law should not be confined to mere territorial considerations. The rationale behind this is that ecological interdependence does not respect national boundaries and that issues previously considered to be matters of domestic concern have international implications (Sands 2003).

3.4.2 The Emergence of Environmental Law in Sri Lanka

As evidenced from ‘Mahawansa’, Sri Lanka has a rich tradition of environmental conservation, which had its origins in Buddhist teaching and in customs and practices followed over time. Modern environmental law in Sri Lanka has evolved from and has been moulded by the principles of Roman-Dutch law, English law, legislation, international treaties and judicial decisions. The modern history of environmental law and policy in Sri Lanka can be traced back to the mid-19th century, i.e., in 1848 the Timber Ordinance was introduced to preserve forests (De Mel & Sirimanne 2009).

There are two main sources of environmental law:

1) *International law*

International law is the body of laws that govern and regulate relations between sovereign states. Accordingly, a state may not invoke a provision in its national law to excuse its violation of international law.

2) *Domestic law*

At the national level, the sources of environmental law will include:

i) *Constitutional law*: The constitution imposes environmental duties on the state as well as on every person to protect and conserve the environment, as a part of the Directive Principles of State Policy and Fundamental Duties.

ii) *Legislation relating to environmental matters*: The most important piece of legislation in this area is the NEA; apart from this Act, other laws deal with specific aspects of the environment. The violation of any of the provisions of the NEA constitutes a penal offence, which is punishable with imprisonment.

iii) *Administration regulations and subsidiary legislation*: Legislation pertaining to environmental matters may delegate regulatory powers, including rule-making, standards-setting and enforcement powers to administrative agencies with a view to achieving the legislative mandate. The CEA exercises significant powers under the NEA that include the power to grant or refuse permits and licences to persons carrying out prescribed activities that may have an impact on the environment.

iv) *Judicial decisions*: Judicial decisions have contributed significantly to the development of environmental law in Sri Lanka. There has been growing awareness among courts, and judges have recently shown an increased willingness to intervene in environmental matters.

v) *Industry standards and codes of conducts*: Industries, institutions and non-government organisations may have self-imposed regulations, standards or codes of conduct relating to environmental issues, although they may be of a non-binding nature. Such standards and codes of conduct may nevertheless hold such institutions accountable to the public as well as to their investors (current and prospective).

Breaches of these standards may destroy investor confidence in the institution and erode the public's confidence in the products or services offered by such institutions. In that sense, institutions may, as part of their corporate governance requirements, hold them accountable to carry on businesses, having concern for matters such as environmental pollution, sustainable development and the preservation of natural resources. Some institutions contribute to the protection and preservation of the environment through their corporate social responsibility (CSR) programs. Moreover, many company annual reports now document how corporate activities impact on the environment and their measures applied towards protecting the environment.

vi) *Customs and practices*: To a lesser degree, customs and practices of communities contribute to the preservation of the environment. The indigenous people of Sri Lanka, better known as the 'Veddas', follow a lifestyle where only what is required from their surrounding environment is utilised and the forests and wide animals are preserved for their future sustenance. In general, indigenous communities have developed ways of life remarkably attuned to their environment (De Mel & Sirimanne 2009).

3.4.3 Important Environmental Laws and Institutions in Sri Lanka

There are 80 laws/regulatory measures in Sri Lanka relating to environmental protection (MoE 2012). Among these, Appendix I contains key laws/regulatory measures and associated authorities in Sri Lanka. From the list in Appendix I, NEA is identified as the most important piece of environmental law applicable for all companies/industries in the country. Other laws/regulatory measures deal with specific aspects of the environment, meaning that they are only applicable for specific industry sectors.

3.5 Strategies for Prevention and Control of Environmental Pollution

Environmental degradation and pollution can affect human wellbeing and have serious health implications. Therefore, one of the major motivations for the conservation of the environment, and control of pollution is the concern for human health (De Mel & Sirimanne 2009). Pollution control usually takes place on the basis of measurable standards and in this respect; the primary pollution control law in Sri Lanka is the NEA (Nanayakkara 2009).

3.5.1 Enactment of Provisions of NEA through CEA of Sri Lanka

The National Environmental Act No. 47 of 1980, as amended by Acts No. 56 of 1988 and No. 53 of 2000, is the basic national charter for the protection, conservation and management of the environment. The NEA was thus enacted as an umbrella law to address a variety of environmental matters while other laws deal with specific aspects. The Act is administered by the CEA, which was established in 1981 under the provisions of the NEA, and functions under the purview of the MoE. The MoE has overall responsibility in the affairs of the CEA, with the objective of integrating environmental considerations into the development process. The CEA was given wide regulatory powers for the protection, management and enhancement of the environment, for its regulation maintenance and control of quality, and for the prevention, abatement and control of pollution (NEA 1980).

The Act specifies the important functions of the CEA thus:

- Implementing Environmental Protection Licence (EPL) procedures
- Implementing the IEE and EIA procedures
- Introducing Strategic Environmental Assessment on spatial plans
- Compliance monitoring of approved projects
- Regulating, maintaining and controlling the types, constituents and effects of waste, discharge, emissions, deposits or other sources of pollution, including noise
- Monitoring and maintaining the quality of the environment by specifying/developing standards, norms and criteria
- Monitoring ambient air and water quality to determine and control pollution trends
- Specifying methods to be adopted in taking samples and testing
- Implementing a waste water discharge fee scheme for industries
- Taking legal action against violators of the NEA
- Extending awareness of local, national and global environmental issues
- Using mass media to promote environmental awareness
- Providing information and documentation services on environmental and natural resources
- Establishing links with regional, national and international environmental information systems for acquisition and dissemination of information

- Promoting, encouraging, coordinating and undertaking long-range planning in environmental protection and management
- Implementing environmental management and protection projects.

The Environmental Council was established under the NEA in order to handle the following main functions (CEA 2007):

- To generally advise the CEA on matters pertaining to its responsibilities, powers, duties and functions stipulated under the NEA; and
- To advise the CEA on any matter referred to the Council by the CEA.

According to the National Environmental (NE) Protection and Quality Regulations No. 1 of 2008, the 1980 NEA is the most important piece of legislation and has extensive provisions on pollution control, regulation of development and preparation of management plans for the protection of the environment. The EPL and EIA are two important tools introduced by the NEA to integrate environmental protection into the economic development process. Further, the Coast Conservation Act, Fauna and Flora Protection Ordinance, Greater Colombo Economic Commission Law, and Southern Development Authority Act also contain provisions on the EIA process in order to ensure that environmental concerns are considered during development activities (Nanayakkara 2009). Accordingly, this section elaborates standards and criteria for prescribed activities, EIA/IEE procedures, EPL procedures, and other provisions of the NEA for prevention and control of pollution.

3.5.1.1 Standards and Criteria for ‘Prescribed Activities’ under the NEA

Part IV A of the NEA deals with ‘environmental protection’ by providing for regulation to ensure that the discharge, deposit or emission of waste from certain prescribed activities by industrial, commercial or other undertakings meets prescribed standards and procedures. According to section 23A of the NEA and NE Protection and Quality Regulations No.1 of 2008, the Minister may determine the ‘prescribed activities’ which require an EPL before they can commence or continue operations. ‘Prescribed activities’ can therefore only be carried out under the authority of EPL issued by the CEA or by the local authority (LA), as the case may be, and in accordance with the standards and other criteria prescribed under the NEA. Moreover, in accordance with

Regulations 3 and 4, NE Protection and Quality Regulations No.1 of 2008, the CEA has the discretion to impose more stringent standards and criteria in respect of a prescribed activity if it believes that such stringent measures are required to protect the environment. The CEA may further determine the standards and criteria that apply for particular circumstances where an activity submitted by an applicant is not covered in terms of the existing standards and criteria (NEA 1980).

Prescribed standards under the NE (Protection and Quality) Regulations No. 1 of 2008 are:

- Tolerance limits for the discharge of industrial waste into inland surface water
- Tolerance limits for industrial waste discharged on land for irrigation purpose and hydraulic loading applicable for different soils
- Tolerance limits for industrial and domestic waste discharged into marine coastal areas
- Tolerance limits for waste from rubber factories being discharged into inland surface water
- Tolerance limits for waste from the textile industry being discharged into inland surface water
- Tolerance limits for waste being discharged from tanning industries
- Tolerance limits for the discharge of effluent into public sewers with central treatment plants.

The primarily focus of these standards is to ensure the quality of surface water. Standards were also gazetted for the control of noise emissions from industries under the provisions of NE (Noise Control) Regulations No. 01 of 1996 (NEA 1980).

3.5.1.2 The Initial Environmental Examination (IEE) and Environmental Impact Assessment (EIA) and Approval of Projects

These assessments are the starting point of environmental considerations and actions with respect to proposed industrial activity towards protecting the environment. Thus, this study investigates these processes and analyses them in the Chapter Six by identifying the extent of environmental impacts and controlling measures initiated in the planning stage of the business process (related to RQ III). EIA is clearly recognised in Sri Lanka as an effective tool for the purpose of integrating environmental considerations into development planning. EIA helps identify the likely effects of a

particular project on the environment at an early stage, to find ways to reduce unacceptable impacts and to shape the project so that it suits the local environment. It enables officials to incorporate mitigating measures identified in this assessment into the planning process before commencing the project, thereby reducing harm caused to the environment. It thus helps the project proponent achieve its aims more successfully in an environmentally friendly manner. The EIA can therefore be considered a major planning tool and one of the key techniques to achieve SD (NEA 1980).

Law, policy and institutional arrangements for EIA in Sri Lanka

EIA has become a mandatory requirement for establishment of development projects in Sri Lanka. EIA was first introduced by the Coast Conservation (Amendment) Act No. 57 of 1981. This applies to projects that come within the 'Coastal Zone'. The NE (Amendment) Act No. 56 of 1988 introduced EIA as a part of the strategy to achieve SD for the entire country and the CEA was assigned regulatory functions. Part IV C of the amendment Act mandated that all 'prescribed' development projects are required to be subjected to EIA. 'Prescribed' means prescribed by regulations (NEA 1980). Large-scale development projects likely to have significant impacts on the environment are listed as prescribed projects. In addition, 'projects' located in 'environmental sensitive areas' are required to undergo EIA irrespective of their magnitude. The NEA stipulates that approval for all prescribed projects must be granted by a Project Approving Agency (PAA). At present, 23 Government Agencies have been designated PAAs. A single PAA is established as responsible for administering the EIA process for a project. When there is more than one PAA involved, the appropriate PAA is decided by the CEA (CEA 2015; NEA 1980).

The NEA (1980) has identified two levels in the EIA process:

- 1) Projects requiring IEE – If the environmental impacts of a project are not very significant then the project proponent may be asked to do an IEE, which is a relatively short and simple study.
- 2) Projects requiring EIA – If the potential impacts of a project appear to be more significant, then the project proponent may be asked to do an EIA, which is a more detailed and comprehensive study of environmental impacts compared to an IEE.

In law, an IEE is required for a project and then, depending on what arises out of the IEE, the project proponent is asked to do an EIA. Prescribed projects are gazetted in a timely manner and made available at the CEA, so that the project proponent first has to find out whether the proposed business falls within the list of prescribed projects. For this, the CEA may provide the industrialist (project proponent) with a 'basic information questionnaire' to submit essential information about the project in order for the CEA to determine the matter (CEA 2015; NEA 1980).

Accordingly, if the project is identified as 'prescribed projects', requiring EIA/IEE procedures, then the CEA determines the appropriate PAA to administer the EIA/IEE process as outlined below.

Steps in the EIA/IEE process

- 1) *Submission of preliminary information:* regarding the nature, location and impacts of a proposed project to the PAA by the project proponent.
- 2) *Environmental scoping:* by the PAA to determine the scope of issues to be addressed and to identify the significant issues related to a proposed action. Then the PAA issues the 'terms of references' for the EIA/IEE after the scoping process.
- 3) *Submission of the EIA/IEE report:* prepared by the project proponent to the PAA for evaluation.
- 4) *Public Participation and Evaluation of the Report:* subsequent to the public commenting period, the PAA appoints a technical evaluation committee (TEC) to evaluate the EIA report and make its recommendations. IEE reports are not required to be opened for public comment and are thus subjected to technical evaluation only.
- 5) *Decision Making:* based on the recommendation of the TEC, the PAA makes its decision on whether to grant approval for the project. If the PAA is not the CEA, it must obtain the concurrence of the CEA prior to granting approval.
- 6) *Compliance Monitoring:* EIA/ IEE approval is generally given with conditions, which the project proponent is expected to meet and thus, the CEA or the PAA monitors the implementation of conditions/mitigation measures. If the project proponent violates the conditions, approval may be revoked.

Following such an environmental recommendation procedure that is mandatory for all prescribed industries, Sri Lanka is able to take adequate mitigatory measures in advance, from the planning state of the project, to minimise anticipated environmental pollution arising from proposed industrial activities/development projects.

3.5.1.3 Environmental Protection Licence (EPL)

The EPL is a regulatory/ legal tool under the provisions of the NEA 1980 as amended by the 1988 and 2000 Acts. Industries and activities requiring an EPL are listed in gazette in a timely manner. Industries are classified under three lists, A, B and C, depending on their pollution potential (Table 3.1).

Table 3.1 Industry classification based on pollution potential, authorised body for EPL procedures and validity period of EPLs

Industry classification	Pollution potential comprises:	Authorised body for obtaining EPL	Validity period of EPL (from the effective date of the Licence)
List 'A'	80 significantly high-polluting industrial activities	Relevant Provincial Offices or District Offices of the CEA	Maximum of one year
List 'B'	33 numbers of medium-level polluting activities		Maximum of three years
List 'C'	25 low polluting industrial activities	Respective Local Government Authorities: Municipal Councils, Urban Councils and Pradeshiya Sabhas	Maximum of three years

Source: www.cea.lk

Objectives of the EPL

- To prevent or minimise the release of discharges and emissions into the environment from prescribed (industrial) activities in compliance with national discharge and emission standards.
- To develop an approach to pollution control that considers discharges from prescribed (industrial) processes to all media (air, water, land) in the context of the effect on the environment.

- To contain the burden on industry, in particular by providing guidance on pollution control for polluting processes.
- To ensure that the system responds flexibly both to changing pollution abatement technology and to new knowledge such as cleaner production, waste minimisation.

Procedure on issuing an EPL for industrial activities

The procedure followed in obtaining EPLs is somewhat different for industrial activities in list 'C' from those of lists 'A' and 'B'.

1) Procedure on issuing an EPL for industrial activities in 'List A' and 'List B'

Step 1 - Submitting an application: to the relevant provincial office or district office of the CEA by the industrialist for each prescribed activity.

Step 2 - Pre-evaluation of the application: to check the relevancy of issuing the EPL and the adequacy of the details furnished and to determine the inspection fee to be requested. If accepted, then the application proceeds to Step 3; others return to Step 1.

Step 3 - Determination and payment of inspection fee: based on the details furnished by the industrialist.

Step 4 - Field inspection: by a team of officers in order to assess the data furnished with respect to the industry and to decide the possibility of operating such an industry while controlling pollution.

Step 5 - Inspection report with recommendations: If the site is recommended, it proceeds to Step 6 and in turn, if the recommendation suggests requesting a proposal for additional pollution control measures, the decision to issue the EPL will be based on the evaluation of the additional details provided by the applicant. If it is decided to refuse to issue the licence, the applicant will be informed accordingly.

Step 6 - Approval for issuing EPL: granted by the CEA and then the legal division of the CEA grants legal approval for the draft conditions of the EPL.

Step 7 - Licence fee: Once legal approval is granted, the industrialist is requested to pay the licence fee so as to enable the CEA to issue an EPL for the industrial activity.

Step 8 - Issuing EPL: for the period as specified in the Gazette: List 'A' for one year and Lists 'B' and 'C' for three years.

2) Procedure on issuing EPL for industrial activities in List 'C'

For prescribed industries in list 'C', power has been delegated to Local Authorities (LA) to issue EPLs and to carry out related functions, such as follow-up, monitoring and law enforcement. In the process of issuing EPL, as in the case of Lists A and B, all steps are to be followed in the same order by the LA where the industry is located.

Renewal of EPL

For activities in List 'A' and List 'B', upon submitting an application for EPL renewal by the industrialist, a team of officers of CEA carry out a field inspection (no inspection fee required) to ascertain whether the conditions stipulated by the previous EPL are violated. If violation of conditions is observed, the CEA requests the applicant/ industrialist to have relevant pollution control measures in order to consider renewing the EPL. For activities in List 'C', once the industrialist has applied for renewal of EPL to the relevant LA, there is follow-up monitoring of industrial activities to check performance of pollution control systems in the industry, and whether the industry complies with conditions stipulated in the EPL and whether there is any change, expansion or alteration to the industrial process. After ensuring conformity in all these, renewal of EPL is considered.

For the purpose of that renewal, monitoring is carried out by relevant authorities by inspecting the industries at regular intervals and reviewing reports on wastewater analysis, noise/vibration measurements and on efficiency/evaluation of pollution control systems adopted. In these instances, the industrialists are requested to consult reputable laboratories to obtain such test reports periodically, as may be indicated in the EPL.

Initiating legal proceedings against industries

Legal proceedings are adopted under Part IV A of the NEA when industrialists who engage in prescribed activities violate any terms, conditions and standards stipulated in the licence, undertake prescribed activities without obtaining an EPL, or emit waste to the environment without conforming to stipulated standards. If the industrialist continues to violate the conditions, legal actions are initiated in terms of cancellation /suspension of the EPL, rejection of the application for an EPL, hearing appeals by the secretary of the MoE, issuing legal notices, and filing cases (CEA 2015; NEA 1980).

Thus, all procedures relating to issuing and renewal of an EPL affect almost all EM initiatives made by industrialists, from the beginning throughout the business process; hence these EPL processes are related to RQ III of this study. Because all listed companies must essentially follow such EPL procedures in complying with the provisions of the NEA.

3.5.1.4 Other Provisions of the NEA to Prevent and Control Environmental Pollution

Important provisions that also affect EM initiatives of listed companies undertaken in their ongoing business processes (related to RQ III) are considered in this section.

Legal requirements and guidelines for the management of scheduled waste

Hazardous waste is identified as 'scheduled waste'. In addition to gazette notifications issued by the government, for this purpose in 2009 the CEA published 'Guidelines for the management of scheduled waste in Sri Lanka', including all required guidelines, legal requirements and procedures to be followed by all applicable industries and organisations (CEA 2009). The CEA takes all necessary procedures to implement these provisions in accordance with the NEA. Accordingly, all persons involved in handling scheduled waste specified in the regulation (generate, collect, transport, store, recover, recycle or disposal) must obtain a 'Scheduled Waste Management Licence (SWML)' from the CEA and comply with standards and other criteria specified by the CEA (CEA 2009; NEA 1980).

Environmental quality

Part IV B of the NEA provides for the regulation of 'environmental quality', prohibiting any person from carrying out polluting activities listed in this part of the statute. Prohibited activities include polluting inland water, the atmosphere, soil or surface of any land, making or emitting excessive noise and the disposal of litter (CEA 2009; NEA 1980).

Laws related to the protection of air, water, soil and noise

As recognised in the NEA, pollution control is usually addressed in terms of two primary approaches: 'end-of-pipe' and 'cleaner production'. The traditional approach is

'end-of-pipe', where the final waste generated through the industrial process is treated, while the modern approach is called 'cleaner production', where pollution control occurs at an earlier stage. Under the cleaner production process, attempts are made to minimise the waste that is generated at the first instance, leaving less waste to be treated as 'end-of-pipe'. Cleaner production seeks to achieve this by modifying the manufacturing process (cleaner technology) and by improving the quality of the raw materials. The NEA makes provision to mandate end-of pipe treatment and empowers the Minister to prohibit the use of any materials for any process, trade or industry, and to prohibit the use of any equipment or industrial plant that will endanger the quality of the environment. Since cleaner production may result in a saving for the industrialist, some industries may prefer to adopt this approach voluntarily (CEA 2009; NEA 1980; Nanayakkara 2009). The following aspects are paid particular attention regarding pollution.

Air

Air emissions from stationary sources are controlled by stipulations in the EPL. The Motor Traffic (Emission Control) Regulations of 1994 under the NEA establish the methodology for vehicle emission testing. NE Regulations No.1 of 2003, amended by Regulations of 2008, establish standards for emissions from vehicles, and also establish fuel standards and vehicle exhaust emission standards for the importation of vehicles.

Water

NEA provisions on 'environmental protection', 'environmental quality' and the 'approvals of projects' are all applicable for the prevention of water pollution. The NEA mandates that, subject to the provisions pertaining to the EPL, the discharge or emission of waste into inland water in contravention of prescribed standards is an offence. Provisions of the law also contain a general prohibition on the pollution of inland water.

On ground water, there is no provision in the law that directly regulates its pollution. But, as primary sources of ground water pollution are through soil and surface water pollution, these sources of pollution can be regulated through other means, including those in the NEA, the Penal Code and the Code of Criminal Procedure Act. The Water Resources Board has the mandate of advising the Minister regarding the preparation of plans for the conservation, utilisation, control and development of ground water.

Soil

As in the case of water, the provisions of the NEA relating to ‘environmental protection’, ‘environmental quality’ and the ‘approval of projects’ are applicable for soil pollution. The environmental quality provisions of the NEA provide for the regulation of soil pollution: no person may discharge or deposit waste into the soil, except in accordance with such standards or criteria as may be prescribed under the Act. The Act also contains general provisions for the prevention of soil pollution.

Noise

Section 33 of the NEA defines noise pollution as ‘the presence of sound at a level which causes irritation, fatigue, hearing loss or interferes with the perception of other sounds and with creative activity through distraction’ (NEA 1980, p.33). Subject to provisions pertaining to the EPL, the NEA prohibits the emission of excessive noise other than in compliance with prescribed standards or limitations.

Further, the NEA empowers the CEA to give directives to LAs for safeguarding and protecting the environment within the limits of such LAs. Accordingly, the Act gives sufficient power to the CEA to regulate all its functions and activities (the key functions and activities are listed in this chapter) for protecting the environment according to provisions for preventing and controlling environmental pollution (CEA 2009; NEA 1980; Nanayakkara 2009).

3.5.2 National Environmental Action Plan (NEAP) for Sustainable Development

Sri Lanka has a wide range of environmental policies covering several sectors. In 1988, a National Conservation Strategy was developed, identifying key environmental issues and the ways to address environmental degradation. The National Conservation Strategy was then developed into a workable action plan, with the CEA preparing a comprehensive inter-sectorial NEAP. The initial NEAP of 1991, which covered the period 1992-1996, was an important tool to set priorities for environmental planning and management. The MoE updates the NEAPs every three years with the participation of key stakeholders, considering new industrialisation strategies and identifying specific actions and institutions that are responsible for their implementation. Consequently, the policies, strategies and action plans adopted through NEAP that relate to the environment are presented in appendix II (De Mel & Sirimanne 2009; MENR 2002).

3.5.3 Sri Lanka's Middle Path towards Sustainable Development through Mahinda Chintana - Vision for the Future – 2012

This is the country report prepared by the MoE to present at the United Nations Conference on SD (Rio+20), known as 'Earth Summit', held in Brazil in June 2012. At this Summit, 172 participating countries, including Sri Lanka, reached the global agreement *Agenda 21 – Action Plan for Sustainable Development*. Agenda 21 reflects the highest level of global consensus and political commitment on development and environmental cooperation. Further, it reaffirmed that SD was delimited by the integration of the economic, social and environmental pillars, as illustrated in Figure 3.1 (MoE 2012).

The report includes actions taken by Sri Lankan authorities over the past 20 years in moving towards achieving SD, and indicates the way forward (MoE 2012). This conference focused on how countries worldwide manage environmental issues together with economic development. Being a member of this global community for more than ten years, Sri Lanka has been encouraged to play a significant role in pursuing strategies for SD that encompass all key sectors in the country. Since 1992, Sri Lanka has made significant progress by establishing institutions, strengthening existing institutions, and promulgating environment legislation in line with the Rio Principles. Inter-agency coordinating mechanisms were also developed to facilitate mainstreaming environmental concerns in the development process. Accordingly, the major strategies applied and actions taken towards this endeavour are summarised below (MoE 2012).

- 1) Established the *National Council for Sustainable Development (NCSD)* in 2009

Exceptionally effective policy development and coordination mechanisms for SD were established through this council ensuring integration of environmental concerns into the economic and social development processes throughout the country. All cabinet ministers who represent key sectors with close connections to the SD agenda are members of the NCSD whilst the MoE acts as the convener of the NCSD.

- 2) Developed *Sustainable Human Development Index* in 2008

- 3) Launched *Haritha (Green) Lanka* in 2009

- 4) Developed *National Action Plan for Haritha (Green) Lanka Program* in 2009

This program was launched by the MoE in 2009, with the objectives of addressing environmental issues in economic development, incorporating an environmental

dimension into the economic development process and ensuring the long-term sustainability of human development. The program includes short-, medium- and long-term targets for the period 2010-2016, with performance indicators to monitor its progress.

- 5) Developed *Sri Lanka Strategy for Sustainable Development* in 2009
- 6) Developed *National Green Accounting Mechanism* in 2011
- 7) Established *National Cleaner Production Centre (NCPC)* and *Sri Lanka Carbon Fund* in 2007
- 8) Established *Green Job Awards Program* in 2009
- 9) Established *National Green Reporting System (NGRS)* in 2011

In promoting transparency of an organisation's sustainability performance, the MoE, as the convener, established the NGRS, which provides a framework for enabling organisations to become transparent through 'sustainability reporting'. The NGRS is based on the Global Reporting Initiatives (GRI) and G3 Guidelines. It suggests the use of ISO 26000 Standard for Guidance on Social Responsibility for the design and implementation of internal sustainability mechanisms. This report should give a balanced account of the sustainability performance of the organisation.

Thus, the objective of NGRS is to:

Facilitate the manufacturing and service sectors to periodically measure and report their sustainability performance with respect to economic, environmental and social aspects, in order to continually improve their production processes and services, relationship with stakeholders and enhance their image, while contributing towards the sustainable development of the country (MoE 2012, p. 9).

3.5.3.1 Private Sector Initiatives in Sustainable Development

The private sector is identified as the engine of growth, propelling the country forward. The private sector has taken a series of novel strategic initiatives to mainstream SD by incorporating initiatives developed by the public sector, and thus demonstrating a true public private partnership (PPP). There have been several initiatives by the private sector for investing in green initiatives and SD. These, among many others, thoroughly demonstrate Sri Lanka's leadership position in promoting the concept of three 'P's': giving equal recognition to the *Planet, People and Profit* (MoE 2012).

Further, Sri Lanka National Energy Efficiency Awards, conducted by the Sustainable Energy Authority, are granted for activities on improving energy efficiency in organisations in general. This recognises successful implementation of cost-effective, transferable and innovative energy efficiency measures taken by small-, medium- and large-scale organisations in a variety of sectors, such as manufacturing, services, hotels, commercial buildings, state sector office buildings and healthcare (MoE 2012).

3.6 Institutions Compliance with Environmental Standards, Accreditations, Regulations and laws

There are several imperative institutions in Sri Lanka that support prevention and control of environmental pollution arising mainly due to industrial activities, by employing procedures and activities in accordance with standards, accreditations, regulations and laws.

3.6.1 Sri Lanka Standards Institution (SLSI)

The National Standards Body of Sri Lanka was first established under the Bureau of Ceylon Standards Act No. 38 of 1964 with the principal objective of promoting standardisation and quality control in industry and commerce. Later it was replaced by the SLSI through Act No. 6 of 1984 to give it wider scope. The SLSI functions under the Ministry of Technology and Research. The SLSI is a member body of the ISO for Sri Lanka, which is made up of national standards institutes from countries large and small, industrialised and developing, in all regions of the world. The ISO develops voluntary technical standards that add value to all types of business operations (SLSI 2013). These standards are market-driven and contribute to making the development, manufacturing and supply of products and services more efficient, safer and cleaner. They also make trade between countries easier and fairer, while safeguarding consumers and users of products and services, as well as making their lives simpler (SLSI 2013).

3.6.1.1 ISO 14000 Environmental Management System (EMS) Certification

ISO 14000 standards relate to the area of EM and associated functions, such as auditing, performance evaluation, and life-cycle assessment to ensure compliance with environmental laws and regulations, which can be implemented by organisations voluntarily. The ISO's profession is to develop standards so that ISO itself does not assess quality or EMSs and does not issue either ISO 14000 certificates or any other certificates, i.e., ISO 9000. The ISO has developed the 14000 standards series, such as ISO 14001, ISO 14004, ISO 14020, ISO 14021, ISO 14024 and, following this ISO 14000 family, SLSI has developed standards below relating to EM concern in Sri Lanka (SLSI 2015).

SLS ISO 14001:2004 - Environmental Management Systems (EMSs) Certification Scheme: it is guidance for use in the EMS certification

SLS ISO 14004:2004 - General guidelines on principles, systems and supporting techniques of the EMS

SLS ISO 19011:2002 - Guidance the principles of auditing, managing audit programs, conducting quality management system audits and EMS audits.

Thus, following these SLS ISO standards, more and more companies in Sri Lanka today are seeking certification of EMS from relevant accreditation bodies. When a product, service or system has been assessed by a competent authority as conforming to the requirements of a relevant standard, a certificate may be issued as proof. Accordingly, the SLS ISO 14001: 2004 - EMS certification scheme is activated by SLSI, opening access to all manufacturing and service organisations operating in Sri Lanka and other parts of the world. It is one of major activities undertaken by SLSI. For this purpose, SLSI conducts training programs/workshops, particularly for industry participants and other required persons with its specific objectives. Table 3.2 shows such a schedule prepared for 2013.

Table 3.2 ISO 14000: EMS training programs/workshops scheduled for 2013

ISO 14000: EMSs	Objectives	Target group	No. of programs per year
a) Workshop on development and documentation of EMSs as per ISO 14001: 2004	To provide awareness to industries on ISO 14001 standard in developing EMSs, environmental auditing, manual writing and performance evaluation	Senior and middle managers who wish to implement EMSs in their organisations	3 (two full days for each)
b) Training program on the evaluation of environmental aspects and impacts and legal requirements in EMSs	To impart knowledge on the evaluation of environmental aspects and impacts and applicable legal requirements for the successful implementation of an EMS	Managers and Executives	2 (one full day for each)
c) Training program on management of industrial solid waste, waste water and air emissions	To give awareness on the minimisation of solid waste, waste water and air emissions with a view to reducing environmental impacts and the rate of depletion of resources and also extract more value from waste resulting in a green environment	Managers and Executives	2 (two full days for each)
d) ISO 14001 Auditor/Lead auditor course	To impart knowledge in developing and implementing EMS Audit Programs those meet the requirements of ISO 14001 Standard. To provide training requirements for individuals seeking registration as Auditors/Lead Auditors with International Register of Certificated Auditors	EMS Quality System Auditors who wish to develop their skills in EMS Auditing; Environmental Professionals who wish to audit EMSs; and others who are familiar with EMS standards, Management System Audits and Auditing Principles	1 (five full days)

Source: SLSI (2013, p. xiii) Training Prospectus

Accordingly, the SLSI annually prepares its ‘Training Prospectus’, covering all functions regulated by the SLSI and makes them available to all interested organisations/industries, while encouraging them to attend those programs.

3.6.1.2 Steps Involved in the SLS ISO 14001: 2004 EMS Certification Scheme

SLSI prescribes the key steps required to be followed:

- 1) Obtain the application and brochure;
- 2) Submit the duly completed application with 'Pre-Assessment Questionnaire' and a copy of the 'Environmental Manual' and other related documents to the SLSI. The information provided in the questionnaire is useful to auditors to determine the nature of applicant's business, manufacturing/service facility, and EMS documentation;
- 3) Adequacy audit: Review EMS manual and associated documents submitted by the applicant and send a detailed report to the applicant highlighting non-conformities in the documented system for correction;
- 4) Improve the EMS by correcting deficiencies;
- 5) Conduct 'Stage I Audit' and submit the report to the client: This provides an opportunity for auditors to confirm the scope of certification, and also enables them to assess the EMS in totality including the degree of implementation and to determine the readiness for the 'Stage II Audit';
- 6) Improve the EMS by correcting deficiencies based on Stage I Audit report;
- 7) Stage II Audit: Once the applicant confirms in writing satisfaction with the audit plan and the list of audit team which SLSI sent for comments, the SLSI will carry out the Stage II Audit and send the detailed report to the client covering non-conformities with reference to the requirements of ISO 14001 and the applicant's documented EMS;
- 8) Corrective actions and follow-up audit: The applicant submits proposals for corrective actions and depending on the nature and degree of the non-conformities these are completed with an agreed timeframe; after confirming by the client that agreed corrective actions are fully completed, the SLSI confirms completion of corrective actions by a documentation review or follow-up visit, as appropriate;
- 9) Award of Certificate: On completion of a satisfactory Stage II Audit, the applicant receives an EMS Certificate of conformity from the SLSI, valid for three consecutive years, subject to compliance with certain conditions, informing any changes made to EMS to the SLSI; agreeing with a 'Surveillance Audit' to be conducted by the SLSI once every 12 months and implementation of

agreed corrective actions, reserving the right of the SLSI to undertake a special audit at short notice in response to complaints or adverse information received; use of EMS Certificate and the Logo for all purposes specified in the conditions for use of the 'EMS Certification Mark'; payment of EMS Certification charges to the SLSI, such as the brochure fee, audit fee, annual fee, recertification fee, additional fee for special audits;

- 10) Renewal of certificate: The EMS certificate is renewed every three years based on the results of the recertification audit of the whole EMS;
- 11) Complaints: All complaints regarding the operation of SLSI EMS Certificate Scheme are accepted by the SLSI for consideration; and
- 12) Confidentiality: Confidentiality is assured for all applicants regarding; information on the business, EMS and its operation, but this information must be disclosed to the auditors upon signing the confidentiality agreement before each audit assignment (SLSI 2012(a), 2012(b)).

3.6.1.3 Benefits of Compliance with ISO 14001: 2004–EMS Certification

The prime motive for achieving compliance with ISO 14001 is meeting direct consumer preference and other market focus to brands. Those benefits may arise in the marketing, financial aspects and also efficiency/performance fields.

- 1) *Market advantages*: Meeting customers' environmental expectations; maintaining positive public relations; enhancing image and market share (leadership); meeting supplier certification criteria (primarily for small and medium-sized companies).
- 2) *Financial benefits*: Satisfying investor criteria and improving access to capital; obtaining insurance at a reasonable cost; liability limitation; cost control.
- 3) *Efficiency and performance benefits*: Through this ISO 14001 standard, business organisations are compelled to study their operations and significant environmental impacts resulting from their operation, and it then allows them to take corrective actions to overcome those impacts and conform to the standard. Further, environmental auditing enables companies to get their EMS evaluated and assess its performance and continuous improvement (SLSI 2015).

3.6.2 Sri Lanka Accreditation Board (SLAB)

The SLAB is the National Accreditation Authority for conformity assessment established by Act No. 32 of 2005 under the Ministry of Technology and Research. The main objectives of SLAB activities are to strengthen quality infrastructure and conformity assessment procedures, and enhance the recognition and acceptance of products and services into international and domestic markets. The SLAB offers accreditation for different types of conformity assessment bodies (laboratories, certification and inspection bodies) in accordance with international standards. The SLAB has international recognition as a signatory to the Mutual Recognition Arrangement of Asia Pacific Laboratory Accreditation Cooperation and International Laboratory Accreditation Cooperation (SLAB 2013).

Integration between SLAB and SLSI

The SLAB serves as a national accreditation body, while the SLSI is a national standards body. The SLSI has a certification section to issue SLS ISO certifications to clients. Likewise, there are about 15 certification bodies in Sri Lanka. These bodies apply for accreditations for their certifications from the SLAB. In this process, SLAB assesses, based on ISO standards, certification bodies in order to verify how they inspect conformities of activities of clients with standards, who their auditors are and what their qualifications are. The SLAB mainly investigates whether the certification bodies have competency to perform this task properly and, further, evaluates their integrity and impartiality.

The SLAB accreditation process and its benefits to clients

The SLAB first undertakes document review and reports deficiencies to the certification body and then undertakes physical assessment and sometime requires witnessing of the on-site performance of auditors of the certification body. Accordingly, upon completion of corrections for non-conformities based on SLAB recommendations, the SLAB grants Accreditation Certificates with the SLAB Logo which are valid for three years. Through this process, some Sri Lankan business firms are now experiencing such accreditation for their SIS ISO 14001 – EMS, ensuring their green business. Business firms take advantage of this accreditation, particularly in international trade, as importing countries ask for such accreditation for their brands so that they can minimise technical barriers to trade via this certificate. Moreover, a certification body (i.e., SLSI),

accredited by the SLAB, will prove that it complies with best practices and is competent to deliver a consistent, reliable and impartial service that meets the appropriate internationally recognised standard. Further, the SLAB identifies future trends in accreditation of certification bodies, such as information security management systems certification, energy management system certification, and accreditation of verification of greenhouse gas (SLAB 2013, 2015).

3.6.3 Ministry of Labour and Labour Relations (MoLLR) and Department of Labour (DoL) for Labour Laws

Labour laws enacted by the Labour Department functioning under the MoLLR provide avenues to control environmental pollution. The main labour legislation relating to manufacturing and related industries is the 'Factories Ordinance'. The Industrial Safety Division of DoL enforces the Factories Ordinance Act No. 45 of 1942 (post amendment) for ensuring occupational health, safety and welfare of employee population. Complying with the provisions of the Act, Sri Lankan industries regulate their operations in a way that ensures safety, health and welfare of working employees, thereby protecting the environment and minimising pollution in these respects (DoL 2013, 2015).

3.6.4 Board of Investment (BOI) of Sri Lanka

The BOI of Sri Lanka – the successor to the Greater Colombo Economic Commission or GCEC (established in 1978) – is the principal foreign investment approving agency, both within and outside the Export Processing Zones. The BOI is the authority for administering the Export Processing Zones. Sri Lanka's first Export Processing Zone was set up at Katunayake in 1978, with the specific objective of attracting export-oriented foreign investment under the BOI of Sri Lanka Law No. 4 of 1978. Accordingly, the BOI has successfully set up and currently administers a total of 12 Export Processing Zones /Industrial Parks in the districts of Colombo, Gampaha, Kalutara, Hambantota, Galle and Kurunegala (BOI 2014, 2015).

The Export Processing Zones/Industrial Parks provide excellent infrastructure facilities, including paved access roads, sophisticated telecom systems, water supply, storm water drainage, solid waste disposal and effluent and sewage treatment. Export-oriented projects located outside the Export Processing Zones are designated 'Licensed Enterprises' (BOI 2014, 2015).

3.6.4.1 Involvement in Environmental Protection and Management of BOI Projects

Environmental degradation is an inevitable outcome of industrial development that is encountered at both the construction and operational stages. To prevent such degradation, the BOI has evolved procedures to ensure that necessary rectification/mitigatory measures are adequately implemented. This is a continuous process that is in operation from project inception to the operational phase and throughout the lifetime of the project. The functions with regard to environment protection and management pertaining to the projects within the purview of the BOI are executed by its Environment Management Department (EMD) through the following key activities:

- Granting environmental approvals for projects
- Issuing EPLs
- Investigating public complaints and recommending suitable control measures
- Executing the functions related to EIA procedures under the EIA regulations in instances where the BOI acts as the Project Approving Agency
- Making recommendations for chemical imports
- Providing advice and guidelines for investors in industrial siting and pollution control including waste treatment and disposal
- Carrying out post-compliance monitoring
- Liaising with other agencies, organisations and departments in activities related to Natural Resources Management and Environmental pollution Control (BOI 2015).

This process is in line with environmental regulations that are mandatory under the NEA.

3.6.4.2 BOI Environment Management Process

Upon submitting an application with project details by the investor to the BOI, the officers of the EMD assess the project in relation to its environmental impacts and carry out an inspection of the site jointly with officers of the CEA. During the site inspection, the EMD checks the possibility of reducing the identified environmental impacts to the regulatory/permmissible requirements. If such reduction is possible, the site is

recommended for accommodating the project, subject to the necessary environmental requirements. This recommendation is granted with the concurrence of the CEA (BOI 2015). Then, the building plans are approved by the EMD only if they have incorporated the necessary pollution control measures e.g., installing an effluent treatment plant, as specified at the site approval stage.

After the building construction and prior to the commencement of production activity on a commercial scale, the EPL is issued by the BOI with the concurrence of the CEA only if the installed pollution control devices are operated properly. Accordingly, the environmental approval procedure required for BOI projects which depends on the nature/magnitude of the project and the location proposed for its siting, is executed by the EMD of the BOI in consultation with the CEA, under the provisions of the NEA (BOI 2015).

3.6.4.3 Other Initiatives made by BOI towards Environment Management

In this regard, the following major initiatives can be noted.

1) Approval needed from BOI for chemical imports

In addition to conforming to the above requirements, investors are required to declare the chemicals envisaged to import for their project operations, in the format issued by the EMD of BOI, and submit it along with the 'chemical safety data sheets'. This is needed to make recommendations for importation of the required chemicals for BOI industries. Further, the EMD tests properties of these chemicals and advises investors on their environmentally sound.

2) BOI laboratory to facilitate environment management

The BOI has established its own laboratory to carry out compliance checking for conformity with BOI pre-treatment limits. In the event that non-conformity is noted, the responsible industry is immediately informed of the need for rectifying its effluent treatment plant. The necessary guidance/advice is also provided in improving treatment devices. In addition, the laboratory carries out testing for air quality to check adherence to the air quality standard circulated in the gazette notifications.

3) BOI intervention to create sound working environments in factories

In addition to wastewater/air quality testing, working conditions within the factory are also tested at the BOI laboratory. This includes testing for noise, heat stress and dust levels. If excessive exposure to noise/heat stress/dust is noted, the EMD provides the

necessary guidance to improve working conditions. This includes guidance on the necessary noise/dust control devices and the safety gear to be worn by employees.

The procedures above serve as a guide for carrying out development activities in an environmentally sound manner. Accordingly, by adopting these procedures as a continuous process throughout the lifetime of the project from its inception, complying with regulations of the NEA and BOI Act, the BOI ensures that industrial development is achieved in an environmentally friendly manner (BOI 2014, 2015).

3.7 Summary

Even though Sri Lanka has a remarkably rich and valuable natural environment, it is being rapidly degraded as a result of development with short-term goals that ignores environmental sustainability. Global and national pressures often encourage ‘development’ to take place in ways that are unsustainable both in environmental and economic terms. The ultimate effect of such risky practices has been environmental degradation and pollution. Therefore, in addition to global pressure, Sri Lanka itself has realised the importance of protecting the environment whilst development projects proceed. It also recognises the necessity of initiating and complying with norms, standards, laws and regulations for development to ensure environmental protection and minimise pollution.

As a result, Sri Lanka now has about 80 laws and other regulatory measures relating to environmental protection. The NEA is the most important of these, with extensive provisions on pollution control, regulation of development and preparation of management plans for protecting the environment. The CEA, controlled by the MoE, is the key central body to regulate for preserving the environment and minimise pollution, through the EPL, IEE, EIA and other regulatory measures. Other institutions, such as the BOI, the SLSI, the SLAB and the Labour Department play significant roles by promoting standardisation, accreditation and quality control.

Moreover, following the concept of SD stimulated through international collaboration, Sri Lanka has been able to initiate and implement policies and strategies under the NEAP by incorporating various institutions and their programs towards SD. Thus, Sri Lanka, as a signatory to international treaties and declarations on environment protection, continues its efforts to strengthen the institutional framework for the

preservation of the environment, demonstrating that environment consideration appears to be at a satisfactory level in every aspect. Environment concerns are increasingly becoming contentious in Sri Lanka too, and this thus makes the role of environmental authorities more challenging at present. The next chapter focuses on research design phases, justifying the fitness of the chosen approach (MMR) for this study.

Chapter 4 Research Methodology

4.1 Introduction

The previous chapter refers to the Sri Lankan environment and its initiatives for protecting the environment by applying strategies and taking actions in terms of laws, regulations, standards and policies structured particularly for development projects and industrial activities. The main concern of this chapter is to describe research design phases, justifying the appropriateness of the chosen research approach. It justifies the selected approach, MMR, by deriving from the literature the practicability and fitness of applying it, rather than a single approach that is either qualitative or quantitative. After identifying the main points of MMR design and its implications for this study summarised in Table 4.2, it broadly outlines the research design process in a diagram. It elaborates key points, deducing research questions and aims under four dimensions (Table 4.3), and then determines the theoretical driver as *deductive*, the core component as *QUAN* and the supplementary component as *qual*. Considering major types of MMR designs (Table 4.4) and research methods and strategies applied, this study identifies itself as research with two paradigms, *simultaneous* and *sequential*, signifying *QUAN + qual* and *QUAN→ qual*, respectively.

The chapter then describes, in the context of MMR, the sampling procedures and techniques applied in determining the population and sample (Table 4.6), the application of instruments, methods in gathering data and descriptive information (mainly using two instruments: a questionnaire survey, and interviews and discussions), implementation of data collection and recording processes, and the data analysis process, elaborating data tabulation and analysis tools. It subsequently outlines how it combines two types of data derived from the *core component* (quantitative) and *supplemental component* (qualitative), in order to present meaningful analysis and interpretation of findings (it integrates at the *results point of interface*). Moreover, it derives the methodological process, stressing procedures and strategies applied by the researcher following the guidelines of the University towards satisfying ethical considerations. Lastly, it summarises the chapter.

4.2 Methodological Choice

This section highlights merits and demerits of adopting a single approach, either quantitative or qualitative, for research, and then elaborates characteristics of MMR and its appropriateness to this study as business research. Further, it concentrates on validity, reliability and generalisability of the research and how the researcher could retain these criteria in this study under the MMR approach.

4.2.1 Quantitative and Qualitative Approach

There are two main research paradigms or philosophies that can be labelled *positivist* and *phenomenological*. The term ‘paradigm’ refers to the process of scientific practice based on peoples’ philosophies and assumptions about the world and the nature of knowledge – in this context, about how research should be conducted. Different authors use different terms to refer these two paradigms, but the most common are *quantitative* and *qualitative*, respectively (Collis & Hussey 2003).

The positivistic approach seeks the facts or a cause of social phenomena, with little regard to the subjective state of the individual, and thus logical reasoning is applied to the research. Positivism is founded on the belief that the study of human behaviour should be conducted in the same way as studies conducted in the natural sciences. It is based on the assumption that social reality is independent of us and exists regardless of whether we are aware of it (Collis & Hussey 2003). Hence it views reality as objective and measurable; human beings are assumed to be rational; and research emphasises facts and predictions and attempts to explain cause and effects.

The phenomenological paradigm has developed as a result of criticisms of the positivistic paradigm. The main criticisms that help to explain the differences between two paradigms are: i) it is impossible to treat people as being separate from their social contexts, and they cannot be understood without examining the perceptions they have of their own activities; ii) a highly structured research design imposes certain constraints on the results and may ignore more relevant and interesting findings; iii) researchers are not objective, but part of what they observe, and they bring their own interests and values to the research; and iv) capturing complex phenomena in a single measure is, at best, a misunderstanding (Collis & Hussey 2003).

The phenomenological paradigm is concerned with understanding human behaviour from the participant's own frame of reference. A reaction to the positivistic paradigm, it is assumed that social reality is within us, and thus the act of investigating reality has an effect on that reality. Also, considerable regard is paid to the subjective state of the individual. This qualitative approach stresses the subjective aspects of human activity by focusing on the meaning, rather than measurement, of social phenomena. It further reveals that, to varying degrees, phenomenologists believe that social reality is dependent on the mind and there is no reality independent of the mind. Thus, what is researched cannot be unaffected by the process of the research (Collis & Hussey 2003).

Thus, by comparing these two paradigms, the main characteristics can be summarised in table 4.1 as follows.

Table 4.1 Paradigm comparison in summary

Positivistic paradigm	Phenomenological paradigm
Tends to produce quantitative data	Tends to produce qualitative data
Uses large samples	Uses small samples
Concerned with hypothesis testing	Concerned with generating theories
The location is artificial	The location is natural
Reliability is high	Reliability is low
Validity is low	Validity is high
Generalises from sample to population	Generalises from one setting to another

Source: Collis and Hussey (2003, p. 55)

The qualitative approach investigates how individuals think and react, and directs itself towards deep understanding of their experiences, motivations and values. Bryman and Bell (2007) indicate that quantitative research can be construed as a research strategy that emphasises quantification in the collection and analysis of data and that i) entails a deductive approach to the relationship between theory and research, in which the accent is placed on the testing of theories, ii) has incorporated the practices and the norms of the natural scientific model and of positivism in particular, and iii) embodies a view of social reality as an external, objective reality (Bryman & Bell 2007).

In this sense, four main criticisms were presented against quantitative research: i) quantitative researchers fail to distinguish people and social institutions from ‘the world of nature’; ii) the measurement process possesses an artificial and spurious sense of precision and accuracy; iii) the reliance of instruments and procedures hinders the connection between research and everyday life; and iv) the analysis of relationships between variables creates a static view of social life that is independent of people’s lives (Bryman & Bell 2007).

By contrast, qualitative research can be construed as a research strategy that usually emphasises words rather than quantification in the collection and analysis of data. It i) predominantly emphasises an inductive approach to the relationship between theory and research, in which the emphasis is on the generation of theories; ii) it has rejected the practices and norms of the natural scientific model and of positivism in particular in preference for an emphasis on the ways in which individuals interpret their social world; and iii) it embodies a view of social reality as a constantly shifting emergent property of individuals’ creation (Bryman & Bell 2007).

Similar to the criticisms of quantitative research, some criticisms were identified against qualitative research: i) it is too impressionistic and subjective; ii) it is difficult to replicate a qualitative study; iii) there are problems with generalisation as the scope of the findings of qualitative investigations is restricted; and iv) there is lack of transparency, as it is sometimes difficult to establish from qualitative research what the researcher actually did and how he/she arrived at the study’s conclusions (Bryman & Bell 2007).

Accordingly, it is clear that there are strengths and weaknesses in both research methods, so that one possible response to this is to propose combining them in ‘mixed methods research’. Such a strategy would seem to allow the various strengths to be capitalised upon and the weaknesses offset (Bryman & Bell 2007).

4.2.2 Mixed Methodologies (Mixed Method Research)

Numerous definitions of mixed methodologies/MMR can be found in the literature. Mix methods (MM) studies have been defined as ‘studies that combine qualitative and quantitative approaches into the research methodology of a single study or multi-phased study’ (Tashakkori & Teddlie 1998, pp. 17-18), and as a research design in which qualitative and quantitative approaches are used in types of questions, research

methods, data collection and analysis procedures and/or inferences (Tashakkori & Teddlie 2003, p. 711). Further, MM designs have been defined as designs which include at least one quantitative method (designed to collect numbers) and one qualitative method (designed to collect words), where neither type is linked to a particular inquiry paradigm (Greene, Caracelli & Graham 1989).

MMR have been defined as qualitative and quantitative data collection, data analysis, and the mixing of qualitative and quantitative approaches within a single study, with data integrated at some stage (Creswell & Plano Clark 2007). This section elaborates the term 'triangulation' in relation to MMR and to emphasise the appropriateness of the MMR approach for business research by reference to the literature and thus for this study too. It further addresses the implications of MMR in ensuring the validity, reliability and generalisability of research outcome.

4.2.2.1 Triangulation and Pertinence of Applying Mixed Methods in Business Research

The use of different research approaches, methods and techniques in the same study is known as 'triangulation'. It can overcome the potential bias and sterility of a single method approach (Collis & Hussey 2003). According to Veal (2005), in research the triangulation method involves the use of more than one research approach in a single study to gain a broader or more complete understanding of the issues being investigated. The methods used are often complementary because the weaknesses of one approach are complemented by the strengths of another. Thus it is clear that triangulation often utilises both qualitative and quantitative approaches in the same study, so that the researcher is able to overcome weaknesses of one approach with another while strengthening completeness and accuracy of the research outcome. However, if triangulation methods are to be used in a study, the approaches taken will depend on the imagination and the experience of the researcher (Veal 2005).

Jick (1979) contends that triangulation has vital strengths, encourages productive research, enhances qualitative methods and allows the complementary use of quantitative methods. However, replication is exceedingly difficult to perform where we have a mixed method approach, particularly where qualitative data are generated, and data collection and analysis are time-consuming and expensive. Moreover,

triangulation cannot be used to rectify a poor research design, but must be integral to a good design (cited in Collis & Hussey 2003, p.78).

Therefore, it is important that the research question is clearly focused and not confused by the methodology adopted, and that methods are chosen in accordance with their relevance to the topic. In particular, the rationale for using triangulation should be outlined, that is, the possible weaknesses of one method and the ways in which the additional method might overcome such a weakness must be explained. This is clearly relevant to the issue of 'validity' and 'reliability'. Often 'triangulation' is claimed in a study because more than one data source or analytical method are used to address different aspects of the research question, or even different research questions (Veal 2005). Denzin (1970) argues that the use of different methods by a number of researchers studying the same phenomenon should, if their conclusions are the same, lead to greater validity and reliability than a single methodological approach (cited in Collis and Hussey 2003, p.78).

4.2.2.2 Defining Validity, Reliability and Generalisability

Validity is the extent to which the data collected truly reflect the phenomenon being studied. Business research faces difficulties in this area, especially in the measurement of attitudes and behaviour, as there are always doubts about the true meanings of responses made in surveys, interviews and self-reported account of behaviour (Veal 2005). Reliability is the extent to which research findings would be the same if the research were to be repeated at a later date or with different sample of subjects. Caution should be exercised when making general statements on the basis of just one study (Veal 2005). Generalisability refers to the probability that the results of the research findings apply to other subjects, other groups and other conditions. While measures can be taken to ensure a degree of generalisability, strictly speaking any research findings relate only to the subjects involved, at the time and place the research was carried out (Veal 2005). The researcher must maintain these three criteria in the research report.

There is some literature relating to business research undertaken by applying a triangulation/MMR approach and it provides evidence on the appropriateness of this approach in guaranteeing the completeness and accuracy of data gathered and in retaining validity, reliability and generalisability of research findings. For example, Stiles (2001), using a triangulated approach, investigated the impact of the board of

directors on corporate strategy. This involved in-depth semi-structured interviews with 51 board directors of UK public companies, a questionnaire survey of 212 company secretaries and four case studies of UK public limited companies. The researcher selected four large UK businesses as case studies in order to test findings that emerged from data collected, using his two preliminary research methods. Stiles' main finding emphasises that multiple perspectives are required in order to understand fully the nature of board activity. Also, Stiles claims that 'this buttressing of the original findings through testing in four different research sites affords a further element of triangulation into the study, with the new data from the case testing the *validity* and *generality* of the initial findings' (2001, p. 634). In that study, validity was also improved through respondent validation, involving a draft of the findings being sent to the case companies and individuals invited to comment (Stiles 2001).

Discussing Stiles's (2001) study, Bryman and Bell (2007) state that the use of a triangulation strategy seems to have been planned by the researcher and the two sets of results were broadly consistent. However, researchers may carry out MMR for other purposes, but in the course of doing so discover that they have generated quantitative and qualitative findings on related issues, so that they can treat such overlapping findings as a triangulation exercise (Bryman & Bell 2007).

Moreover, with a view to examining different aspects of organisational reality, Zamanou and Glaser (1994) conducted a longitudinal study of culture in a government organisation in the USA, by using survey, interview and observation data (one of the researchers also became a participant observer in the organisation for a period of two months). They suggest that this triangulated approach enabled them to collect different types of data that related to different cultural elements, from values to material artefacts – something that other cultural researchers have found difficult to achieve. They further state that, by using such data, they were able to combine 'the specificity and accuracy of quantitative data with the ability to interpret peculiarities and complex perceptions, provided by qualitative analysis' (Zamanou & Glaser 1994, p. 478).

In view of research methods associated with qualitative and quantitative research, Bryman and Bell (2007) state that the amount of combined research has been increasing since the early 1980s, and combined research is especially popular in business and management research. By MM research, they were referring to combined research methods that cross the two research strategies. The term MMR is used as simple

shorthand to stand for research that integrates qualitative and quantitative research within a single project. Bryman (2006a, 2006b) emphasises that the qualitative and quantitative data deriving from MMR research should be mutually illuminating. Collins and O’cathain (2009) also disclose that MMR is a rapidly emerging research paradigm, and thus they presented ten points that a novice researcher should be aware of when designing a MM study in accordance with three phrases: research formulation, research planning and research implementation.

Collis and Hussey (2003) also state that it is not unusual in business research to take a mixture of approaches, particularly in the methods of collecting and analysing data. As they pointed out, mix methodologies allow researchers to take a broader and often complementary view of the research problem or issue. The two paradigms represent two extremes of a continuum and one’s study may represent a blend of assumptions and methodologies. Collis and Hussey (2003) further emphasise the importance of paying attention to all the features of paradigms and of ensuring that there are no contradictions or deficiencies in the chosen methodology, regardless of which paradigm is employed. Even if there would be some difficulties in mixing two paradigms in the same study, it is perfectly possible, and even advantageous, to use both quantitative and qualitative methods for collecting data (Collis and Hussey 2003).

Accordingly, referring the ways of facilitating qualitative research and quantitative research each other, it reveals two ways of utilising qualitative research to guide quantitative research: i) providing hypotheses that can be subsequently tested, using a quantitative research strategy, and ii) aiding measurement – the in-depth knowledge of social contexts acquired through qualitative research can be used to design survey questions for structured interviewing and self-completion questionnaires. In turn, quantitative research also facilitates qualitative research in several ways: in the main, quantitative research can prepare the ground for qualitative research through the selection of people to be interviewed or companies to be selected as case studies. MMR occurs when the researcher cannot rely on either a quantitative or a qualitative method alone, and must buttress his or her findings with a method drawn from the other research strategy (Bryman & Bell 2007).

In regard to problems with generality, Silverman (1984, 1985) argues that some quantification of findings from qualitative research can often help to uncover the generality of the phenomena being described. In addition, the combined use of

qualitative and quantitative research methods represents a common pattern in case study research in business and management, and is used by researchers in order to enhance the generality of their findings (Bryman & Bell 2007). Truss (2001), by applying four principal research methods (questionnaires, interviews, focus groups and the collection of documentary evidence), investigated the relationship between human resources management and performance at Hewlett-Packard in the UK, and revealed that, through a case-based analysis, the study was able not only to adopt a longitudinal approach and track change over time, but also to consult multiple informants and employ more in-depth, qualitative techniques than was possible in a more quantitative study. Truss (2001) argues that more qualitative research is needed in order to increase the understanding of the link between HRM and organisational performance, concluding that the findings are the direct results of the qualitative aspect of the study. This study further reveals that quantitative research results may be seen as somewhat misleading, in that they reflect the organisation's rhetorical position rather than the reality experienced by employees, and thus Truss suggests that the latter would not have been exposed without the addition of qualitative methods of investigation.

4.2.2.3 Appropriateness of MMR Approach to this Study

The researcher was motivated to use MMR approach in this study because it seemed more appropriate in addressing the research questions more precisely and thus producing complete and expressive analysis and thorough interpretation on findings. The researcher visited each and every company (see section 4.3.3.2) for the survey and conducted interviews and discussions mostly with executives concurrently and subsequent to the survey (in some instances, observations were undertaken particularly related to environmental aspects). This process, followed in the data collection, helped build trust and mutual understanding between the researcher and respondents, so that the researcher could maintain a 100% response rate by motivating respondents to provide all required data with adequate accuracy and completeness and with proper understanding about the questions and context.

It could also help understand specific situations, issues and reasons faced by individual companies in relation to MA practices and EM considerations and actions in Sri Lanka. Because the MMR approach applied in this study assists the researcher to ask situational questions, where necessary, while continuing discussion in order to obtain

further descriptive information and clarification with real examples provided based on the experiences of personnel involved. Thus, through this process of data collection by applying the MMR approach, the researcher could gather further information with real examples and explanations on specific situations, while obtaining a thorough understanding on every aspect of phenomena investigated relating to MA practices and EM considerations of listed companies, in addition to answers to the questionnaire and interview. Moreover, by utilising the MMR approach for data analysis, the researcher could produce a complete descriptive analysis and also meaningful findings with evidence from individual companies and industry sectors, and hence reach sound conclusions. This would be the ultimate effect of applying MMR to this study, as it facilitates the researcher to complement weaknesses of one approach by the strengths of another, thereby strengthening the completeness and accuracy of the research outcome.

Thus, it is obvious that the process of data collection and analysis applied here through MMR influences this study in confirming the validity of data and maintaining reliability and generalisability of research results and findings to the maximum possible level. Accordingly, the research design is explained in the next section.

4.3 Research Design

This section elaborates procedures and methods applied under the MMR approach, from pinpointing research questions to interpreting findings and then reaching conclusions. Over the last ten years, interest in MMR design has escalated. Researchers consider MMR design to be a way to work efficiently with the nuances of present-day research and to encapsulate quantitative variables with phenomena that cannot easily be quantified in the same project. They consider MMR design to be efficient because it can incorporate both meaning and quantity into the same project (Morse 2010).

As Morse (2010) suggests, in MMR design it is important to define the main points relating to this project, as shown in Table 4.2.

Table 4.2 Main points in MMR design and their implications to this study

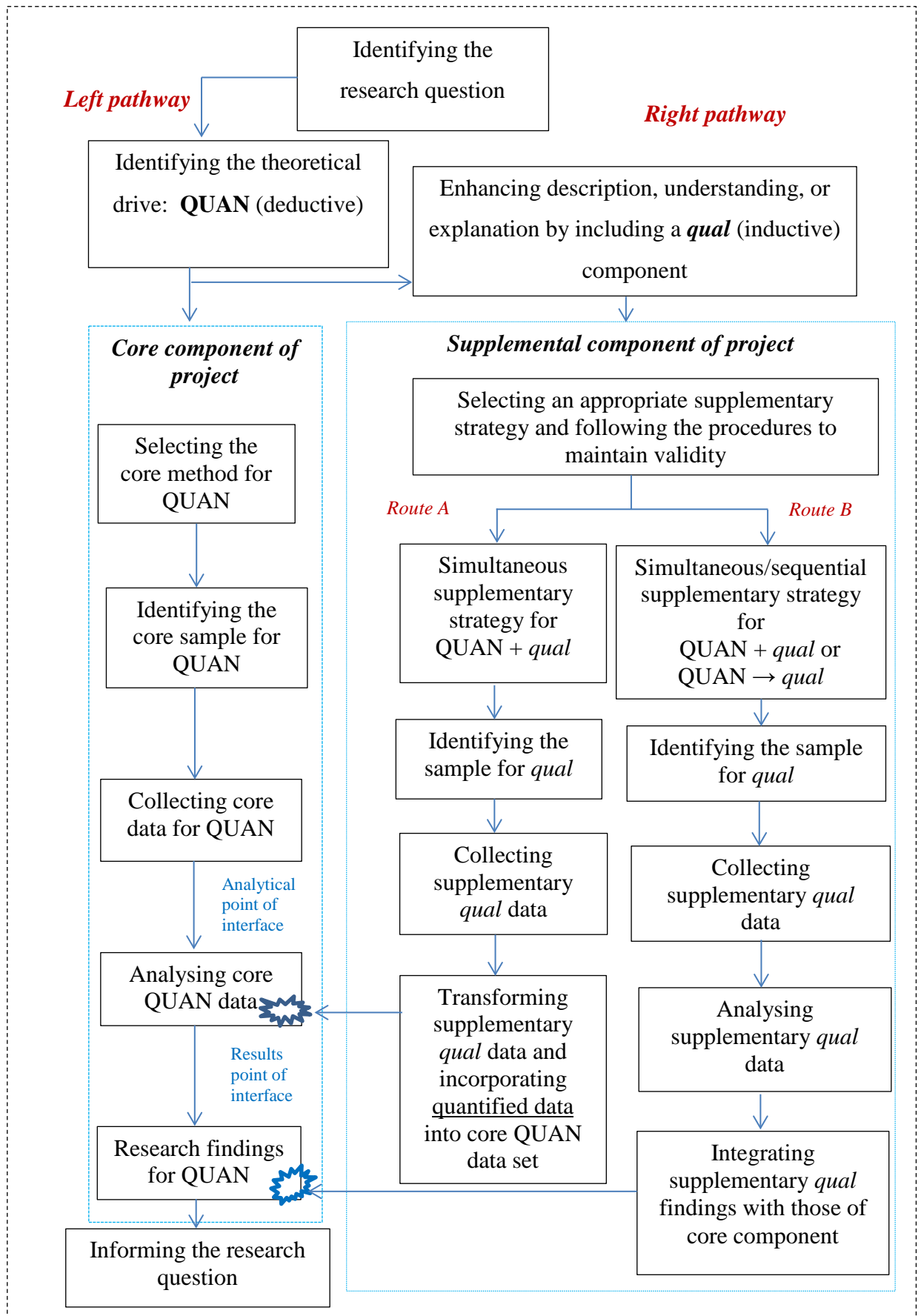
Main points in MMR design	This project relates to
Theoretical drive: inductive or deductive	Deductive
Core component: QUAL or QUAN <ul style="list-style-type: none"> ○ Method: (identify/describe) 	QUAN
Supplemental component: <i>qual or quan</i> <ul style="list-style-type: none"> ○ Strategy(ies): identify/describe 	<i>qual</i>
Pacing: Simultaneous or sequential	Simultaneous and sequential
Point of interface: Analytic or results narrative	Results point of interface

Source: Adapted from Morse (2010)

Delineating MMR design in this way (as shown in Figure 4.1) enables the project to be conducted with minimal error and confusion. Also, writing will enable clear communication of what has been done, when, why, and how, empowering the evaluation and appreciation of the results (Morse 2010).

Moreover, diagramming enables the researcher to envisage the core method, the supplemental component, and the pacing of the project (i.e., how the project will be organised – here simultaneously and sequentially), and to determine the point of interface (i.e., where they will link – either in the analysis section or the results section). Once a diagram has been developed, project details can be placed on it readily, including sample size, the instruments used, etc., so that the diagram becomes a map depicting the course of the project (Morse 2010).

Figure 4.1 An overview of QUAN-qual Mixed Method designs



Source: Morse (2010, p. 343)

In view of these major points in MMR design in relation to this research based on the diagram shown in Figure 4.1, the design can be detailed under several sub-components in the following sections.

4.3.1 Research Questions and Purposes

The research question plays a central role in the process of conducting research, particularly the decision to use MMR. The MM literature is uniform in its position that MMR is appropriate when a study's purpose and research questions warrant a combination of quantitative and qualitative approaches. At its most basic level, researchers conduct research to answer questions, and therefore research questions are of central importance for all approaches to research (Plano Clark & Badiee 2010).

According to Plano Clark and Badiee (2010), three elements define the focus for any study: *the content area, the purpose, and the research questions*. These are viewed in a hierarchy that spans from the general and broad (the content area) to the specific and narrow (the research questions) (Creswell 2008; Punch 2005; Ridenour & Newman 2008). The content area, also referred to as the topic or research problem, represents the broad substantive subject matter of a study. A study's purpose that falls within the content area describes the researcher's primary intent, objectives and goals for the study. The purpose provides a guide to the researcher's thinking about the study (Punch 2005) and sets the overall direction for the research (Creswell 2008). The general purpose for a MM study indicates the need for and use of both quantitative and qualitative methods (Teddlie & Tashakkori 2009). Research questions are derived from and extend a study's purpose (Ridenour & Newman 2008). Research questions set boundaries to a research project, clarify its specific directions, and keep a study from becoming too large (Punch 2005; Teddlie & Tashakkori 2009)

Also research questions are important in reporting research. Researchers typically state multiple research questions and often sub-questions that further narrow larger questions. These questions and sub-questions are often content-or issue-focused. The most traditional approach to generating research questions is for the researcher to develop them in response to problems identified within the literature and practice (Plano Clark & Badiee 2010). In this study, the primary research question is *'how and to what extent do listed companies in Sri Lanka adopt MA practices, and respond to EM issues through their MA practices?'*

This primary research question is more clearly delineated via six specific questions (RQs), as indicated in Chapter One.

In addition to using different question types, researchers also use different forms for writing their research questions: explicitly as *research questions* (as interrogative statements or questions), as *study aims* (declarative sentences that express what a researcher means to accomplish), and as *hypotheses* (statements that predict the outcome of the research questions and are best used in pre-set designs when a researcher has a sound reason to be able to make a prediction) (Johnson & Christensen 2010).

This study applied questions and aims (see Chapter One), so that this first indicated the primary research question and then deconstructed this into six sub-questions. Parallel to these questions, it also outlined study aims, so that the main objective of this research is to investigate the nature and extent of MA practices in Sri Lankan listed companies, and their responses to EM issues. Then, more explicitly, this has become six specific objectives from, corresponding to RQs (i) to (vi).

Research questions provide the narrow focus for a study and thus offer a direct link from the study's purpose to its design and methods. There are three ways of interpreting research questions: more quantitative, more qualitative, and more mixed. This recognises that, rather than viewing research questions as dichotomised neatly into distinct categories, such distinctions lead to better interpretations as to whether the questions the researcher has generated are best addressed with quantitative, qualitative or a combination of information (Plano Clark & Badiie 2010). Like many other scholars, this research also uses terms such as quantitative questions or mixed questions as shorthand for questions that have those characteristics and are answered with corresponding forms of data.

Quantitative questions may be descriptive and focus on participants' responses to individual variables. They often involve more than one variable and fall into two broad categories: questions about relationships between variables or questions about comparisons between groups. Researchers using deductive logic are more likely to state their quantitative research questions as hypotheses, because they may be able to make predictions based on prior research or existing theories (Plano Clark & Badiie 2010). Qualitative questions are often associated with purposes that call for developing

understanding, uncovering meaning, explaining processes, and generating theories (relating to certain phenomena). A study often asks a general, open-ended question about a single phenomenon, process or issue, and this provides the researcher with sufficient flexibility and freedom to explore a topic in depth (Corbin & Strauss 2008). Good qualitative research questions are broad, but also narrow enough to focus on issues most relevant to the individuals under investigation (Plano Clark & Badiee 2010).

Studies that include questions associated with both quantitative and qualitative approaches fall into a more mixed dimension (Plano Clark & Badiee 2010). Research questions in MMR require two types of information, narrative and numerical, to be answered (Teddlie & Tashakkori 2009). Bryman (2006a) assembles a list of 16 reasons for combining quantitative and qualitative research to address mixed research questions based on the methodological literature and researchers' practice: triangulation, offset weaknesses, completeness, structure and process, different research questions, explanation, unexpected results, instrument development, sampling, credibility, context, illustration, utility of results, confirm and discover diversity of views, and enhancement. Reviewing these, Plano Clark and Badiee (2010) identify four dimensions shown in the Table 4.3 that describe how researchers write research questions within the context of their MMR studies.

Table 4.3 Dimensions for writing research questions in mixed methods studies

Dimension	Options	Description	How questions of this study relate to MMR design
1) Rhetorical style: format	Question	The researcher writes an interrogative sentence complete with question mark	<i>Primary research question & Sub-questions (i - vi)</i>
	Aim	The researcher writes a declarative sentence that expresses what is to be accomplished	<i>Main research objective & Specific objectives (i - vi)</i>
2) Rhetorical style: level of integration *	Separate questions only	The researcher writes separate questions for the quantitative and qualitative strand of the study	<i>Sub-questions: (i), (ii), (v), (vi) (more QUAN) (iii), (iv) (more QUAL)</i>

	General, overarching MM questions	The researcher writes a broad question that is addressed with both quantitative and qualitative approaches	<i>Sub-question: (iv)</i>
	Hybrid MM issue question	The researcher writes one question with two distinct parts and uses a quantitative approach to address one part and a qualitative approach to address the other part	<i>Primary research question: how and to what extent do listed companies in Sri Lanka adopt MA practices (more QUAN), and respond to EM issues through their MA practices? (more QUAL)</i>
	MM procedural/mixing question	The researcher writes a narrow question that directs the integration of the qualitative and quantitative strand of the study	<i>Sub-question: (iv)</i>
	Combination	The researcher combines at least one MM question with separate quantitative and qualitative questions	<i>Combining primary question with separate sub-questions: (i), (ii), (v), (vi) (more QUAN) (iii), (iv) (more QUAL)</i>
3) The relationship of questions to other questions	Independent	The researcher writes two or more research questions that are related, and one question does not depend on the results of the other question	<i>First part of the primary research question: how and to what extent do listed companies in Sri Lanka adopt MA practices? and Sub-questions: (i), (ii), (iii)</i>
	Dependent	The researcher writes a question that depends on the results of another research question	<i>Second part of the primary research question: how and to what extent do they respond to EM issues through their MA practices? and Sub-questions: (iv), (v), (vi)</i>
4) The relationship of questions to the research process	Pre-determined	The researcher writes a research question based on literature, practice, personal tendencies, and/or disciplinary considerations at the outset of the study	<i>Developed the primary research question and sub-questions during the research proposal stage</i>
	Emergent	The researcher formulates a new or modified question during the design, data collection, data analysis, or interpretation.	

Source: Adapted from Plano Clark and Badiee (2010, pp. 290-292).

Note: MM = mixed methods, QUAN= quantitative, QUAL= qualitative

* Level of integration refers to the rhetorical style of the written research questions.

The first two relate to the rhetorical style used to write the questions and the latter two identify how the questions relate to other questions in the study and to the overall research process. Accordingly, the Table shows how the research questions of this study relate to MMR design.

The MMR approach expects all MM studies to meaningfully integrate the quantitative and qualitative strands of the study. Therefore, rather than indicate the extent to which results are integrated, the level of integration dimension assesses the extent to which the research questions are written in an integrated style. MM researchers state either separate quantitative and qualitative research questions, or MM research questions, or both. Separate research questions are two or more questions that the researcher associates with at least two different methods. A MM research question is defined as a single question that embeds both a quantitative research question and a qualitative research question within the same question. An overarching MM question is one broad issue-focused question which the researcher interprets as requiring both quantitative and qualitative information to answer. Hybrid questions are single questions about the content of the study that includes two distinct parts, with each part associated with either a quantitative or qualitative approach (Plano Clark & Badiee 2010).

MM procedural/mixed questions explicitly direct the procedures for mixing the strands of a MM study and they are tied to the specific design used (Creswell & Plano Clark 2007). Many researchers combine multiple styles. Combinations work well because the different styles emphasise different aspects of a MM study, including the content issue, the specific questions that call for different methods and the integration procedures (Plano Clark & Badiee 2010). Accordingly, under each option the level of integration of the primary research question and sub-questions of this study, as shown in Table 4.3, can be identified.

Also, the relationship between the questions described under Dimension 3 is important, because it shapes (and may be shaped by) the overall design and the relationship between quantitative and qualitative components of the study. In this sense, the questions may be related, but independent of each other (for instance, *First part of the primary question and Sub questions: (i), (ii), (iii) of this study*), or one question may depend on the results of another questions. In this study, the second part of the *primary question*, ‘*how and to what extent do they respond to EM issues through their MA practices?*’ depends on the results of its first part: ‘*how and to what extent do listed*

companies in Sri Lanka adopt MA practices?’ Also, *Sub-questions* (iv), (v), (vi) depend on the results of the sub-questions (i), (ii), (iii).

Dimension 4 focuses on the relationship of questions to the research process, because, even though research questions are often generated at the start of the research process (called predetermined questions), they may also emerge during the research design, data collection, data analysis and interpretation stages of the research process (called emergent questions), due to issues such as complications with the implementation of methods, an unexpected finding, or new understanding (Plano Clark & Badiie 2010). In this study, all research questions and aims were generated at the outset of the research process, i.e., the proposal stage, based on the researcher’s understanding of the literature, and awareness and knowledge of MA practices and EM issues, particularly relating to the context being investigated, personal tendencies and discipline considerations.

4.3.2 Theoretical Drive, Core Component and Supplemental Component

Initially the research design is directed by and extends out from the research question. For example, if the research question is asking about relationships, co-occurrences or even causation, then the project is deductive and the theoretical drive is quantitative (indicated as QUAN). That is, the complete method is a quantitative method that best answers most of the research question. Then the part of the question that cannot be answered by the selected quantitative method is addressed by either a qualitative or quantitative strategy, conducted at the same time (called simultaneous, shown with a + sign) or else immediately following the core component (called sequential, indicated with an arrow→). In turn, if the research question is inductive, and descriptive or interpretive, it is usually answered using a qualitative method (indicated as QUAL), and the strategy used to answer the other part of the question may be either qualitative or quantitative and conducted simultaneously or sequentially (Morse 2010). Onwuegbuzie and Collins (2007) also present a similar interpretation on this time orientation of conducting MMR, stressing that most MMR designs utilise a time orientation dimension as its base.

MMR design consists of one project, known as the core project (component), which is a complete method in itself, and a second project, consisting of different types of data or analysis, known as the supplemental component, using a strategy (there may be more

than one) that is incomplete. The supplemental component is not comprehensible or publishable apart from the core project. This supplemental strategy provides a means to access another area that is pertinent to the research question and cannot be included in the core component. Data for the supplemental component are collected and analysed only until the researcher is certain that he/she has the answer to that particular part of the research question (Morse 2010).

In regard to the content area, the primary research question and the purpose of this study, the theoretical driver for the study can be identified as deductive, as it mainly uses a questionnaire survey that is mostly related to the first part of the main question (*how and to what extent do listed companies in Sri Lanka adopt MA practices*). The second part of the main question (*how and to what extent do they respond to EM issues through their MA practices*) is typically addressed by a qualitative strategy, i.e., using semi-structured interviews and discussion conducted simultaneously or sequentially with the survey, depending on the situation. Consequently, for this research, the core component is identified as 'QUAN' and the supplemental component as 'qual'. Morse (2010) emphasises the importance of identifying the theoretical driver, indicating that it reminds the researcher of the overall direction of the project, which assists the researcher in remaining consistent with the principles of induction and qualitative inquiry (for QUAL projects) or with deduction and quantitative inquiry (for QUAN projects). This is particularly important with sampling. Morse (2010), however, further emphasises that, despite the fact that the theoretical driver is inductive (for QUAL projects) or deductive (for QUAN projects), the supplementary component must be conducted by adhering to the principles of the supplementary component's paradigm. These components and strategies are discussed in detail in the data collection section (4.3.4) below.

Thus, the theoretical driver is exceedingly important because it reminds the researcher of the overall direction of the project, even if the design includes a strategy from the other paradigm (i.e., in QUAL + *quan* or QUAN + *qual* design). However, this does not mean that the supplementary project is actually conducted using the principles of the core component of the other paradigm; it means that the results of the supplementary component will be integrated into the results of the core component, with the core component forming the theoretical base for the presentation of the results (Morse 2010). Accordingly, eight types of research designs shown in the Table 4.4 are derived,

indicating the theoretical driver with uppercase and supplemental strategy with lower-case.

Table 4.4 Major types of simultaneous or sequential mixed methods designs

Different paradigms	Same paradigms
QUAL + <i>quan</i>	QUAL + <i>qual</i>
QUAL → <i>quan</i>	QUAL → <i>qual</i>
QUAN + <i>qual</i>	QUAN + <i>quan</i>
QUAN → <i>qual</i>	QUAN → <i>quan</i>

Source: Morse (2010), p.341.

In considering these explanations, this research is shown to be concerned with two paradigms of MMR designs:

QUAN + *qual* and QUAN → *qual*

4.3.3 Identifying the Sample

In both qualitative and quantitative studies, researchers must decide the number of participants to select (sample size) and how to select these sample members (sampling scheme). While the decisions can be difficult for both qualitative and quantitative researchers, sampling strategies are even more complex for studies in which qualitative and quantitative research approaches are combined either concurrently or subsequently. However, as cited in Onwuegbuzie and Collins (2007), the vast majority of qualitative and quantitative researchers do not make clear their sampling decisions and thus the exact nature of the sampling scheme is rarely specified (Onwuegbuzie 2002b). As such, sampling in qualitative and quantitative research appears to be undertaken as a private enterprise that is unavailable for public inspection (Onwuegbuzie & Collins 2007).

As noted by Onwuegbuzie and Leech (2005), random sampling tends to be associated with quantitative research, whereas non-random sampling typically is linked to qualitative research. However, choice of sampling class (random *versus* non-random) should be based on the type of generalisation of interest (statistical *versus* analytic). In

practice, qualitative research can involve random sampling (Onwuegbuzie & Collins 2007). Before deciding on the sample scheme, MM researchers must decide what the objective of the study is. For example, if the objective is to generalise qualitative and/or quantitative findings to the population from which the sample was drawn (i.e., to make inferences), then the researcher should attempt to select a sample for that component that is random. Onwuegbuzie and Leech further emphasise that, in MMR, sampling schemes must be chosen for both qualitative and quantitative components of the study, and thus sampling typically is much more complex in MM studies than in mono-method research, which characterises either solely qualitative or quantitative studies. In this situation, Onwuegbuzie and Collins (2007) suggest five random (i.e., probability) sampling schemes that MM researchers can select at one or more stages of the research process: simple random sampling; stratified random sampling; cluster random sampling; systematic random sampling; and multi-stage random sampling.

4.3.3.1 Two Dimensions of MMR Design that help MM Sampling Design

The two dimensions of MMR design are ‘time order’ and ‘purpose of mixing’. Crossing these two dimensions Onwuegbuzie and Collins (2007) present a matrix that encompasses 10 cells, as shown in the Table 4.5.

Table 4.5 Matrix crossing purpose of MMR by time orientation

Purpose of MMR	Concurrent design appropriate?	Sequential design appropriate?
Triangulation	Yes	No
Complementarity	Yes	Yes
Development	No	Yes
Initiation	Yes	Yes
Expansion	No	Yes

Source: Onwuegbuzie and Collins (2007, p. 292)

This matrix matches the time dimension to the MM purpose. Most MMR designs utilise the time orientation dimension as the base. Time orientation refers to whether the qualitative and quantitative phases of the study occur at approximately the same point in time, such that they are independent of one another (concurrent) or whether these two

components occur one after the other, such that the later phase is dependent, to some degree, on the former phase (sequential). In this respect, the purposes of MMR are: triangulation, complementarity, development, initiation and expansion (Onwuegbuzie & Collins 2007).

If the purpose of MM is triangulation, then a concurrent design is appropriate, such that the qualitative and quantitative data can be triangulated, but sequential designs are not appropriate for triangulation, because, when they are utilised, either the qualitative and quantitative data are gathered first, so that findings from the first approach might influence those from the second, thereby positively biasing any comparisons. On the other hand, if the purpose of MM is development, then sequential designs are appropriate, because development involves using the methods sequentially, so that the findings from the first method inform the use of the second. For this reason, concurrent designs do not address development purposes. Similarly, sequential designs are only appropriate for expansion purposes. Finally, both concurrent and sequential designs can be justified if the MM purpose is either complementarity or initiation.

In relation to the time dimension of the matrix, as indicated above, this research comprises both sequential and concurrent designs. Taking into account the views of Veal (2005) about triangulation method, stated in section 4.2.2.1 above, this study also represents the triangulation method, because it utilises both qualitative and quantitative approaches in the same study. Accordingly, it utilises QUAN + *qual* and QUAN → *qual* paradigms with for the purposes of triangulation and complementarity. This type of MM design helps the researcher gain a more complete understanding of the underlying research area and related issues (MA practices and responses to EM issues through such practices of listed companies) by overcoming weaknesses of quantitative and qualitative approaches, using these two approaches together. Once a decision has been made about the MM purpose and design type (time orientation), the next step is for the researcher to select a MM sampling design.

4.3.3.2 Selecting MM Sampling Design

Hence a multi-stage purposeful random sampling method was applied for sampling, because it generalises, to some extent, the qualitative and quantitative findings to the population identified for the study. With this sampling scheme, the researcher chooses settings, groups or individuals representing a sample in two or more stages. Random sampling ensures that all members of the population have an equal chance of inclusion. The larger the sample, the more chance it has of being representative of the population. A sample that is not representative is described as biased. Thus, random sampling seeks to provide a representative sample and to minimise bias (Veal 2005). It also intends to obtain insights into phenomena under investigation (here, MA practices and responses to EM issues) relating to individual companies (which is often the case in the qualitative components of MM study).

The researcher thus purposefully selected industry sectors (five sectors from 20 representing manufacturing and manufacturing-related industries) and then selected individual companies across those five sectors by applying random sampling and non-random sampling methods. As many MMR studies do, it applied several non-random sampling methods, such as snowball sampling, convenience sampling and purposeful sampling in selecting the most suitable accessible sampled companies from the selected industry sectors for this study. In this sampling process, it considered factors such as accessibility to companies, relevance of businesses of companies to the research area, and nature of data and information required, particularly in answering the research questions. Snowball sampling is a form of convenience sample, because, with this approach, the researcher makes initial contact with a small group of people relevant to the research topic and then uses these to establish contacts with others (Bryman & Bell 2007).

Accordingly, in this study, sometimes the researcher could call on other companies through links already established with responding companies who were initially contacted for the same purpose. Convenience sampling denotes choosing individuals who are conveniently available and willing to participate in the survey (Onwuegbuzie & Collins 2007). Consequently, utilising these sampling methods, the researcher selected appropriate companies and then contacted suitable respondents (finance manager, deputy general manager (DGM) finance, personnel involved in environmental activities) from those companies, with a view to maximising understanding on the

underlying phenomena while obtaining required data for the intended study with adequate accuracy and completeness.

Accordingly, the sampling methods followed in this study can be identified in two principal stages: the first relates to the core sample for QUAN (relating to the core component) and the second relates to the sample for *qual* (relating to supplemental component (see Figure 4.1)

Stage 1: Identifying the population and core sample for QUAN

This sampling scheme consists of two phases: selecting industry sectors (population) and selecting companies representing industry sectors chosen for the questionnaire survey (sample). The researcher decided to conduct this study in Sri Lanka as it is a developing country with less research in the area of study, compared to developed countries. Further, Sri Lanka has been focusing attention to environmental issues and concerns, and made substantial initiatives in terms of laws, regulations, standards, policies and procedures aimed at protecting the environment particularly in relation to industrial activities. Moreover, no prior research can be found pertaining to the integration of MA practices and EM concerns in the Sri Lankan context. In view of the above, the researcher recognizes that Sri Lanka is an important site to conduct this research.

Phase I

As this study relates to listed companies in Sri Lanka, in the first stage, it identified five industry sectors out of 20 according to the categorisation of the Colombo Stock Exchange (CSE) as at 30 April 2012. The population of this study is identified as all listed companies (101 companies), representing selected five industry sectors listed in the CSE (Table 4.6). It utilised purposeful sampling in selecting these sectors, mainly concentrating on two factors: whether they represent manufacturing or manufacturing-related industries, and whether these industries may have greater environmental impacts in their business process. As this study investigates MA practices of listed companies and their responses to EM issues, the manufacturing sector is the most representative and polluting sector, and thus these industries may have significant environmental impacts. Also, their environmental performance deserves careful consideration from stakeholders (mainly local communities and government). This study therefore selected

industry sectors representing the manufacturing sector (MNF) and four manufacturing-related sectors: food, beverage and tobacco (F&B), chemicals and pharmaceuticals (CHEM), diversified holdings (DVS), and plantation (PLT), assuming that those industries may have greater environmental impacts when compared with other industries such as services and telecommunications.

Phase II

This phase relates to identifying the sampled companies for QUAN, so that the sample of 42 companies was selected from those five industry sectors, as shown in Table 4.6. It followed several strategies in selecting companies for the survey, accessing publicly available information in companies' annual reports and websites, and using personal contacts, in addition to applying random and non-random sampling methods. Some companies were initially contacted over the telephone or by email; then, based on responses of those who gave their consent to participate in the survey; those companies were included in the sample. Similarly, within the period of survey, administered gradually, other companies in selected industry sectors were contacted randomly or purposefully through contacts already made with previously identified companies and then included in the sample until the intended sample size was achieved in each sector.

Table 4.6 Population and sample of the study

Industry Sector	Population (No. of listed Companies as at 30 April, 2012)	Sample (No. of listed Companies selected in each sector)	Percentage (%)
1. Food Beverage & Tobacco	22	8	19
2. Chemicals & Pharmaceuticals	12	3	7
3. Diversified Holdings	16	5	12
4. Manufacturing	39	18	43
5. Plantation	20	8	19
Total	101	42	100

Stage II: Identifying the sample for qual (relating to supplemental component)

The research design built on two paradigms: QUAN + *qual* and QUAN → *qual*, following methods such as snowball sampling, convenience sampling and purposeful sampling to identify respondents for qualitative aspects of the study. The first step (QUAN + *qual*) involved discussions and semi-structured interviews with the same respondents (finance manager, chief finance officer) who represent the core sample, with an aim of obtaining further clarification and identifying specific situations, issues and reasons for them that relate to phenomena casing the questionnaire, conducted simultaneously with the survey. In this respect, the sample for qual (QUAN + *qual*) would be unquestionably similar to the core sample for QUAN. Although the main focus of utilising QUAN + *qual* would be to have discussions and interviews with finance officers involved in MA practices, in some situations officials who handle environmental aspects of those companies also participated in this stage with finance officers, giving their responses to EM-related questions in the survey, in addition to involvement in related discussions and interviews conducted by the researcher.

The researcher subsequently conducted further discussion and semi-structured interviews (QUAN → *qual*) with officials who handle environmental aspects of those companies. This depended on the availability of personnel involved in EM aspects and on situations where further information was required, particularly on EM issues and concerns, which can be identified in the QUAN + *qual* stage. Even though this would be the main purpose of applying the QUAN → *qual* paradigm in this study, in practice there have been other specific situations that required the same paradigm to be applied. Such situations appeared mainly due to time constraints of respondents such as finance manager who participated in the survey and their interest and willingness to provide further information on MA practices and related issues, so that subsequent discussions were held with them on the same or another day. Further, there have been other situations where respondents (finance officers), after completing the survey, attended to have further discussions not only on matters relating to MA practices but also matters on EM aspects, taking advantage of their thorough knowledge and experience on both aspects (MA practices and EM considerations) of those companies.

Accordingly, following these processes in sampling for supplementary components at the QUAN + *qual* and QUAN → *qual* stages, the researcher was able to gather ‘rich’ information on the underlying phenomena from the most suitable personnel.

4.3.3.3 Sample Size

Veal (2005) states that ‘there is a popular misconception that the size of a sample should be decided on the basis of its relationship to the size of the population, that is, a sample should be 5% or 10% of the population. This is generally not so. What is important is the *absolute size* of the sample, regardless of the size of the population’ (Veal 2005, p. 201). Veal further states that this is true except when the population itself is small. However, the issue of appropriate sample size to provide a representative sample of a population is an important matter. Therefore, Veal (2005) presents three main criteria that are important to be considered in determining an appropriate sample size:

- i) *The required level of precision in the results:* the degree to which the researcher wants the findings from the sample to precisely reflect this characteristic or opinion in the whole population.
- ii) *The level of detail in the proposed analysis:* the choice of sample size, which is that the necessary sample size depends on the type of analysis to be undertaken. If many detailed comparisons are to be made, especially concerning small proportions of the population, then a small sample size may not allow meaningful analysis.
- iii) *The available budget:* the resources available for a study that will ultimately be the limiting factor in determining the sample size. Even if the available budget limits the sample severely, it may be decided to go ahead and risk the possibility of an unrepresentative sample.

If the sample size is small, however, the detail of the analysis will need to be limited. If resources are so limited that the validity of quantitative research is questionable, it may be sensible to consider qualitative research that may be more feasible.

However, in this study, concentrating on the first two criteria above, the sample size for the core component (QUAN) was 42 out of 101 companies (population), representing a significant proportion of the population (approximately 40%). Then sampling for the *qual* supplemental components was undertaken, adhering to the principles of qualitative sampling. The third criterion, budget availability, was not a factor because this study related to a PhD degree.

4.3.4 Data Collection

MMR designs can be as complex as the phenomena demand. However, there is no need to limit the number of supplementary projects to one. The advantage of MMR designs is that they allow the researcher to maintain the complexity of the phenomena within the research project (Morse 2010). In relation to this QUAN project, the researcher applied one supplementary project that consisted of a simultaneous and sequential *qual* supplementary component (QUAN + *qual*) in the process of data collection. The purpose of utilising such a mixed method for data collection is to obtain complete understanding on MA practices and EM issues of sample companies and their reactions in resolving those issues. It was also intended with this approach to obtain more clarification and descriptive information on specific circumstances and reasons for them within the context under consideration. Accordingly, data collection for this research took place in two ways for primary data: i) collecting core data for QUAN, and ii) collecting supplementary *qual* data, using appropriate instruments. It also collected secondary data through available sources as detailed in subsequent sections.

4.3.4.1 Collecting Core Data for QUAN

By applying mixed methods, in this stage this study mainly utilised a questionnaire survey instrument to collect data on MA practices, EM issues and responses to them in sampled companies. It applied a personal visit approach to each and every company in the sample in order to maintain sound response rate and the quality of data obtained. For this purpose, the researcher typically contacted financial executives of listed companies (chief finance officers, finance directors, finance managers, chief financial controller), and if they were not available, the researcher contacted management accountants and/or cost accountants and financial accountants. In addition, in some situations, other executives or middle-level officials who handle EM activities of those companies also participated in the survey in answering EM-related questions.

Relevant officials of each company were contacted by e-mail or telephone and sent a questionnaire with a brief summary of research aims. This helped them understand the survey and to make a decision on their participation. Upon respondents' returning the signed consent form, which was approved by Human Research Ethics Committee (HREC) of the University, the researcher made arrangements for appointments with officials of companies. Accordingly, the researcher was able to complete the survey of

42 companies shown in the Table 4.6 and maintain a 100% response rate. Here can be seen a specific circumstance where the researcher applied a strategy to obtain better responses and sound data with more detailed information: the researcher actively participated in the survey while continuing interviews and discussions simultaneously and subsequent to the survey with respondents by visiting each and every company.

Merits of a questionnaire survey

Each research method has its merits and appropriate uses. Questionnaire surveys are useful when the research questions indicate the need for relatively structured data and when data are required from samples representative of a defined wider population (Veal 2005). A questionnaire survey is most appropriate for this study, as it required structured data on MA practices and EM considerations of listed companies associated with a sample. Questionnaire surveys usually involve quantification – the presentation of results in numerical form – and this has implications for the way the data are collected, analysed and interpreted.

The merits of a questionnaire survey are: i) quantified data for decision making (it is an ideal means of providing quantified information for organisations that rely on quantified information for decision making); ii) transparency (even though absolute objectivity is impossible, it provides a transparent set of research procedures, and how information has been collected and analysed is clear for all to see; data from surveys can be re-analysed by others if they wish to extend the research or provide an alternative interpretation); iii) succinct presentation (quantification can provide relatively complex information in a succinct, easily understood form); iv) comparability (methods such as longitudinal surveys and annual repeated surveys provide the opportunity to study change over time, using comparable methodology); and v) capturing complexity (a questionnaire can be an effective means of gathering a wide range of complex information on individuals or organisations on a comparable basis) (Veal, 2005).

The survey method was selected for this study, in addition to the merits above, as it allows researchers to gather data and information from a sample at relatively low cost and in a short period of time, and surveys place less pressure on immediate responses and provide respondents with a feeling of anonymity. Also, data collected through a survey enable researchers to examine patterns and relationships, which are mostly the

concern of this study. However, surveys have issues of low response rates and non-response bias (which are not an issue for this study because it utilised personal visits) and cross-referencing of respondents from the same company is restricted due to anonymity of respondents.

According to Veal (2005), there are several types of questionnaire survey, such as a household survey, telephone survey, e-survey, mail survey, captive group survey, and organisation survey. This survey falls into the category of organisation survey, which can take one of two forms: interviewer-completed or respondent-completed. In this study, both forms were undertaken in face-to-face situations, depending on the opinions of respondents. Generally, the researcher first asked the respondent whether he/she was willing to complete the questionnaire. The researcher read questions to the respondent and recorded the answer on the questionnaire. Sometimes respondents read and filled out the questionnaire themselves. However, in both situations, the researcher could have fruitful discussions and semi-structured interviews with the respondents whilst answering the survey questions in order to get more detailed information and clarification, and to identify specific circumstances and reasons for responses. With the permission of respondents, the researcher used a voice recorder to retain conversations for future reference.

As a result of these strategies and procedures, the researcher could maintain a 100% survey response rate. The respondents could also contribute to the survey with proper understanding of the questionnaire because they received it in advance and because the researcher actively participated in the survey while discussing matters relating to questions and intended outcomes, so that they could provide answers more precisely and completely.

4.3.4.2 Collecting Supplementary *qual* Data

The researcher mainly utilised instruments of discussions and semi-structured interviews but rarely the observation instrument in this qualitative approach (supplemental component) involved in two stages: QUAN + *qual* and QUAN → *qual*, as described in the sampling section in this chapter.

The first stage (QUAN + *qual*) comprised discussion but also sometimes semi-structured interviews face-to-face between the respondents and the researcher

concurrently with the questionnaire survey. The discussions and semi-structured interviews were conducted with the same respondents (finance manager, chief finance officer) who represented the core sample. As the respondents were sent the questionnaire in advance, the researcher could have fruitful discussions with officials with a proper understanding of the questions, and sometimes semi-structured interviews within the underlying structure to obtain further information with clarification, details about specific situations, related issues and reasons for them.

In the second stage (QUAN → *qual*), depending on the situation, availability of personnel and information requirements regarding EM issues and concerns that were identified in the QUAN + *qual* stage, the researcher conducted further discussions and semi-structured interviews with officials who handle environmental aspects of those companies (the environmental manager, sustainability manager, quality manager, technical officers). Even though this was the main purpose of applying the QUAN → *qual* paradigm, in practice the paradigm has to be applied further in certain situations to continue discussion and semi-structured interviews in the same context covered in the previous stage (QUAN + *qual*), mainly due to time constraints of respondents with their tight schedules as executives. Subsequent discussion and semi-structured interviews were conducted with financial executives in the same manner, because of their wide-ranging understanding, awareness and inclination to provide further information, not only on MA practices and related issues, but also on EM-related issues and concerns, taking advantage of their thorough knowledge and experience. Such discussions and interviews were with relevant officials on the same or other day/days. Moreover, on occasion the researcher visited office premises and factories with officials to observe EM-related actions and concerns, such as actions for minimising noise at the workplace, minimising waste of electricity, water and other resources, confirming efficient use of those resources and ensuring safety and health of workers.

Accordingly, this QUAN → *qual* approach was applied, where necessary, depending mainly on specific situations and issues identified through the questionnaire survey, necessity, accessibility to further information, and time constraints/preference of respondents, to gather qualitative data on MA practices i.e., different situations, specific circumstances, methods and purposes of applying certain MA techniques; EM systems and related issues i.e., water management policies, strategies applied, obtaining and renewing EPL, and purposes of applying certain MA techniques, EM systems and

related issues and actions, i.e., waste management policies and strategies applied, obtaining and renewing EPLs; and generally how listed companies comply with environmental legislation in continuing business process. Alternatively, this implies that the researcher does not intend to utilise this QUAN→ *qual* approach to all companies in the sample in the same manner and in the same extent as did in the core component (QUAN). Thus, the number and time-span of discussions and interviews will vary from person to person and company to company depending largely on the availability and interest of personnel involved in, the nature and extent of their MA practices and EM considerations and related issues.

This study further utilised this QUAN → *qual* approach to conduct discussions and semi-structured interviews with officials of government institutions such as CEA, SLSI, SLAB, BOI, Labour Department, who engage in initiating and implementing environmental legislation, standards and related activities, to obtain descriptive information for Chapter Three. This approach helped the researcher obtain more information and clarification on enactment of environmental legislation, application of EMS standards and their implications, particularly for listed companies in Sri Lanka. It also facilitated the researcher being aware of practical issues faced by those authorities in executing such legislation, particularly in the context of listed companies.

Merits of qualitative methods

This study also applied qualitative methods, mainly in the form of discussions and semi-structured interviews, because it required more descriptive information and, where necessary, more clarification on underlying phenomena and as the researcher sought to uncover the meanings and understanding of the issues being researched. The advantages of applying such qualitative methods are: i) it enabled the researcher to understand and explain in detail the personal experiences of individuals; ii) it focused on people's understanding and interpretations, rather than seeking external causes or laws for behaviour; iii) it allowed the researcher to experience research issues from a participant's perspective; iv) it presented qualitative reports in a narrative form rather than statistical form, making them generally more interesting and understandable for readers not trained in statistics; v) it was useful in examining personal changes over time; and vi) it tended to focus on human-interest issues that were meaningful for everyday managers.

4.3.4.3 Collecting Secondary Data

Secondary data and information are also reviewed in this study through annual reports, budgets, variance analysis reports, newsletters, websites of companies, policy documents, proceedings, formal procedures and registers of the EM system, environmental performance indicators, and investment proposal forms produced by sample companies. Through these secondary sources, this study gathered background information, descriptive data and information on EM activities, MA practices, and related issues and concerns of those companies. Further, before starting company visits, going through companies' websites the researcher obtained information on vision, mission, goals and objectives, policies and procedures, nature and extent of businesses and other important information.

Moreover, with a view to gathering information on environmental consideration for Sri Lanka, the researcher also accessed environmental rules, regulations and procedures prescribed by government authorities that should be followed by listed companies in complying with environmental legislation. This environment-related information was typically gathered by reviewing the NEA and other relevant laws, policies, procedures, NEAPs, guideline documents, manuals, training prospectus issued by the CEA and other relevant authorities, labour rules and regulations, prospects of the SLSI and measures of SLS ISO 14001 for EMS Certification Scheme; Accreditation scheme for certification bodies activated by the SLAB, and BOI rules and regulations.

4.3.4.4 Instrument Design

This research mainly developed two instruments: a survey questionnaire and an interview guide. The questionnaire comprised three main parts: part one consisting of background information of sampled companies; part two presenting MA practices under ten sub-sections covering traditional and modern MA techniques, such as budgeting, standard costing, product costing, target costing, and the balanced scorecard; and part three typically covering EM systems, EM actions and motivations behind them, questions incorporating MA practices and responses to EM issues, associated challenges and factors affecting them, and the ultimate impact of all of these on the organisation's performances. The questions were developed via the literature on MA practices, EM issues and concerns, as well as addressing gaps in the fields that are

essential in seeking data and disclosing findings and conclusions. A copy of questionnaire is provided in Appendix III.

Interviews were conducted using an interview guide developed specifically for this purpose. As a form of data collection, the interview process has, through qualitative methods, become widely known and accepted (Wolcott 1990). The interview guide was also divided into three parts, each part corresponding to a part of the questionnaire in terms of the underlying research area, because the main purpose of utilising a qualitative approach (discussions and interviews) is to obtain complete understanding on the areas covered by the questionnaire. Thus, with a view to gathering more descriptive information and identifying specific situations and reasons for them within the context under investigation, this interview guide was designed. A copy of the interview guide is also attached in Appendix IV. Although the interviews were conducted in a conversational style, the interview guide allowed the researcher to maintain focus, and further questions were asked when needed to elicit information on a particular topic and related issues, or to rephrase original questions from the guide that had not been fully answered in the researcher's opinion.

4.3.4.5 Implementation of Data Collection and Recording

Following the granting of ethics approval from the HREC of the University, the recruitment phase for participants began. Sampling and data collection from sampled companies were identified and relevant officials (respondents) were contacted, utilising sampling methods outlined above. Upon obtaining consent from the respective personnel to be involved, appointments were made and the researcher implemented and completed the data collection task successfully, covering 42 listed companies with a 100% response rate. The researcher also gathered descriptive information from government officials involved in initiating and implementing environmental legislation, standards and related activities, particularly those related to listed companies in Sri Lanka.

The researcher obtained permission from all participants in listed companies involved in the questionnaire survey, discussions and interviews, and all government officials involved in environmental matters, to record the sessions, which were transcribed for analysis of responses. The language used in conducting interviews with respondents is in English. All This process of recording and transcribing key elements from the

records facilitates the researcher in obtaining required data and information efficiently with minimum effort and time, and for re-using these later for further clarification. It also assists the researcher to make subsequent inquiries on the same topic for the completeness of data and information by maintaining their accuracy through transcription evidence. Finally, follow-up contacts were made by telephone or e-mail with all respondents/companies and officials of government institutions to ensure the completeness of data and information gathered whilst data collection was taking place.

4.3.5 Data Analysis

Upon completion of data collection, the role of the researcher is to tabulate and analyse data and information, interpret the findings and then reach conclusions on the underlying setting so as to provide answers to the research questions and achieve the study objectives. This project is concerned with analysing both qualitative and quantitative data and information. The analysis of textual qualitative data is contrasted with that of the quantitative approach, where structure and testing rigor prevail through numerical analysis and statistical procedures. Accordingly, this section describes the data tabulation process and data analysis process implemented.

4.3.5.1 Data Tabulation

Data tabulation involves two forms based on data types:

- Tabulating quantitative data

Using SPSS software, this study organised survey data by coding and numbering questions and answers in the questionnaire. A coding system was applied to identify companies industry-wise, but also protecting their anonymity. Codes were allocated by reference to industry sector and also used to identify categories of questions based on MA techniques and EM issues.

- Tabulating qualitative data

The recordings were individually played back, company-wise, in order to transcribe descriptions, further clarification, specific situations, issues and reasons for them, key statements and quotations in a way that assisted the researcher to do analysis and

interpretation that were made subsequently by mixing both types of data. This tabulating process enabled the researcher to arrange qualitative data and information meaningfully and match them with themes identified with the questionnaire and interview guide.

4.3.5.2 Point of Interface and Data Analysis Process

The analysis involves sorting and evaluating responses to questions that are related to the conceptual framework or research questions. By reviewing responses from the questionnaire and interviews, and information obtained through discussions, it is possible to determine key themes for the analysis and interpretation of findings. Data analysis comprises two stages based on main aspects of the research question: MA practices and their contribution in responding to EM issues, which relate to Chapters Five and Six, respectively. Both chapters integrate QUAN findings of the core component with supplementary *qual* findings under each theme, with an aim of presenting meaningful complete analysis and interpretations, and finally reach a sound conclusion. Chapter Five principally consists of background information of sampled companies, analysis of MA practices and related issues industry-wise and techniques-wise. Chapter Six discusses EM measures undertaken by listed companies in accordance with environmental legislation and ISO EMS certification, and analyses implications of MA practices on these EM actions and related issues or challenges, and then presents findings and discussions based on the research questions.

Point of interface

There are several strategies available in analysing data in the MMR process. However, a researcher is required to assess the types of analysis that will yield the optimum outcome based on the available data sets. In this study, two analysis chapters integrate QUAN findings of the core component with supplementary *qual* findings under each theme. Thus, the point of interface for this study is determined at the point where the two components meet in the analysis (i.e., the results point of interface) as shown in Figure 4.1.

One of the key aspects of MM design is that, although the two components are conducted separately, the supplemental component is imported into the core component for analysis at the analytic point of interface or into the results section to contribute to

the narrative description of the results (Morse 2010). Accordingly, there are two points of interface available in MM design for integrating core and supplemental components to form a meaningful complete analysis and interpretation as follows.

i) Analytical point of interface:

This is the first position in the analysis section of the core component. It is for importing data that have been transformed from textual (in the *qual* component) to numerical. They are imported into the analytic point of interface as new variables and statistically analysed as a part of the core data.

ii) Results point of interface:

This is the second position. All research has a section in which the results are presented for the reader. The textual results of the *qual* supplemental component are written into the QUAN results, with the QUAN results forming the framework, or base, of the results. This is primarily narrative, although it may contain some tables or figures to enhance the description. With sequential QUAN design, again the core project is placed on hold following analysis until the data from the *qual or quan* supplemental component have developed to the point where they may be imported into the analysis in the results narrative (Morse 2010).

With MMR the researcher preferably writes the results section, combining the findings from both components, but not paragraph by paragraph. The core component always forms the theoretical base or foundation for the results, and the findings from the supplemental component embellish this, adding important details. While the reader should be able to identify which results came from each component, on no account should the two results be presented separately (Morse, 2010).

In view of these two positions and core data (QUAN) and supplemental data (*qual*) gathered for this study, the researcher identified the *results point of interface* as the suitable position for integrating two components to form a meaningful complete analysis and interpretations, because the qualitative data and information collected through the supplemental *qual* approach typically contain descriptions on particular aspects, specific situations and issues, and clarification, and on matters derived through the questionnaire, all of which were obtained further to responses given in the

questionnaire survey, so that those could not be transformed into numerical form but they are suitable for adding to QUAN results to provide descriptive meaningful complete analysis and interpretations for the study.

Data analysis tools and the process involved in integrating two components

In accordance with the point of interface chosen for the study, upon tabulating survey data through SPSS software, first quantitative data were analysed, using statistical tools, i.e., frequency tables, bar charts, and chi-square with cross tabulation (Fisher's exact test). The validity of the chi-square test depends on both the sample size and the number of cells. According to Cochran (1954), to carry out chi-square test and use its results for 2 x 2 tables, the expected value for each cell needs to be 5 or higher. This analysis decided to apply Fisher's exact test, as the sample would not meet that condition (the expected value for each cell of the sample is not 5 or above). Even if the sample size is 42 companies, when considering industry sector-wise (five sectors), one sector includes fewer than five companies. In such a circumstance, Fisher's exact test is more appropriate than a chi-square test for investigating the relationship between industry sector and other variables considered.

Then, using thematic analysis and content analysis techniques, qualitative data are analysed. The themes for this analysis are identified with reference to major sections, such as MA practices, EM issues, EM actions and motivations for them, considering EM measures together with MA practices, and sub-headings, such as traditional and modern MA techniques, stages of business process in relation to environmental impacts and related actions taken, and industry sectors. These headings represent the sections and/or questions of the questionnaire and interview guide used in the data collection process. Content analysis is mainly used to analyse secondary data and information available in annual reports of listed companies, particularly relating to EM considerations and actions taken, which are disclosed under 'sustainability report' or 'CSR activities' or other relevant themes.

In most instances, both components are used first in analysing core data derived through the survey and then reinforcing such analysis and situations using supplementary *qual* data with more details, evidence and examples. However, in certain situations with themes, i.e., EM initiatives undertaken by responding companies (RQ

III), it considers mostly supplementary *qual* data in the analysis. Then, focusing on the RQs, it presents findings and discussions integrating two components under each theme and sub-headings identified. Accordingly, depending on the nature of the RQs and related themes, two components are integrated in the analysis, aiming at answering the respective RQs precisely whilst providing an opportunity to derive fruitful findings and discussion, and then reach to sound conclusions.

4.4 Ethical Considerations

Unlike in the natural sciences, in business research there is no written code, and thus it is up to the researcher, in conjunction with the supervisor, to determine what is ethical (Collins & Hussey 2003). As this research project occurred under the administration of the University, ethics approval was received at its outset from the HREC of the University in February 2013. Accordingly, ethical considerations were satisfied in the process of this research when and where applicable, as follows:

- *Recruitment of participants:* The researcher spent some time negotiating access to organisations and developing good relationships with them in order to conduct the research. An invitation to participate was made via telephone and/or email, with required information on the research being undertaken. The researcher acknowledged all participants verbally and also through email, expressing appreciation for their cooperation that made this research project a success.
- *Informed consent:* The researcher informed potential participants of the purpose of the research, providing a document 'Information to participant', in addition to verbal explanations, and then obtained their agreement to participate in the survey and interviews by returning a signed consent form, all of which were approved by the HREC of the University.
- *Ensuring no harm to participants:* The researcher used the questionnaire and interview guide for data collection after obtaining ethics approval from the HREC of the University.
- *Confidentiality/Anonymity:* The researcher assured the participants that confidentiality of data and comments was absolute, to encourage participants

to give more open and honest responses. Further, to allow identification of those data and comments but to protect their anonymity, a coding system was introduced industry-wise but not company-wise.

- *Protection of data:* Completed questionnaires are to be kept in a locked filing cabinet at the University for a specified period and this ensures that those data and comments are not to be used for other purposes rather than this research purpose.

4.5 Summary

This chapter has presented a discussion of and justification for the methods and processes undertaken during this study. It has justified the appropriateness of mixed methods for this research, showing its main features and the restrictions arising from applying single approach, whether quantitative or qualitative. There is clear evidence that mixed methodologies have been applied in previous research appropriately. Such literature enabled the researcher to apply MMR to this study because it provides insights and motivations to establish the methodological process used here. Accordingly, this chapter described the methodological process involved in the research, elaborating it with a diagram on MMR design. It has summarised the main points of MMR design and their implications to this study (Table 4.2). In the process, first it elaborated how to define the primary research question and sub-questions under the MMR approach, in accordance with four dimensions outlined, and then it identified the theoretical driver as deductive, the core component as QUAN and the supplemental component as *qual*. Accordingly, this research is concerned with two paradigms in respect of methods and strategies applied simultaneously and subsequently indicated as: QUAN + *qual* and QUAN → *qual*, respectively.

This MMR approach is further defined considering two dimensions: time order and purpose of mixing. Within this framework, the sample was selected by using multiple methods, mainly multi-stage purposeful random sampling, snowball sampling, convenience sampling and forms of purposeful sampling. Data collection was undertaken using two instruments principally, a questionnaire survey and interviews and discussions, but rarely observations. It then described the data analysis process, how and when both types of data and information derived from the core component and

supplemental component combine to present sound analysis and interpretation in the research report. For this purpose, by considering the nature and types of data, these two components (core and supplemental) were integrated at the results point of interface. Finally, this chapter recapped the methodological process by emphasising strategies adopted for ethical considerations.

In the next two analysis chapters, the study describes the analysis of data and information of all kinds and interprets findings within the frame of the MMR design while maintaining the validity and reliability of the findings to the maximum possible level.

Chapter 5 Data Analysis and Discussion 1: Management Accounting Practices of Listed Companies in Sri Lanka

5.1 Introduction

The previous chapter outlined the research methods applied by the researcher throughout the project, specifying the methods of data collection and of data analysis. Accordingly, this chapter aims to analyse the data and then present findings and discussions related to first part of the primary research question, *how and to what extent do listed companies in Sri Lanka adopt MA practices*, thereby providing answers specifically to RQ I. This chapter first identifies the nature of sampled companies in terms of industry sector, age, size and types of products and businesses. Relating to systems and personnel involved in MA practices and EM activities, 73.8% are functioning with management accountants and the rest with financial accountants. Contrary to this progress in MA practices, no-one in the sample employed environmental management accountants and only seven companies (16.7%) are cooperating with an environmental manager/consultant or sustainability manager in handling EM activities. The researcher was successful in the data collection process in securing the involvement generally of senior management (SM) (81%), and sometimes management accountants (16.7%), but rarely financial accountants, so that this provides evidence for the success of this study from its inception.

The chapter elaborates the level of adoption of MA practices by listed companies in different industry sectors by comparing and contrasting traditional *versus* modern MA techniques and then analyses and discusses the findings, highlighting variations, specific situations and considerations associated with different companies/industry sectors. It also compares all judgements, where possible, with previous findings in the literature. Thus, it reveals that all listed companies in the sample are practising both traditional and modern MA techniques (except for JIT) at a satisfactory level, but in the Sri Lankan context traditional MA techniques are still more popular (94%) than modern MA techniques (57%). This trend is further confirmed with the high variations shown on the level of application of modern MA techniques by industry sectors, compared to traditional MA techniques. Despite the above average application of modern MA techniques by Sri Lankan companies, none of them adopt JIT systems, possibly due to its inappropriateness to the Sri Lankan business environment. Moreover, in relation to

different industry sectors, specific characteristics can be identified on the level of application of MA techniques, especially in the PLT sector.

It also descriptively analyses and discusses the nature of MA practices of listed companies in relation to each traditional and modern MA technique, focusing particularly on: systems, procedures and methods followed; factors considered; specific situations and constraints; and purposes to be achieved through such applications. When and where possible, it compares these findings with those of the literature, highlighting practices of developing and developed countries. Even though Sri Lankan listed companies are functioning with sufficient resources and well-equipped staff required in adopting modern MA techniques such as ABC and BSC, most reveal that they still see no need to adopt these because they are satisfied with existing systems and applications. This suggests that the listed companies are functioning well by applying any of the most appropriate MA practices with either traditional or modern techniques by adjusting them for compatibility with their own purposes, product lines, associated processes and structures, and the needs of the company.

The chapter concludes with a summary and directions of the next chapter, Analysis II, which centres on answering RQs II to VI on integrating MA practices and EM issues.

5.2 Background of Listed Companies

This section describes the nature of sampled companies in terms of structure and types of businesses by industry sector, their length of operations in years, and size of companies (large or medium). It also designates the personnel involved in the survey and the interviews, whether senior management (SM) or middle-level management, and then considers whether they employ distinct personnel such as management accountants or cost accountant to handle MA practices, or whether both FA and MA systems are handled by the same personnel (a financial accountant), and whether or not they hire specialists to handle environmental aspects of companies, i.e., an environmental manager.

5.2.1 Structure and Size of Companies and Types of Businesses by Industry Sector

The sample of this study can be elaborated in view of structure and size of companies highlighting their types of businesses by sector, as shown in Table 5.1. On the size of sampled companies, the majority (73.8%) are large size and 26.2% are medium size (Table 5.1). In the DVS and PLT sectors companies are only large, whereas in the other three sectors the majority are large.

Table 5.1 Structure and size of companies and types of businesses by industry sector

Industry sector	Number of Companies		Total	%	Major products and businesses
	Large size	Medium size			
F & B	6	2	8	19.0	Food and beverage products (dairy products, fruit, coconut and organic products, salt, poultry products; other consumer products
CHEM	2	1	3	7.1	Agro-inputs, chemicals, paints, bituminous products
DVS	5	0	5	11.9	Garments; blending and packing tea; baby items, cologne, soaps; other consumer products; toothbrush and toothpaste etc.
MNF	10	8	18	42.9	Ceramic products; cables, wires, conductors; aluminium products; refrigerators, washing machines, air conditioners, freezers, sewing machines; rubber products; cement, wall plaster, concrete, tile adhesive, flooring water proofing; pipes, show cases, partitions, ladders, sliding doors and windows, roller shutters, curtain rails, channels etc.
PLT	8	0	8	19.0	Tea, rubber, coconuts, palm oil, cinnamon etc.
Total	31	11	42	100	

Abbreviations: Food Beverage & Tobacco (F&B); Chemicals & Pharmaceuticals (CHEM); Diversified Holdings (DVS); Manufacturing (MNF); Plantation (PLT)

Considering the nature of businesses, because the researcher purposefully selected five industry sectors encompassing manufacturing and manufacturing-related industries, all companies in the sample deal with manufacturing and selling different types of products for local and/or export markets, as outlined in Table 5.1.

Countries use different definitions for demarcating industries as large, medium and small, based on their level of development. The commonly used yardsticks are total

number of employees, annual turnover and total investment. In Sri Lanka, according to the National Policy Framework for SME, size in the manufacturing sector is based on the number of employees and annual turnover (Table 5.2).

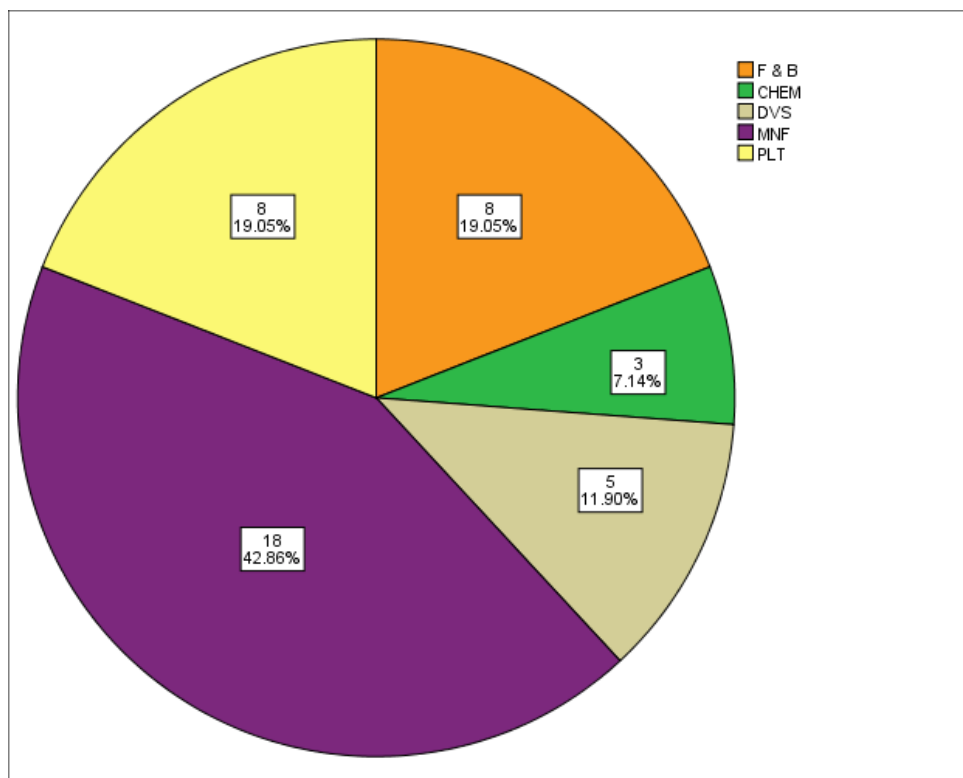
Table 5.2 Criteria used for defining size of Companies in Sri Lanka

Sector	Criteria	Size	
		Medium size	Large size
Manufacturing sector	Annual turnover	Rs. Mn. 251 – 750	More than Rs. Mn. 750
	Number of employees	51 – 300	More than 300

Source: www.industry.gov.lk (2015), National Policy Framework for Small and Medium Enterprises, Ministry of Industry and Commerce

The combination of industry sectors in the sample can be demonstrated further in a pie chart (Figure 5.1).

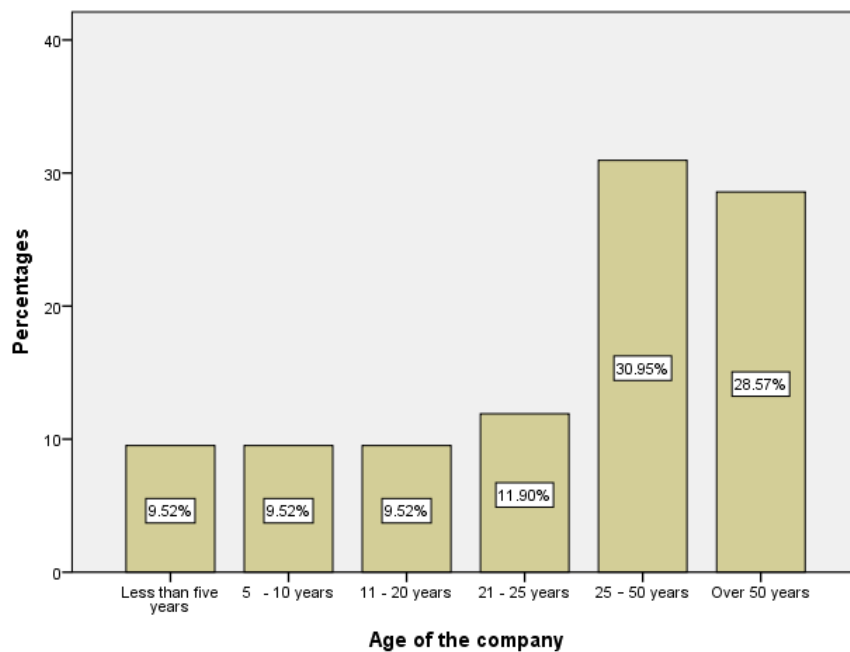
Figure 5.1 Industry sectors to which a Company belongs



5.2.2 Age of Companies

The length of operations of sampled companies range from less than five years to over 50 years, as indicated in Figure 5.2, irrespective of industry sector. The highest percentage of companies (31%) belongs to 25-50 years, closely followed by those over 50 years (28.6%). The least level (9.5%) is represented equally in the first three categories (from less than 5 to 20 years) in operations.

Figure 5.2 Ages of Companies



5.2.3 Management Personnel Involved in the Survey

As for types of data and information needing to be collected through the survey and interview schedules, the researcher deliberately sought to get the involvement of SM, i.e., finance directors, chief financial controllers, finance managers, and DGM finance, rather than middle-level management, such as financial accountants and management accountants, because senior management is typically competent to provide more descriptive analytical answers to questions with their vast knowledge and experience, not only in the specific area of concern (i.e., accounting), but also in other aspects explored in this research, i.e., EM activities, policies and procedures, and decision making and allied surroundings at board level.

Accordingly, as indicated in Table 5.3, 81% of the personnel involved in the survey represent SM, while 11.9% represent management accountants. The researcher applied such an approach in this survey by contacting, as far as possible, the most suitable personnel at SM level, as they have substantial knowledge and competencies compared with middle-level personnel, and as they would very much influence favourably obtaining all relevant data and descriptive information on the phenomena explored, with adequate justifications and examples, and hence support to have meaningful findings and discussion.

Table 5.3 Management personnel per industry surveyed

Industry sectors	Number of Companies				Total
	SM	MA	FA	MA + FA	
F&B	5	2	0	1	8
CHEM	0	3	0	0	3
DVS	5	0	0	0	5
MNF	17	0	1	0	18
PLT	7	0	0	1	8
Total	34	5	1	2	42
Percent	81	11.9	2.4	4.8	100

Abbreviations: SM-Senior Management; MA-Management Accountant; FA-Financial Accountant; MA+FA - both Management Accountant and Financial Accountant

5.2.4 Positions Responsible for MA and EM Activities

The survey pinpoints whether Sri Lankan listed companies employed specialists, i.e., management accountants or environmental managers, to handle MA practices and environmental aspects of those entities, respectively: 73.8% (30 + 1 companies) are functioning with management accountants and the rest (11 companies) with financial accountants (Table 5.4).

Table 5.4 Personnel involved in MA practices and EM activities by industry sector

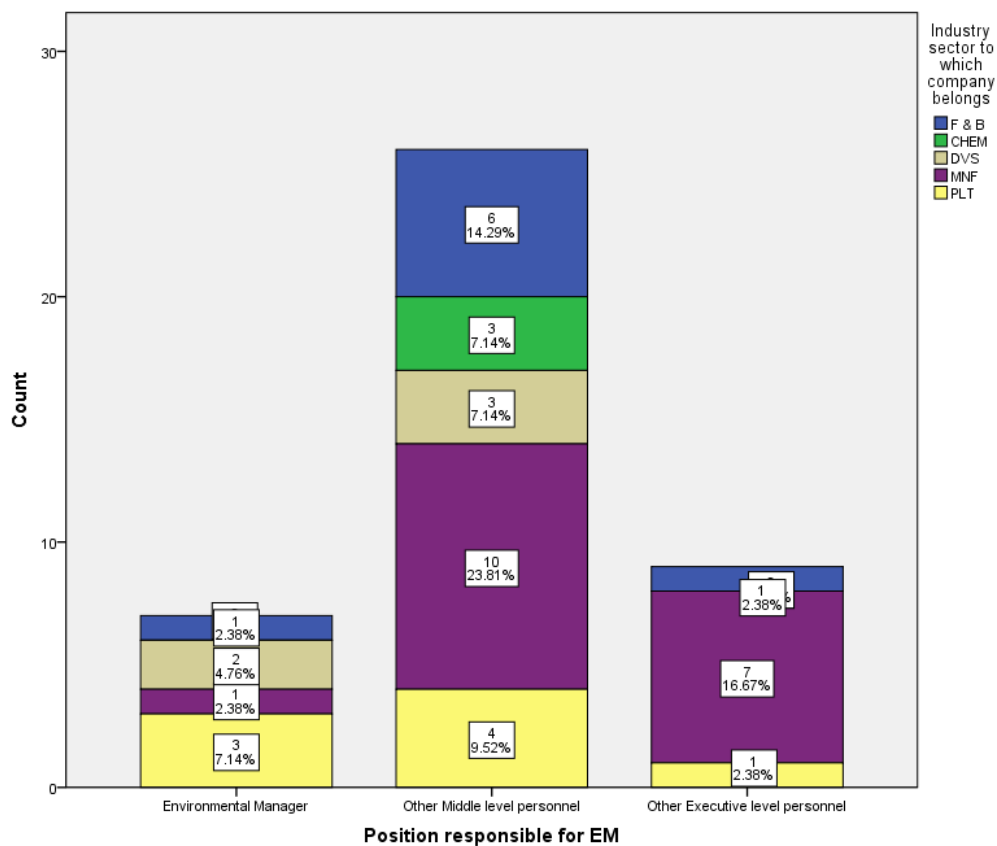
Industry sector	MA Practices – Number of Companies			Total	EM activities – Number of Companies			Total
	MA	FA	MA+CA		EM	OML	OEL	
F&B	6	2	0	8	1	6	1	8
CHEM	2	0	1	3	0	3	0	3
DVS	5	0	0	5	2	3	0	5
MNF	10	8	0	18	1	10	7	18
PLT	7	1	0	8	3	4	1	8
Total	30	11	1	42	7	26	9	42
Percent	71.4	26.2	2.4	100	16.7	61.9	21.4	100

Abbreviations: MA-Management Accountant; FA-Financial Accountant; MA + CA– both Management Accountant and Cost Accountant; EM - Environmental Manager; OML - Other Middle Level Personnel; OEL - Other Executive Level Personnel

However, the MA practices of all companies are monitored well under the close supervision of SM (finance executives), i.e., the finance director, chief financial controller, finance manager, so that they have been able to handle their MA practices in a healthy manner even in a situation where management accountants are not available for the function. This can further be described by industry sector in Table 5.4.

Contrary to this progress in MA practices, as shown in Figure 5.3, the survey shows that no-one in the sample employs environmental management accountants and only seven companies (16.7%) are cooperating with environmental managers/consultants or sustainability managers in handling EM activities. The extent of assigning EM responsibilities to personnel in diverse levels and positions is detailed in Table 5.4 and Figure 5.3.

Figure 5.3 Personnel involved in EM activities



Therefore, the majority, 61.9% (26 companies), assigns EM responsibility to other middle-level personnel, i.e., the operations manager, HR manager, quality manager, technical manager, and the remainder (nine companies or 21.4%) do it by executive-

level personnel, i.e., the managing director, the DGM operations and the DGM finance, so that all of them perform this role in addition to their own duties in the positions to which they are normally assigned.

In relation to EM issues, all responding companies typically pay attention to EM issues at each stage of the business process and take actions by being motivated legitimately with environmental legislation such as the NEA (mainly through EPL and EIA/IEE procedures, SWML, and Noise Control Regulations), labour laws and BOI laws, and particularly with environmental standards, i.e., SLS ISO 14001: 2004 EMS certification and accreditation. Such EM initiatives undertaken by those companies are detailed in Chapter Six. Further, in complying with legislation, they mostly expect through such EM actions to create a good image for the company and hence survival of the business.

Four respondents indicated that they have assigned the EM responsibility for all personnel in the company, as it seems to be a team effort of the entire company, rather than anyone's or a specific group effort in the entity.

Of the companies with environmental managers, the PLT sector shows superior attainment with 43% (three of seven companies) to the other four sectors. They call these environmental consultant, manager (sustainability) and junior executive (sustainability). This trend may be attributed to the nature of the PLT sector which involves highly environmentally sensitive processes spread throughout several large geographical areas, as explained in Chapter Six. Due to this factor and their greater commitment towards protecting the environment, the PLT sector could better respond to EM issues by undertaking a number of measures in their estates. These estates are operated at the strategic business unit (SBU) level under the control of the estate manager and with the assistance of superintendents and other personnel of respective estates.

One company in the F&B industry that has international recognition in the Asia-Pacific region, ranking among Forbes Asia's 200 best-performing companies, is using an environmental manager. In the DVS sector, two companies have employed environmental managers: one, an international company regulated by the parent company in the UK, and with the core function of *blending and packing of tea for the export market*, is successfully handling its EM function with a group sustainability manager, and the other company, a subsidiary of a well-reputed group of companies in

Sri Lanka, is also managing all EM activities, to the maximum efficient level, with a group sustainability manager. In the MNF sector, only one has been handling EM issues more efficiently with an environmental manager. This company has been functioning approximately for 45 years, pursuing sustainable profit and growth. Further, the company became a subsidiary of an Australian multinational group of companies 20 years ago. This suggests that, considering companies who function with environmental managers or allied positions, there is a tendency that almost all such companies deal with international markets and further, in certain instances, with international collaboration/agreements, for which environmental consideration is seen to be of the utmost importance. In addition, most of them are the leading companies in their respective industry sectors.

5.3 The Extent of MA Practices by Industry Sector

This section elaborates the level of adopting MA practices by listed companies in different industry sectors by comparing and contrasting traditional *versus* modern MA techniques, as depicted in Table 5.5 and Table 5.6. In this regard, ‘the extent’ means the level of adopting MA techniques by responding companies in terms of comparative figures and/or percentages.

Table 5.5 The level of use of traditional MA techniques by industry sector

Industry sector	BUD %	STD %	PC** %	PP %	TP %	PE %	Average %
F &B	100	100	100	100	50	100	92
CHEM	100	100	100	100	100	100	100
DVS	100	100	100	100	80	100	97
MNF	100	100	100	100	67	100	94
PLT	100	100	25	*100	100	100	88
Total Average	100	100	85	100	79	100	94

Notes:

1. BUD – Budgeting, STD – Standard costing, PC – Product costing, PP – Product pricing, TP – Transfer pricing, PE – Performance evaluation
2. * The PLT sector has to adopt prices determined based on demand and supply and quality of brands prevailed at respective auctions occurred usually weekly or fortnightly, so that pricing decisions are made beyond the control of individual companies.
3. ** PC includes traditional cost allocation systems (TCAS), batch costing, job costing, process costing and standard costing used for product costing purposes.

Table 5.6 The level of use of modern MA techniques by industry sector

Industry sector	ABC %	ABB %	Tgt. C %*	Kai.C %*	BSC %	BM (ext.) %*	BM (int.) %*	JIT %	Average %
F&B	38	50	75	50	75	88	88	00	58
CHEM	33	33	100	33	33	67	33	00	42
DVS	60	60	100	40	80	100	100	00	68
MNF	28	33	67	78	61	78	78	00	53
PLT	100	100	00	63	63	100	100	00	66
Total Average	52	55	68	53	62	86	80	00	57

Notes:

1. ABC – Activity based costing, ABB – Activity based budgeting, Tgt.C – Target costing, Kai.C- Kaizen costing, BSC – Balanced scorecard, BM (Int.) – Internal Benchmarking, BM (Ext.) – External Benchmarking, JIT – Just-in-time system
2. * Indicates MA techniques, for which respondents were asked to rate the level of application. The above figures represent companies who apply the techniques always, often, and sometimes and responses with ‘rarely’ and ‘never use it’ are considered as not applying the techniques.

These results make it apparent that all Sri Lankan listed companies adopt both traditional and modern MA techniques (except for JIT) simultaneously, but practise more traditional MA techniques (94%) rather than modern MA techniques (57%).

Of the traditional MA techniques considered, all sectors usually apply BUD, STD, PP and PE excellently (100%) and, except for the PLT sector, all sectors apply traditional PC and PP to the maximum. Even though 100% of applications of PP by the PLT sector is shown, pricing decisions made mostly rely on prices determined at auctions. The main reason for the rather low usage of PC (25%) in the PLT sector is the highest application of ABC (100%). in regard to TP, however, the level of application varies noticeably from industry to industry, even though it averages 79%.

In regard to modern MA techniques, except for JIT, average usage reaches 57%, ranging from 52% to 86% by technique. No-one in the sample adopts JIT, because it does not match the business processes and the environment in which those Sri Lankan companies operate. This affects considerably the lessening of the overall average use of modern MA techniques, because, if JIT is ignored, average use would be 65%. The highest practice is for external BM (86%), followed closely by internal BM (80%). Except for the CHEM sector, the application of internal BM and external BM seems to be at similar levels in each sector. Specifically, all those in the PLT and DVS sectors strongly apply both internal and external BM.

In contrast, except for JIT, the lowest application (52%) appears for ABC, even though the whole PLT sector applies it (100%). This implies that the application of ABC by others is really confined to low levels: F&B, 38%, CHEM, 33%, and MNF, 28%; only the DVS sector represents a comparatively high level of usage (60%). Of five in the DVS sector, three companies apply ABC: one is a multinational company regulated by the parent company in the UK, and the other two are higher-level leading companies, and all of them run their businesses with great reputation for their brands in the Sri Lankan market, and perhaps in foreign markets, too. This further highlights that ABC and ABB are applied by the same entities (20 companies), representing all industry sectors, as these two are mostly interrelated. Nevertheless, the average use of ABC and ABB slightly differ from 52% to 55%, because two companies in the F&B and MNF sectors apply only ABB to some extent, but not to ABC.

The application of target costing appears at a very high level (100%) in the CHEM and DVS sectors and at a satisfactory level in the F&B and MNF sectors. Nevertheless, no one in the PLT sector applies target costing, due to its specific nature of price determination and also frequent changes of those prices (i.e., weekly, fortnightly), typically not allied with associated costs at all, but conforming to demand and supply and quality and brands.

The application of BSC is at 62% on average; however, its application by the CHEM sector is at the lowest level (33%). The highest usage (80%) appears in the DVS sector, which consists of comparatively large leading companies and multinational companies with greater reputation for brands both at local and foreign markets. The other three sectors apply BSC at a satisfactory level.

Compared to other techniques, the application of Kaizen costing is at a low level (53%) The highest application (78%) is in the MNF sector, probably due to its importance for production processes that typically deal with durable products. A high application appears in the PLT sector (63%), mainly due to the specific nature of manufacturing processes requiring utmost care consistently to maintain the quality of output, as they mostly depend on international markets, where the excellent quality is very important.

5.4 Findings and Discussions on the Level of Application of MA Practices of Listed Companies in Sri Lanka

This section analyses and discuss the findings pertaining to the extent of adopting traditional and modern MA practices by listed companies, and highlighting specific situations and considerations associated with different companies/industry sectors, and it compares and contrasts all judgements, where possible, with previous findings in the literature.

5.4.1 General View of the Adoption of MA Practices

The findings show that, overall, all listed companies in the sample are practising both traditional and modern MA techniques (except for JIT) at the same time, but traditional MA techniques remain more popular (94%) than modern MA techniques (57%). The zero (0%) application of JIT affects considerably the lessening of the average use of modern MA techniques to that level. If JIT is ignored, the average use of modern MA techniques is be 65%, which it still indicates a rather low application.

These findings support the literature: for example, Hyvonen (2005), investigating both traditional and modern MA techniques relating to large firms operating in the forest, metal and electronics industries in Finland, reveals that all the MA techniques considered have been adopted by the majority of respondents. Angelakis et al. (2010) present similar findings on large Greek manufacturing firms, demonstrating that the majority of traditional and modern MA practices considered were implemented by most organizations. Also, Chenhall and Langfield-Smith (1998), in relation to large manufacturing firms in Australia, reveal that, although the adoption rates for many recently developed MA practices such as ABC were higher than those reported in surveys from other countries, overall, traditional MA practices were somewhat higher-applied than recently developed ones.

Waweru et al. (2005) also present similar findings that modern accounting techniques such as ABC and BSC-type performance measures are used together with traditional MA techniques such as budgeting and standard costing in South Africa. In line with the popularity of traditional MA practices, as disclosed in this study, Abdel-Kader and Luther (2004) suggest that MA systems employed in many UK companies representing the food and drink sector were not particularly sophisticated, and concluding that traditional MA is very much alive and sound. Sulaiman et al. (2004), in a literature

review in relation to four Asian countries (Singapore, Malaysia, China and India), suggest that the use of contemporary MA tools is lacking, while the use of traditional MA tools remains strong in the four countries studied.

Considering traditional MA practices, all companies strongly apply all techniques, except for TP (79% of companies), and except for PLT sector; all others apply PC 100%. Even though this indicates a 100% application of PP in the PLT sector, in this respect they all absolutely rely on prices determined at auctions that mostly occur weekly or fortnightly. Thus, this suggests that pricing decisions of the PLT sector are affected by factors outside the control of individual companies. In regard to the product costing function, the most common feature identified (in Table 5.16) is that some companies depend on one costing system, while others use more than one at once, in most instances including traditional cost accounting system (TCAS). This combination may be attributed to the necessity of different costing systems for companies with their diversified product categories and different information needs.

Findings demonstrate that listed companies mostly adopt suitable costing systems (sometimes more than one), as shown in Table 5.16, considering their specific requirements, different costing purposes and perhaps depending on management interest. However, considering such single and multiple product costing systems of sampled companies, TCAS indicates the highest application (78.5% or 33 companies, including two PLTs), and second place goes to batch costing (31% or 13 companies). But it has very low application of job costing, standard costing and process costing only, at 5%, 7% and 5% of companies, respectively. These findings suggest that TCAS remains the most widely used popular costing system in Sri Lanka, probably due to its simplicity, lower cost and its applicability for a variety of business processes. However, the PLT sector indicates a low application of TCAS (25%), as they all apply ABC instead.

Moreover, sometimes they use more than one system for product costing purposes by incorporating both traditional and modern MA techniques, i.e., of the 20 companies applying ABC, 14, representing all sectors, apply traditional product costing systems, i.e., TCAS, batch costing, job costing, and ABC systems (Table 5.16). For example, two PLT companies use TCAS together with ABC. The findings suggest that they use more than one product costing system at once, integrating both traditional and modern MA techniques, as complements for and/or alternatives to one to another, and,

depending on their own requirements, purposes and particular circumstances, that individual companies deal with. For example, a company in rehearsal stage on the application of ABC may concurrently use TCAS as a complement in order to verify the product costs derived through the new system. In turn, if a company applies ABC only for certain aspects of the costing system, because of their difficulties in applying ABC for the whole system (probably due to its high costs, complexity, lack of staff, or time constraints), then these two systems act as alternatives one to another. Consistent with these findings, Tuanmat and Smith (2011) recommend using both advanced and traditional MA practices as complements and as substitutes for each other.

5.4.2 Variations among the Application of MA Techniques

Considering variations of the level of application among MA techniques reveals rather higher variations relating to modern MA techniques than to traditional MA techniques. No variations are indicated at all among traditional MA techniques, except for TP. It indicates discrepancies in the level of application of TP across sectors, even though the average usage is at a satisfactory level (79%), as shown in Table 5.5. The findings suggest that the necessity and level of application of TP may really vary from company to company, and perhaps from industry to industry, depending typically on the company structure, purposes and the nature of products and business processes that they need to handle within and outside the company across divisions/subsidiaries/parent company/other companies. This may further be affected by policies, obligations or regulations pertaining to a particular company, in some cases as a sister company or a parent Company in a group. It also indicates no variations between sectors relating to PC except for the PLT sector, because application of PC varies significantly between PLT (25%) and other sectors (100%), perhaps due to the high application of ABC (100%) in the PLT sector, as depicted in Table 5.5.

It appears that there are rather high variations in the level of application of modern MA techniques, not only across techniques but also among companies and industry sectors. For example, even though all companies in the PLT sector use ABC, ABB, internal and external BM, no-one in the sector uses target costing, mainly due to their uncontrollability in determining market prices and also regular changes that follow in those prices, irrespective of associated cost of production, and hence there is no relationship between product costing and pricing decisions in the PLT sector. However, considering the adoption of ABC and ABB, as these two are mostly integrated with one

another, all companies across five industry sectors who adopt ABC are unsurprisingly practising ABB, too. Only two companies use ABB to an extent but do not adopt ABC.

5.4.3 Variations between Industry Sectors on the Application of MA Techniques

Considerable variations between industry sectors are indicated, for example, regardless of the 100% application of ABC and ABB by the PLT sector; their use by other four sectors is limited to 60% or below. The main reason is that, even though product costing is essential for all, as stated above, ABC and ABB can be applied as alternatives or complements to traditional PC and BUD respectively, so that each and every company tends to apply ABC and/or PC, and ABB and/or BUD, or all of them together. In this respect, for example, two PLT companies apply ABC, TCAS (under PC), ABB and BUD simultaneously, depending on their needs and curiosity.

Referring to the level of application of Kaizen costing by industry sectors, the highest usage (78%) is indicated in the MNF sector. This may be attributed to the high demand for the techniques for companies in this sector because of the nature of their products. The findings reveal that most companies in the MNF sector produce durable products like refrigerator, washing machine, components, sub-components, building materials and cables, all of which require methodical inspection throughout the process to maintain the quality of output. The costs associated with those durable products are higher than those of consumer products and thus the necessity and relevance of this technique is higher for durable products than for consumer products like foods. Therefore, those companies in the MNF sector are undoubtedly compelled to apply Kaizen costing, with a view to retaining a satisfactory margin through minimizing waste that has occurred due to quality defects, and thereby it remains in competitive markets, securing brand reputation. In contrast, it indicates a rather low level of application of Kaizen costing in the CHEM sector (33%), while others practise it at a moderate level, as shown in Table 5.6.

In regard to BSC, the highest application appears in the DVS sector (80%), followed closely by the PLT sector (63%); the lowest application is in the CHEM sector (33%). The findings show that most companies adopting BSC represent superficially large leading companies (Table 5.1) and some are multinational companies that function with a greater reputation for their brands, both in local and foreign markets. For example, all in the DVS sector and PLT sector represent large companies, and all in the PLT sector

depend entirely on export markets with brand reputation. The greater tendency to adopt BSC by large companies than medium companies in each sector can further be illustrated in Table 5.24. Thus 71% of large and 45% of medium companies practise BSC. These findings thus suggest that manufacturing firms in Sri Lanka, performing as market leaders with large volume and/or serving particularly in international markets, may have a tendency to adopt BSC greater than others who are non-market leaders with rather low volume performing typically in local markets.

However, among modern MA techniques, the highest application seems in external BM (86%), followed closely by internal BM (80%). The DVS and PLT sectors emerge as the highest among five sectors with all companies (100%) practising both aspects of BM, as shown in Table 5.6. As with BSC, such a highest application of BM by all companies in these two sectors may be attributed to their soundness in competing in the local and export markets, as described in the above section. Another factor behind this success is the international collaboration developed by most as leading companies in their respective industries with their popular brands. For example, all in the PLT sector functioning with international collaboration require producing their brands with an excellent quality, mainly for export markets (indirectly through brokers), so that it is essential to apply external BM for them to compete in the market. Moreover, three other sectors apply BM at a satisfactory level. These findings suggest that application of external BM appears mostly in companies that deal with export markets rather than those competing in local markets. In addition, companies in highly competitive markets, either local or international, also tend to apply internal BM.

Further, target costing shows a higher application; however, it appears that the uppermost variances from 0-100% between industry sectors are mainly due to zero usage by the PLT sector. The main reasons for not applying target costing at all by the PLT sector are the specific nature of price determination at respective auctions, i.e., the tea auction, rubber auction, occurring mainly based on demand and supply and also on quality and brands, and frequent changes of those prices that ensues from auction to auction (possibly weekly or fortnightly), so that there is no relationship between prices and associated costs of products in the PLT sector. As the PLT sector deals entirely with export markets through brokers, fluctuations in exchange rates may also have specific impact on prices and on their frequent changes. Thus, executives of all companies in the PLT sector consistently state that adopting target costing is pointless

for the sector due to the inherent nature of their markets, price determinations and regular fluctuations of prices, all of which are subject to no control by individual companies, as they are mainly deal with export markets.

Also, despite the above average application of modern MA techniques by Sri Lankan companies, none adopt JIT systems in their business processes, possibly due to its inappropriateness to the Sri Lankan business environment. This suggests that Sri Lankan companies do not need to adopt JIT because its drawbacks might outweigh benefits and because they can ensure the soundness of existing operational cycle without applying JIT.

Accordingly, specific characteristics identified on the level of application of MA techniques in relation to different industry sectors can be summarized as follows.

5.4.4 Specific Characteristics Identified Relating to Industry Sectors

F&B sector

Except for TP (50%), all traditional MA techniques are totally applied in the sector. Such a moderate usage for TP may be attributed to its lesser importance or irrelevance for certain companies. Relative to modern MA techniques, in spite of ABC (38%), this sector uses all the other techniques at or above average, showing 58% in total. In this respect, this shows the highest application for external and internal BM (88%).

CHEM sector

Of the five sectors, CHEM shows comparatively different practices, as pointed out below: in relation to traditional MA techniques, CHEM has the highest position, with a 100% application of all, and thus also on average. In regard to Modern MA techniques, CHEM takes the lowest position, limiting the extent to 42%, whilst the total average of the sample reaches 57%. This is undoubtedly due to the lowest level of application of ABB, Kaizen costing, BSC and internal BM. CHEM becomes the second lowest, only relating to ABC (33%). However, same as DVS, CHEM is the highest in applying target costing (100%).

DVS sector

The DVS sector possesses the highest level of application of modern MA techniques, on average (68%), whilst the total average of the five sectors limits to 57%. Excluding

PLT, the DVS sector is the one able to retain the highest level of application relating to each modern technique, apart from Kaizen costing. Also, as for PLT, all in the DVS sector practise both internal and external BM in a situation where the next highest (F&B) is at 88%. Further, it shows a 100% application for target costing in the sector. This trend with regard to the application of modern MA techniques may be attributed to the sector's greater ability and soundness of businesses in competing in both local and export markets, in most instances as market leaders with reputed brands and for a longer time.

MNF sector

In regard to application of modern MA techniques, on average, the MNF sector is the second lowest (53%) of the five sectors. The least practice is indicated for ABC and ABB, with levels of 28% and 33%, respectively. The highest level of application is for Kaizen costing at 78%, probably due to its applicability and importance to the sector which includes companies that typically manufacture durable products with high per unit costs.

PLT sector

The PLT sector has shown specific circumstances compared with the other four sectors, particularly in the application of PC, PP, ABC, ABB and target costing. In regard to traditional MA techniques, only 25% of the sector applies PC regardless of its high usage (100%) by the other four sectors. This is mainly due to the very high application of ABC by the PLT sector instead. Only two companies apply both traditional PC and ABC together. In regard to product pricing, the PLT sector has to adopt prices for their products from auctions based on demand and supply and the quality and brands prevailing at each auction, usually taking place weekly or fortnightly, so that price determinations are probably made outside the control of individual companies.

In relation to modern MA techniques, all companies in the PLT sector strongly use ABC and ABB, feasibly caused by the foundation of the sector under British rule by applying ABC concepts and by its appropriateness to that sector. Also, the whole PLT sector applies both internal and external BM, undoubtedly because they all produce their brands mostly to export markets where the quality is very important. No-one in the PLT sector uses target costing because of the inherent nature of markets experienced

and of price determination and the frequent changes that would come from non-comparability with associated costs of production.

5.4.5 Standard Deviation (SD) and Co-efficient Covariation (CV) of MA Practices

The discussion above demonstrates that, compared to traditional MA techniques, high variations appear in the level of application of modern MA techniques, across techniques and companies/sectors. This is further shown in Table 5.7. Overall, SD and CV relating to the level of application of traditional MA techniques is lower (0.064 and 6.961) than those of modern MA techniques (0.174 and 31.812), and also the same pattern appears in each sector. A specific circumstance appears in the CHEM sector, having the lowest SD and CV for traditional MA techniques (as they apply all techniques 100%) and the highest SD and CV for modern MA techniques.

These findings suggest that any of companies, irrespective of their industry sector, would be rather likely to apply traditional MA techniques such as BUD, STD, PC, PP and PE due to their necessity, simplicity, and lower costs involved than most modern MA techniques, such as target costing, BSC and JIT. These findings further imply that business firms may have more freedom and/or choice in adopting modern MA techniques than traditional MA techniques, and the decision on the adoption of certain MA techniques may depend on various factors such as goals and structure of the firm, nature of products, processes and level of product diversification, availability of staff and their skills, competency, market positions (i.e., market leader), markets served (i.e., local and export markets), obligations as a subsidiary of a group of company, and other specific circumstances faced by an individual company or industry sector such as PLT.

Table 5.7 Standard Deviation (SD) of MA practices by industry sector

Industry sector	Traditional MA practices		Modern MA practices	
	SD	CV	SD	CV
F&B	0.089	9.719	0.176	30.441
CHEM	0.000	0.000	0.191	45.826
DVS	0.075	7.711	0.190	28.085
MNF	0.081	8.560	0.185	34.993
PLT	0.077	8.817	0.129	19.716
Overall index	0.064	6.961	0.174	31.812

Thus, the findings suggest that traditional MA techniques remain popular among all companies in Sri Lanka, irrespective of the sector or company, probably due to their necessity and relevance for any type of business and their lower costs and simplicity in application. Moreover, except for JIT, all other modern MA techniques considered tend to be applied by all companies across the five industry sectors at above average level, depending on their necessity, applicability, competency and other specific situations. For example, the PLT sector does not apply target costing at all, due to its inapplicability to the sector, but they all apply ABC.

These findings further suggest that there is a tendency to apply modern MA techniques (i.e., BSC, BM, ABC) by manufacturing firms in Sri Lanka that are large or multinational companies (sometimes market leaders), mostly with greater reputation for their brand both in local and foreign markets, and serving particularly in international markets by establishing international collaboration, than do other types of firms (e.g., application of internal and external BM by all in the PLT and DVS sectors). Supporting these findings, Sulaiman et al. (2004), a literature review of four Asian countries (Singapore, Malaysia, China and India), emphasize the importance of adopting modern MA tools, strategies such as JIT, ABC, total quality management (TQM), process re-engineering, life cycle assessment and target costing, because these greatly enhance the ability of corporations to meet global competition that is required for success in the present dynamic business environment. However, overall they suggest that the use of contemporary MA tools is lacking, while the use of traditional MA tools remains strong in the four countries studied.

5.5 The Nature of MA Practices Adopted by Listed Companies

‘Nature’ as a term for this study represents certain areas of MA practices that the responding companies applied, the systems, procedures and methods followed, the factors considered, specific situations and constraints, and the purposes to be achieved through such applications.

In addition to high, or low (or static) variation in the level of application of MA techniques between companies/industry sectors, the nature of the application of each technique by each company/industry sector may also differ, primarily depending on their systems and procedures and methods followed, the components and factors considered, specific situations, constraints, and the purposes to be achieved through

such applications. It is generally accepted that ‘the social system consists of different sub systems/components each having different characteristics so that if we want to identify those characteristics, we should investigate each sub systems/components separately’. The sampled companies may vary from one another within the industry and between industries, irrespective of their resemblance through manufacturing and manufacturing-related operations, in terms of the nature of products, product diversification, markets served (i.e., domestic or export), market position (market leader or non-leader), length of operation in years, size (large or medium), and policies, procedures, objectives and specific circumstances that individual companies face. All of these may have an impact on the nature and extent of MA practices. Hence this section continues to analyse those characteristics relating to MA practices of sampled companies under several sub-sections, each dealing with a particular traditional or modern MA technique, and also comparing findings, where possible, with the literature.

5.5.1 Budgeting

This study examines budgeting practices focusing on several important aspects: forecast time period, budget revision and implementation, the use of ABB, techniques used to forecast sales and the purposes of budgeting in firms’ business processes. All companies in the sample apply budgeting in their routine planning and control functions. These findings are consistent with those of previous studies: Waweru et al. (2005), 98% in South Africa; Hope and Fraser (1998), 99% in Europe; Szychta (2002), 80% in Poland; Abdel-Kader and Luther (2004), almost all companies in the UK; and (Wijewardena and De Zoysa (1999), almost all companies in Australia and Japan.

Budget components and forecast time period

The results obtained pertaining to the forecast time period for budget preparation in relation to five major budget components are presented in Table 5.8. The findings reveals that basically, all companies initially prepare annual budgets for all these components and then divide these into monthly and/or quarterly budgets according to their requirements. They all prepare only BIS and OB monthly, as these two are typically more important for their routine planning and control functions than are others. They give less attention to monthly CEB (79%): as some respondents commented, it is difficult to forecast monthly CEB, so instead they give more attention to monthly BCF and BBS, because these two are rather useful in managing business

day-to-day. They pay lowest attention to semi-annual budgets (13%) in general, but give more importance to BIS (17%) compared to other components, probably due to their greater concern about the impact of transactions on the income level of the company.

Table 5.8 The frequency of forecasting budgets for major components

Components	Forecast time period (% of Companies applied)				
	Monthly	Quarterly	Semi-annually	Annually	Beyond one year
Budget components					
Budgeted income statement (BIS)	100	36	17	100	21
Budgeted balance sheet (BBS)	90	29	12	100	19
Budgeted cash flow (BCF)	95	29	12	100	17
Operating budgets (OB)	100	31	12	100	10
Capital expenditure budgets (CEB)	79	26	12	100	24
Average Index	93	30	13	100	18

Quarterly budgets are also beneficial (30%), because some companies make budget revisions quarterly whilst business processes are going on, so that they are compelled to prepare quarterly budgets to an extent. Further, findings reveal that long-run budgets (18%) are more useful than semi-annual budgets (13%). In the long run, they normally prepare budgets for next three or five years, mostly in summary form, but detailed budgets only for the next first year beyond one year. In the long term, compared to other components, the highest attention goes to CEB (24%) due to its high practicality and usefulness, whilst lowest attention is on OB (10%), because it is rather difficult (and indeed useless) to prepare OB beyond one year in a changing business environment. However, among the industry sectors, there are no significance differences in the frequency of preparing budget components.

Similarly, Wijewardena and De Zoysa (1999) find that the budget components above were prepared by almost all companies in Australian and Japan, but the considerable difference between these two countries is that the balance sheet and capital expenditure budget are seen to be less popular in Japan. Somewhat deviating from the findings of this study, they reveal that annual budgets are the most popular in Australia as opposed to biannual budgets in Japan, and monthly budgets are at moderate level, while

quarterly budgets seem to be less important in both Australia and Japan. Also, the least importance was given to long-run budgets, with figures of 4% in Japan and 15% in Australia.

Budget revision

The frequency of budget revision made by responding companies is shown in Table 5.9. The findings reveal that all companies discuss progress each month and each quarter at regular board meetings held monthly, and revise budgets accordingly, depending on their policies, necessity and applicability, so that monthly/quarterly revision is at a moderate level (52.4%). Also, 4.8% respondents reported that they revise budgets (if needed) only if there appear to be considerable differences between actual and budgeted outcome in the past period.

Table 5.9 Implementation of budgets with or without revision

Category	Number of Companies	Percentage
No revision	18	42.9
Revise monthly	11	26.2
Revise quarterly	11	26.2
Revise if needed	2	4.8
Total	42	100.0

However, the findings suggest that necessity and frequency of budget revision largely rely on the specific nature of businesses, and the policies and procedures of companies.

Thus finance manager of one company in the CHEM sector dealing with fertilizer and agro-chemicals expressed their experience:

We essentially require budget revisions, called ‘situation based budget revision’ each month due to weather changes. As the weather forecasts strongly affect sales, we normally prepare seasonal-based budgets. Due to unfavourable weather conditions, there would be drastic decline in sales in some periods. If we couldn’t recover budgeted sales in a certain month, then [we] revise the budget, anticipating achieving targets in the next month, but it further depends on the weather conditions of the coming month too.

Finance manager of another company dealing with garments in the DVS sector stated:

We have no need to consider budget revisions because we do not entirely rely on budgets, and thus use budgets basically for financial planning, performance management and cost control purposes. In planning activities, we mostly use a monthly production plan, which is prepared based on orders placed, demand, style of the customers, employment and circumstances prevailing in the period, but this plan is not linked to the budget. Thus, more concentration is on customer needs of the period because as garments, the demand for them and fashion normally change within short periods of time.

The use of budget revision may be attributed to the level of apparent environmental uncertainty experienced in developing countries like Sri Lanka. Waweru et al. (2005) present similar views, reasoning from environmental uncertainty that flexible budgeting is most widely adopted by South African companies (68.7%) in view of the rapidly changing business environment. Similar situations can further be identified in studies such as Szychta (2002), with 74%, in Poland, and Waweru et al. (2003), where 68% of companies in Kenya use flexible budgets.

In contrast, 42.9% of respondents of the present study agreed with the following sentiments:

We do not make changes to initially prepared budgets because, in practice, we have no remarkable changes between actuals and related budgets. We believe that it seems to be a time-consuming task and/or a no-value-added task. However, if any differences occurred, we can identify them with reasons at the monthly board meetings and so take actions promptly if these deficiencies are controllable.

Supporting this view, Abdel-Kader and Luther (2004) reveal that almost all companies in the UK use budgeting for planning and control, but a high proportion did not amend their budgets for changes in volume or other factors and thus they work only with fixed budgets, applying 'what if' analyses fairly frequently.

Application of Activity-based budgeting (ABB)

The results on the application of ABB are illustrated in Table 5.10. The findings confirm that the adoption of ABB in Sri Lanka is at moderate level (52.4%) which shows rather high application compared with previous findings relating to other developing countries i.e., Waweru et al. (2005) -11.7% in South Africa, Joshi (2001) - 7% in India. Moreover, a specific situation can be seen in the PLT sector reporting 100% application of ABB as of ABC.

Apart from the integration of ABC and ABB, this study further illustrates a tendency towards adoption of ABB rather than ABC, as discussed previously. This suggests that Sri Lankan companies would rather concern themselves with budgeting than costing, being convinced of the importance of planning rather than control of business processes through costing systems. Consistent with this finding Abdel-Kader and Luther (2004) state that in the UK ABB is seen to be noticeably more important and frequently used than ABC, supporting their general finding that ‘budgeting is more valuable than costing’.

Table 5.10 Application of activity-based budgeting (ABB)

Stages	Number of Companies						Percentage
	F&B	CHEM	DVS	MNF	PLT	Total	
ABB has been introduced	4	1	3	6	8	22	52.4
It is intended to introduce ABB	0	0	2	2	0	4	9.5
Some consideration has been given to introduce ABB in future	0	1	0	4	0	5	11.9
A decision has not been taken to introduce ABB	3	0	0	3	0	6	14.3
No discussions so far	1	1	0	3	0	5	11.9
Total	8	3	5	18	8	42	100.0

Methods of forecasting sales

The results show that in forecasting sales almost all companies (95%) always/often use subjective estimates based on managerial experience, and statistical forecasting seems to be at above average (always/often, 64%) level, whereas market research is remarkably low (always/often, 26%), as shown in Table 5.11.

Table 5.11 The pattern of forecasting sales using different methods

Technique	Number of Companies and percentages										Rank
	(a)	%	(b)	%	(c)	%	(d)	%	(e)	%	
Statistical forecasting	15	35.7	12	28.6	4	9.5	2	4.8	9	21.4	2
Market research	6	14.3	5	11.9	18	42.9	3	7.1	10	23.8	3
Subjective estimates-based on staff experience	30	71.4	10	23.8	0	0	1	2.4	1	2.4	1

Notes: 1. (a) Always; (b) Often; (c) Sometimes; (d) Rarely; (e) Never

2. Ranking was based on values obtained by (always*3) + (often*2) + (sometimes * 1)

These findings are consistent with those of Waweru et al. (2005), where 85% of respondents always/often used subjective methods. No-one in the PLT sector in the present study always/often undertakes market research, because they mostly deal with export markets and also they cannot identify their customers in the local market, as they sell their brands to brokers, (e.g., tea brokers, rubber brokers) and then these brokers sell them mainly to buyers in foreign markets, so that market research might not be important in the industry. Instead, 75% of respondents in the sector always/often use statistical methods in forecasting sales, based on production targets estimated by estate managers, as their production is mostly equal to sales volume.

Further, one large company in the DVS sector stated that, as it deals only with the export market (the UK, the USA) for garment products, they have no need to undertake market research with regard to sales forecasts. However, this shows different views in relation to other companies/sectors: for example, a company in the CHEM sector that prepares seasonal budgets due to changes in weather conditions stated that a sister company in the group undertakes market research full time to identify demand for agricultural inputs. Thus, it forecasts sales using statistical forecasts, subjective experience and market research data.

Thus these findings suggest that Sri Lankan companies mostly prefer to use subjective estimates based on experience, probably due to its simplicity, and thus meeting cost/benefit considerations. Also, irrespective of the limited use of statistical methods in South Africa, probably due to their sophistication and associated costs, this study

confirms satisfactory usage of this technique in Sri Lanka. This trend might be due to the solid competition faced by Sri Lankan listed companies both in local and foreign markets. Companies pay less attention to market research, probably due to its inapplicability for some companies because a substantial proportion of total sales deal with the export market (the PLT sector). Moreover, such low attention to market research may be attributed to availability of other sources for them in Sri Lanka to get market information, some of which is publicly available sources.

Bases considered in preparing operational budgets

The results indicate a low application of zero-based budgeting (ZBB) (33%) in Sri Lanka; instead firms mostly use the previous year's actuals (81%) as a base for preparing operational budgets, as shown in Table 5.12.

This is not consistent with MA literature, which indicates a high application of ZBB (58.8%) in South African companies (Waweru et al. 2005). However, Szychta (2002) finds somewhat similar situation to the Sri Lankan context, in that 38% of companies use ZBB in Poland. Further, the moderate level application of Base 3 (52%) may be attributed to the application of ABB and ABC (which also appear at a moderate level) by those companies.

Table 5.12 Bases used in preparing operational budgets

Bases	Number of Companies						
	F&B (8)	CHEM (3)	DVS (5)	MNF (18)	PLT (8)	Total (42)	% (100)
Base 1 - Previous years actuals	8	3	5	13	5	34	80.95
Base 2 – ZBB	2	0	1	7	4	14	33.33
Base 3 - Different activities	5	1	4	7	5	22	52.38

Considering industry sectors, the MNF (39%) and PLT (50%) sectors have shown a higher level of application of ZBB than others. This trend may be attributed to the nature of products these two sectors handle: for example, most companies in the MNF sector manufacture durable products that mostly require ZBB. Also, in agricultural products, the PLT sector usually confronts changes in their production processes and changing weather conditions that require new budgets in a timely manner, and thus the PLT sector might show a greater application of ZBB compared to other sectors.

Most respondents use more than one technique at the same time to ensure the viability of budgets: for example, 15 respondents use Bases 1 and 3, six uses Bases 1 and 2, and two use all Bases at once. Most respondents indicate that normally they also consider the previous year's actuals as a measure of applicability of budgets when in general they use the other two Bases for this function. Compared to other Bases, ZBB requires much more effort and time, so that meeting cost/benefit requirements might be a problem. However, to avoid deficiencies associated with ZBB, some companies use it, combining it with either of the other two Bases: for example, six companies use ZBB with Base 1 and three use ZBB with Base 3, or rarely use both options together with ZBB, as indicated above (two companies). A similar situation (use of ZBB with other Bases) can be seen in the South African companies reported by Waweru et al. (2005). Supportive of this view, Hope and Fraser (1998) also propose a move towards the adoption of ZBB in order to counter the deficiencies of incremental budgets.

Purposes of budgeting

The results indicate moderate/high importance relating to all purposes, as shown in Table 5.13.

Table 5.13 Importance of budgeting pertaining to different purposes

Purposes	Number of Companies & percentages				Rank
	High	%	Moderate	%	
Planning activities	39	92.9	3	7.1	1
Communicating business activities	23	54.8	19	45.2	6
Coordinating activities	34	81.0	8	19.0	2
Allocating resources for day-to-day operations	32	76.2	10	23.8	4
Authorization	22	52.4	20	47.6	7
Control	33	78.6	9	21.4	3
Performance evaluation	29	69.0	13	31.0	5
Motivation	21	50.0	21	50.0	8

Notes: Ranking was based on values obtained by (high*3) + (moderate*2)

It is shown that budgeting seems to be the most important technique for all companies, irrespective of type of industry sector and/or of business, playing the biggest role for planning activities and a slightly lesser role for coordination, control and orderly resource allocation functions. However, the least importance appears for motivation. These findings are somewhat different from those of Waweru et al. (2005), where budgeting plays a much greater role in controlling activities of organizations than in motivating managers, while planning is identified as the second important function.

5.5.2 Standard Costing

All companies in the sample apply standard costing, but its level of application, mode of practices and related purposes may vary, depending mainly on the type of industry sector, the nature of products and processes, and company requirements, policies and purposes. Accordingly, this section focuses on bases considered in setting standards, the frequency of revising standards/standard costs and of analysing variances, the application of the ex-post analysis approach and the importance of standard costing and variance analysis with regard to particular functions and purposes.

Such a 100% application of standard costing may be attributed to the nature of the companies, because all in the sample mainly deal with manufacturing processes, so that necessity of applying standard costing may be higher than for non-manufacturing related firms (such as the services sector). The literature supports this finding: for example, in relation to manufacturing companies, Drury et al. (1993) find 74% in the UK; Horngren, Foster, Datar and Uliana, (1999) find 75% in South Africa; Wijewardena and De Zoysa (1999) find 69% in Australia, but a low usage in Japan, at 31%. However, these findings do not accord with those of Waweru et al. (2005) in finding 36.5% in South Africa. As they pointed out, such a low usage may be attributed to the nature of firms and the country they operate in: their sample consists of manufacturing and non-manufacturing sectors in South Africa, and the rapidly changing economic environment in developing countries may render the use of standards meaningless. Contrary to this observation, this study, investigating a developing country, reports the highest usage level (100%).

Considering bases used for setting standards, the following patterns in the sampled companies are shown in Table 5.14.

The findings suggest that Bases 1 and 2 would be more popular in Sri Lankan companies probably due to their simplicity, availability and low cost than those of Bases 3 and 4. But it reveals that companies that mostly use contract labour (outsourced labour) do not consider past records in setting labour standards. Low attention to engineering studies may be attributed to their complexity and high cost, so that it may be difficult to meet a cost/benefit criterion. Also, some respondents consider other bases, such as labour regulations (labour rates) enacted by the government and exchange rates mostly by those who depend on import/export markets for materials and

sales. It shows high usage of a combination of different bases in setting standards: 33 companies (78.6%) for DM; 29 companies (69%) for DL; and 26 companies (62%) for OH standards. Such a combination may be attributed to the necessity of ensuring sufficient accuracy and completeness of standards set whilst avoiding complexity associated with certain bases such as engineering studies.

Table 5.14 Bases used for setting standards for main cost elements

Cost element	Number of Companies				
	Base 1	Base 2	Base 3	Base 4	Base 5
Direct materials (DM)	30	35	22	5	-
Direct Labour (DL)	32	32	16	11	1
Overheads (OH)	34	31	5	2	1

Notes: **Base 1**-Past records; **Base 2**-Forecasted costs & prices; **Base 3**-Engineering studies;

Base 4-Other bases; **Base 5** -None

Specific situation can be identified in the PLT sector, as all firms use Bases 1, 2, 3 and 4 for DL standards and 87% use Bases 1, 2 and 3 for DM standards. Such a high usage of a combination of different bases may be attributed to difficulty in setting standards in the PLT sector, as they are practising in a frequently changing environment and they have greater involvement of labour in the production processes. However, no-one in other sectors uses all bases at once. Further, most companies used to set OH standards as a percentage of direct costs, considering Base 1 and/or Base 2, predominantly satisfying cost/benefit reflection. In this respect, no specific situation appears among industry sectors.

Findings reveal that respondents normally revise standards when required. For example, a majority in the PLT sector (62.5%) undertake this revision ‘when required’ (probably weekly or bi-weekly), considering frequent changes in the working environment and in the market prices, as an industry involved in manufacturing and selling of agricultural products mainly to export markets.

Considering the frequency of variance analysis, all companies essentially analyse variances on a monthly basis at board meetings and take suitable decisions to improve performance levels in future. In addition, some companies do such analysis either daily or weekly in order to take immediate action to overcome shortages that occur, particularly in manufacturing processes. This shows that frequency of variance analysis

mostly depends on the nature of the products and processes. For example, the PLT sector does this sometimes on a daily or weekly basis to respond to frequent environmental and price changes. Expressing different views, finance manager in the garment industry (DVS) stated that they normally analyses variances monthly; it is very difficult to do this and make changes daily or weekly. Yet they always monitor labour at each stage and inspect the quality of output before going to the next process, right through to the final product. Supporting these findings, Waweru et al. (2005) report 82% and Szychta (2002) reports 89% of respondents analysing variances.

With respect to the ex-post variance analysis approach, the findings show a higher application (74%) in Sri Lankan companies experiencing high usage, particularly in the F&B (100%) and PLT sectors (87.5%) than in other sectors, because these two sectors experience greater changes frequently in the production processes and in the market since they produce consumer food products, beverages and agricultural products. The respondents state that they used to follow this approach in analysing variances because they need to identify controllable factors and take actions accordingly and to evaluate performance precisely.

The findings reveal the importance of standard costing, as shown in Table 5.15.

Table 5.15 Importance of standard costing relating to different purposes

Purposes	Number of Companies			Rank
	High	Moderate	Low	
Planning(setting budgets)	33	9	-	2
Tracing costs to products	34	8	-	1
Controlling costs & day-to-day operations	30	12	-	4
Decision making	31	11	-	3
Evaluating (Managerial) performance	18	24	-	6
Motivating individuals to achieve targets	23	15	4	5

Note: Ranking was based on values obtained by (high*3) + (moderate*2) + (low*1)

The findings reveal that the most important purpose of applying standard costing is in tracing cost to products (81% of companies rated this as high) and slightly less importance in planning, decision making and control. However, low positions are indicated for motivating managers (54.8%) and for evaluating managerial performance

(42.9%), because most companies use their own norms and key performance indicators (KPIs) for these two purposes. No significant differences appear between industry sectors.

5.5.3 Product costing

The findings show that some companies apply a single costing system, while others use more than one, subject to necessity and the nature of business processes, as shown in Table 5.16. Even though ABC and standard costing are considered in this study as separate techniques, these are also analysed in this section as types of product costing systems. Of the sample, 19 companies (45%) used to depend on one costing system – mostly on TCAS (26%, most of them in the MNF sector) and ABC (14%, represented only by the PLT sector). The remaining 5% use batch costing, with two companies from the F&B and MNF sectors. Thus this suggests that companies in Sri Lanka mostly rely on these three MA techniques for product costing purposes.

Table 5.16 Patterns of adopting product costing systems by industry sectors

Industry	Number of Companies											Total
	a	b	c	d	a, b	a, c	a, d	a, b, c	a, b, d	a, c, d	a, b, c, d	
F&B	1	0	1	0	2	2	0	1	0	1	0	8
CHEM	2	0	0	0	1	0	0	0	0	0	0	3
DVS	1	0	0	1*	2	0	0	0	0	0	1	5
MNF	7	0	1	0	2	3	1	2	1	1	0	18
PLT	0	6	0	0	2	0	0	0	0	0	0	8
Total	11	6	2	1	9	5	1	3	1	2	1	42

Notes: 1. (a) - Traditional cost allocation system (TCAS); (b) – ABC; (c) - Batch costing; (d) – Others (Job costing, Process costing, Standard costing)

2. * A company that depends on two other systems: Job costing & Standard costing

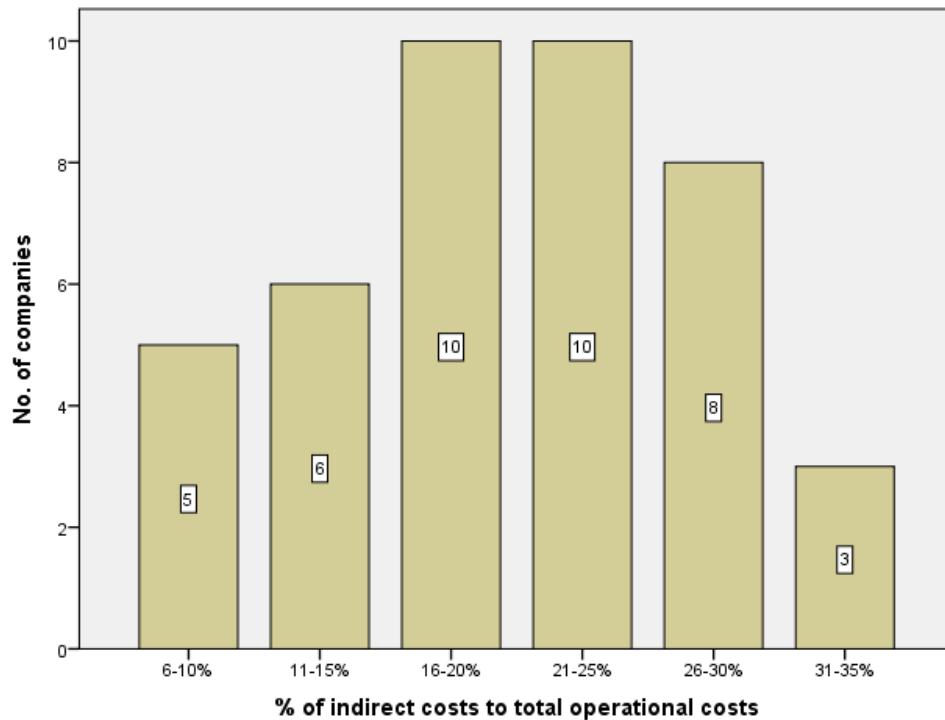
Of the 23 companies (55%) who apply more than one costing system, the most popular pattern is the application of TCAS with ABC, which is common for all sectors, with nine companies (21%), and then batch costing with TCAS (12% or five companies), and combination of these three (TCAS, ABC and batch costing) (7% or three companies). Such a combination may be attributed to sophistication in applying rather complex systems in total (i.e., ABC), the need to ensure accuracy of costs derived through traditional systems, the nature of production processes and sales, and demand for multiple systems (i.e., batch costing, job costing) from diversified product lines. For

example, one multi-national company in the DVS sector applies several costing systems (TCAS, ABC, batch costing and job costing) together, because they have grown steadily, diversifying into a number of areas not only in manufacturing sector but also in the services sector.

In total, the most popular is TCAS (78.5%; 33 companies) and the second place goes to ABC, adopted in 20 companies (48%) and then batch costing (31%; 13 companies). Nine companies (21.5%) do not apply TCAS; this comprises six companies in the PLT sector, which instead apply ABC, one F&B and one MNF, which apply batch costing, and one from the DVS sector that manufactures garments and applies job costing and standard costing together. But there is considerably lower demand for other methods that are practised by only six companies (14%): job costing (1), standard costing (2), job costing and standard costing (1), and process costing (2).

All companies divide costs into fixed and variable costs, consistent with findings reported by Waweru et al. (2005) of 92% in South Africa and by Waweru et al. (2003) of 77% in Kenya. Abdel-Kader and Luther (2004) state that the separation of costs into variable/incremental and fixed/non-incremental is acknowledged as an important task by most of companies in the UK. Relating the approaches followed by Sri Lankan companies to this classification, two approaches seem to be equally important: a) a subjective basis with managerial experience (38%), and b) classifying all overheads as fixed costs and direct costs as variable costs (40%). However, there has been comparatively low application of regression analysis on this classification, not only in this study (no one applies), but also in previous studies by Waweru et al. (2005) (4.2%), Clarke (1994) (1%), and Drury et al. (1993) (2%). Such a low application of regression analysis may be attributed to complexity of the technique and its lesser importance for this function and hence complications in meeting cost/benefit criteria. Moreover, some companies (22%) classify all overheads and labour as fixed costs and material costs as variable, because they identify labour cost as an uncontrollable cost element that specifically relates to permanent workers, in compliance with labour laws and regulations enacted by the government of Sri Lanka. There are no remarkable changes or specific situations identified between industry sectors relating to cost classification. With respect to the proportion of indirect costs to total operational costs of sampled companies, the findings reveal that the percentages range from 6% to 35%, as shown in Figure 5.4.

Figure 5.4 The proportion of indirect costs to total operational costs



However, certain differences between industry sectors appear in these ranges: F&B, 6-35%, CHEM, 11-25%, DVS, 11-35%, MNF, 6-30%, and PLT, 16-30%. Such a low proportion of indirect costs to total operational costs may be attributed to the extensive use of labour-demanding procedures in Sri Lankan companies that are experienced in developing countries, suggesting that this trend may discourage the adoption of complex costing systems like ABC. Nevertheless, regardless of such a low proportion of indirect costs, 48% of the sampled companies apply ABC.

The findings further specify that most companies (64.3%) allocate both direct costs and a proportion of period/overheads to products, and 21.4% companies allocate all costs to products, while six companies (14.3%) assign only direct costs to products (F&B – 2, DVS – 1, MNF – 3). This may be attributed to the high consideration of product costing and of its impact on pricing decisions in companies in Sri Lanka. It otherwise implies that all in the CHEM and PLT sectors, and most companies in other sectors, are undeniably concerned about both direct and indirect costs. This trend suggests that, except for specific circumstance such as prevail in the PLT sector, in general, companies in Sri Lanka have recognized and taken into account the effects of product costing on product pricing.

One in the CHEM sector commented:

Individual product based cost allocation is very difficult due to our large volume of products and ranges. And it is impractical and time wasting to allocate all OHs using different bases. If someone does so, it has no value addition, i.e., allocating service department costs to other service departments. Thus, when processes are going on across divisions they charge OHs to particular divisions/centres at the time the costs incur. Accordingly, we identify all OHs as production OHs and selling OHs. Other OHs such as financial cost, legal costs are allocated among divisions based on budgeted sales.

The findings further reveal that ‘cause and effect’ and ‘fairness and equality’ have become the most popular criteria across all industry sectors is assigning overheads to products. Most companies do not consider ‘ability to bear’ in this respect, because they feel that, as a company competing in the local/foreign markets, ‘no-one is ready to earn profit for others’. Thus only 10% (four companies) often use ‘ability to bear’, with one company in each sector except for F&B. Moreover, in certain instances, they do not worry much about allocating overheads, to the extent that concern on cost/benefit considerations. In this regard, all respondents, when required, use the direct method in allocating service department costs to other service departments. Respondents rated the bases used in allocating overheads to products shown in Table 5.17.

Table 5.17 Bases used in allocating overheads to products

Bases	Number of Companies					Rank
	Always	Often	Sometimes	Rarely	Never	
Machine hours	8	8	1	6	19	3
Direct labour hours	9	10	2	4	17	2
Cost of labour	8	4	2	8	20	5
Cost of materials	8	3	2	8	21	6
Units of production/sales	22	7	1	2	10	1
Cost of activities	6	8	2	6	20	4

Notes: Ranking was based on values obtained by (always*3) + (often*2) + (sometimes * 1)

Considering always/often usage of these bases, the findings suggest a relatively high usage for unit of product/sales (69% of companies) and a low usage for direct labour hours (45%) and machine hours (38%). Comparatively higher usage for labour hours than for machine hours in OH allocation process may justify the application of labour-demanding procedures in Sri Lankan companies in the PLT sector. However,

Wijewardena and De Zoysa (1999) indicate somewhat different situations in Japanese and Australian manufacturing firms, where, despite decreased labour components, they are likely to allocate factory overheads mainly on the basis of direct labour. Further, Waweru et al. (2005) report a widespread use of simple cost allocation methods, regardless of the high proportion of indirect costs that should have resulted in the widespread use of activity-based cost allocation methods.

The findings thus suggest that companies in Sri Lanka still apply such a simple method or bases in assigning overheads to products, rather than using fairly complicated bases, such as cost of activities. Consequently, only 14 companies (33%) always or often use cost of activities as an allocation base, even though 20 companies implement ABC. The main reason is that most (14 of 20) who apply ABC used to depend on more than one system in product costing (Table 5.16), and thus they prefer to use simple bases. However, all in the PLT sector (even if two use ABC with TCAS) always or often use cost of activities for this purpose. Findings, further, suggest that companies would prefer to use quantity/unit based methods, i.e., direct labour hours and machine hours rather than cost based methods, i.e., cost of labour, cost of materials, probably due to their complexity compared to unit-based methods. Nevertheless, the bases chosen by each company basically depend on what is preferable for their own purposes, situations, processes and products.

These findings are inconsistent with those of Waweru et al. (2005), who reveal a high use of cost of activities (45.5%) as a base for allocating indirect costs, suggesting a move towards ABC. However, other findings, such as Horngren et al. (1999), and Haldma and Laats (2002) suggest that many companies still prefer to use simple allocation bases, i.e., direct labour hour and machine hours, rather than other bases. In view of this, it can be suggested that, even though companies in developing countries are adopting ABC, most still prefer to use simple allocation bases such as units of production/sales, direct labour hours and machine hours for product costing, probably because of their appropriateness and simplicity and hence meeting a cost/benefit criterion.

In regard to short-term and long-term decisions, the findings suggest that variable/incremental costs are mostly important in making investment decisions, particularly for existing projects, but total relevant costs (variable and/or fixed costs) are mostly considered for new projects. Also, the types of costs to be considered for

making or buying decisions mainly depend on situations and policies of the company, but more broadly they consider incremental costs associated with further processing of products. Thus, findings of this study support the literature (Waweru et al. 2005, Drury et al. 1993, Szychta 2002) which emphasizes the importance of variable costs for decision making and the irrelevance of fixed costs for short-term decisions.

5.5.4 Activity Based Costing

The survey explored the stages/positions of the responding companies in respect of introduction of ABC. The findings are shown in Table 5.18. The findings show, irrespective of the small proportion of indirect costs (ranging from 6% to 35%), a relatively high level of adoption of ABC (47.6%) in Sri Lankan companies compared to what the literature reveals in relation to developing and developed countries. Moreover, 16.7% of companies intend to introduce ABC in the future. South Africa, for example, shows 32% (Waweru et al. 2005) and 14% (Horngren et al. 1999), the UK 31% (Burns et al. 1999) and 20% (Innes & Mitchell 1995), and India 20% (Joshi 2001). In Australia, however, a low adoption rate of ABC is reported (Chenhall & Langfield-Smith 1998). Sulaiman et al. (2004), however, state that recent surveys have reported increasing use of ABC, particularly in Western enterprises (Scapens 1991); in Asian countries the percentage use of ABC is lower. But Sulaiman et al. (2004) also report that amongst foreign firms and foreign-partnered joint venture firms ABC usage is much higher. The findings of the present study, in contrast, reveal different views on adoption of ABC by foreign companies (multinational companies) as they tend to adopt both TCAS and ABC together.

Table 5.18 Stages/positions towards adoption of ABC (by industry sector)

Stages/ positions	Number of Companies					Total number of Companies	%
	F&B	CHEM	DVS	MNF	PLT		
No discussion on ABC	4	1	0	7	0	12	28.6
Decision not to introduce ABC	0	0	0	0	0	0	0
Intend to introduce ABC	1	0	1	5	0	7	16.7
Some consideration given	0	1	1	1	0	3	7.1
ABC has been introduced	3	1	3	5	8	20	47.6
Total	8	3	5	18	8	42	100

The findings illustrate a tendency towards adoption of ABB rather than ABC in Sri Lankan companies. In addition, some consideration has been given to introducing ABB and ABC by another five companies (11.9%) and three companies (9.5%), respectively, which indicate more interest in ABB than in ABC at this stage. This suggests that Sri Lankan companies are more concerned about budgeting than costing, which argues for the importance of planning rather than control of business processes through costing systems. Abdel-Kader and Luther (2004) indicate that all companies which reported high level of usage for ABC did the same for ABB, assuming that companies start implementing ABC and then they use the activities analysis performed during ABC implementation to prepare their budgets. However, supporting the findings of this study, they also conclude that budgeting is more valuable than costing, considering the relative importance and use of ABB and ABC as it appeared in UK companies.

Concentrating on the relationship between industry sector and adoption of ABC, Fisher's exact test shows that there is a significant relationship between these two (significant at 97.4% confidence level ($P = 0.026$)). The findings show a substantial relationship between the PLT sector and adoption of ABC as all in the sector have implemented ABC, even though other sectors report a rather low level of application of ABC: F & B, 37.5%, CHEM, 33.3%, DVS, 60%, and MNF, 27.5%. Therefore, an explicit situation can be seen in the PLT sector because all firms use ABC in a specific manner, arising from the sector's colonial history, according to executives of the companies. An executive (DGM Finance) of a leading company in the PLT sector stated his views and experience on the application of ABC:

The origin and evolution of PLT sector came from British rule, as Sri Lanka (called Ceylon in that period) had been under British rule in the period 1796-1948. They initially structured and managed the PLT sector that had become the main component of the economy of Ceylon in that period, in their own systems, policies, procedures and techniques. We believe that, from the colonial stage under British rule from 1796, the PLT sector might have applied ABC concepts in their accounting systems. As a result, at present, the whole PLT sector inevitably applies ABC in a way specific to that particular sector. Also, by viewing this accounting system, as executives of the plantation industry we strongly believe that ABC precisely matches this sector in managing all activities in an efficient manner, particularly relating to the manufacturing process sited in various

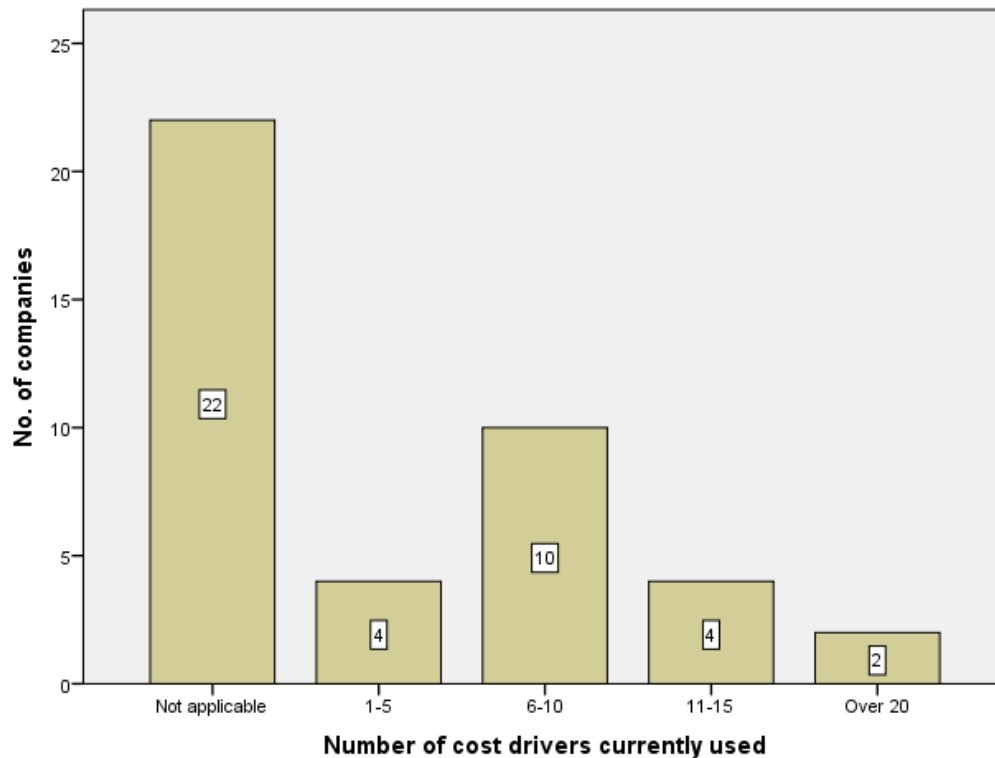
geographical areas called 'estates'. Moreover, we experienced that recruiting people to the finance division as accountants or finance executives is somewhat difficult, as they assume that, unlike the ABC systems normally practised by other industry sectors, this ABC system is a very complex system, implemented in a specific manner to that particular sector.

Moreover, there is no significant relationship between the age of the companies and adoption of ABC, as Fisher's exact test shows a 3.3% confidence level ($P = 0.967$). Using Chi-square tests in relation to South African studies, Waweru et al. (2005) report that there was no significant relationship between adoption of ABC and industry sectors or age of the companies, although the relationship between industry sector and adoption of ABC is significant at the 90% confidence level ($P = 0.1$).

Fisher's exact test shows a significant relationship between size of companies and adoption of ABC, with a 97.2% confidence level ($P = 0.028$) in this study, with adoption of ABC occurring in far more large than medium-size companies. Out of 20 companies that implemented ABC, 90% (18 companies) were large and 10% (two companies) were medium size. These findings are broadly consistent with those of Waweru et al. (2005), who recognize a significant relationship, with large companies being far more inclined to use ABC. Innes and Mitchell (1995) report similar findings based on a study in the UK. This trend of adopting ABC mostly by large companies may be attributed to their high demand for such modern MA techniques to provide more accurate cost information relating to their large-scale operations, the necessity to adopt such a sophisticated costing system in order to handle rather diversified product lines with large volume of outputs, and their strengths and capability to invest more resources to develop advanced MA systems in order to obtain more useful more accurate cost information that can better respond to their decision making processes.

The number of cost drivers used by responding companies varies, as shown in Figure 5.5. There are between six and ten cost drivers in 50% of firms (10 companies) and none in the range of 16 to 20, while 10% (two PLT companies) apply more than 20 cost drivers. Such a large number of cost drivers appear in the PLT sector probably because of the inherent nature of the production processes spread across separate geographical areas (estates).

Figure 5.5 Number of cost drivers used in ABC systems



However, Waweru et al. (2005) reveal that, overall, 87% of the ABC adopters in South Africa experience between 6 and 20 cost drivers, which appears, in the present study, as 70% of ABC adopters in that range. Waweru et al. (2005) further suggest that the increase in cost drivers beyond 20 may be considered dysfunctional, since it may lead to the system becoming more complicated and, as a result, the cost of using the system may not meet the cost/benefit requirement. Cooper and Kaplan (1999) argue that, where the primary focus of the ABC system is to estimate product and customer costs, 10 to 30 cost drivers would be adequate. Contrary to these arguments, in this study those who adopt more than 20 cost drivers emphasize that they are operating well and satisfying their information needs more efficiently with their ABC system.

For example, a DGM Finance of a leading company in the PLT sector commented that it has been implementing the ABC system efficiently with a large number of cost drivers (more than 100), providing the most appropriate cost information on time to make sound decisions relating to all estates located in various geographical areas. He further stated that the management of the company is very satisfied with this system

because it supports the firm’s survival in both local and foreign markets as large leading company in the sector.

The findings reveal there are influencing factors for not adopting ABC in the remaining 22 companies, as depicted in Table 5.19.

Table 5.19 The influencing factors for not adopting ABC by Sri Lankan companies

Factors	Number of Companies					Rank
	High	Moderate	Low	Unimportant	Total	
More complex and costly	3	4	2	13	22	3
Lack of resources	-	-	5	17	22	5
Lack of trained staff	-	2	5	15	22	4
Prefer to apply simple methods	6	5	3	8	22	2
Management is satisfied with existing costing system	22	-	-	-	22	1

Notes: Ranking was based on values obtained by (high*3) + (moderate*2) + (low*1)

Accordingly, the most reliable possible factor underlying this is that they all entirely (100%) satisfied with the existing costing system: 86% (19 companies) with TCAS (11 companies with only TCAS, five with TCAS and batch costing, and three with TCAS, batch costing and/or other systems); and 14% (three companies) are satisfied with batch costing alone (two companies) and with job costing together with process costing (one company) as detailed in Table 5.16. Another important factor is that they prefer to apply simple methods, which was rated as high/moderate by 50% of the group. This further confirms that listed companies in Sri Lanka are functioning with sound resources, including talented staff and competing in local and possibly in foreign markets, so that it is unlikely that they would have faced lack of resources or trained staff in this regard.

Moreover, this issue is not relevant for the whole PLT sector. In the other sectors, no specific situations or considerations appear in this regard. Thus, the findings suggest that, even though Sri Lanka listed companies are functioning with sufficient resources and well-equipped staff required in adopting ABC systems, some still see no need to adopt ABC because they are satisfied with their existing costing systems. This further suggests that listed companies in Sri Lanka are functioning well by applying any of most appropriate costing system/s (either ABC or traditional costing systems) that are mostly compatible with their own purposes, product lines, associated processes and structures, and the needs of the company.

5.5.5 Product Pricing Methods

The findings show that the most commonly used method in Sri Lankan companies for product pricing is the price based on market prices of competitors (23.8%, 10 companies) and marginally low applications appear for 'total unit cost plus% mark-up', which considered both manufacturing and non-manufacturing cost (21.4% or nine companies) and for 'direct cost plus a mark-up' (19%, or eight companies). The lowest application is for 'target pricing' (4.8%, or two companies), which is the value target customers are willing to pay, whilst 'total manufacturing cost plus mark-up' is the second lowest (11.9%, five companies). A specific situation appears with respect to other methods (19%, eight companies) applied by all in the PLT sector, because, as discussed previously, that whole sector has to adopt prices for their products from auctions based on demand and supply. Companies in the PLT sector act as price takers not as price makers.

Fisher's exact test provides further evidence that there is a significant relationship between the respondents who apply different pricing methods and their industry sector, showing a 100% confidence level ($P = 0.00$). For example, the whole PLT sector applies another method (prices based on demand and supply at auctions); the MNF sector mostly applies direct cost plus mark-up (33.3%) and the price based on market price (33.3%), and the remaining 33.3% use equally two other costs plus methods; the F&B sector applies all methods, while CHEM sector uses only total unit costs plus (66.6%) and market price (33.3%); the DVS sector uses all methods except for direct cost plus (40% -market price and 20% each for the other three methods).

The findings are to some extent consistent with previous findings: Waweru et al. (2005) report that the most common pricing method in South Africa was 'cost-plus' (53.2%) and least important one target pricing (10.6%); Horngren et al. (1999) report that full product cost-based methods were considered most important in South African firms; Drury (2000) found that 60% of companies in the UK applied cost plus pricing methods, whereas there was low usage (15%) for marginal pricing; and Waweru et al. (2003) state that 49% of companies in Kenya applied cost plus methods. Thus, this suggests that cost plus/full cost plus is more used than the direct cost plus method.

Moreover, the findings stress the necessity of carefully considering market prices by companies, whatever methods they apply for product pricing, because is most important

for them in competing in the market. Thus, apart from the 10 companies who apply 'market prices' as the base for pricing and the whole PLT sector (eight companies), 58.3% (14 of 24 companies) also consider market prices so that they can make adjustments, where necessary, to predetermined prices, making it possible to compete. Supporting this view, Waweru et al. (2005) report that 48.1% of respondents compared product costs with market-determined selling prices for major products to ensure the ability to competing in the market.

By appraising experiences of sampled companies in relation to different circumstances, this study finds that choosing pricing methods mostly depends on factors other than company policies, so that it is more meaningful, rather than an absolute comparison of different methods, to consider influencing factors behind decisions. Thus, the study suggests that selecting a pricing method is a crucial matter for any company because it mostly depends on factors such as nature of products, competitive position in each product and length of production, target customers/buyers, and other specific situations with respect to the industry sector.

Accordingly, the findings suggest that, if a company deals with consumer products in highly competitive markets, direct costs plus mark-up is preferable for keeping in line with relative market prices, and for unique products (garments, furniture), mostly full cost plus mark-up is used, with low attention to the market where there are no similar products or of the same quality. Moreover, if a company deals with regular buyers for certain products, such as, industrial products, it might be more likely to select full cost plus methods, because it has built links with buyers and thus faces less market competition. However, if it provides the same product to the market with competitive brands, it must concern itself with market prices and then adopt a suitable cost plus method compatible with those prices.

Further, this suggests that, if a company is the market leader for certain products, either consumer or durable products, it can select cost plus methods as it wishes. If it is not the market leader for such products, then it is better to select a pricing method compatible with relative market prices and keep a margin accordingly. Further, if a company considers its existing products, it is enough to take into account only the manufacturing costs, but it is essential for new products to consider both manufacturing and non-manufacturing costs in order to determine whether they are profitable or not. A different argument was presented by another executive: 'it is unfair to consider OHs of new

products for pricing decisions, as they contain high OHs against the low sales volume at the initial stage, and thus with OHs it is very difficult to compete in the market at this stage'. In special situations, where buying and selling take place between two parties, such as between a subsidiary and head office by agreement, then selection of pricing methods should be in accordance with those particular requirements and situations. It may be full costs plus or market-based price or imported market-based price or any specific price agreed by both parties.

In view of the nature of products, this suggest that direct cost plus is more suitable for consumer products and full costs plus is preferable for durable products when also considering a cost/benefit criterion. For diversified companies operating with a number of different brands and product lines, it is rather difficult to operate with a single pricing method; instead, different pricing methods may be more appropriate to apply, focusing on specific circumstances. Moreover, in specific circumstances prevailing in a particular industry sector, such as the PLT sector, there is no point in discussing pricing methods at all, but in normal situations a company can select the most appropriate pricing method/methods after considering all factors affecting their situation and decisions.

Pricing policy objectives

Pricing policy objectives of responding companies are indicated in Table 5.20.

Table 5.20 Pricing policy objectives of listed companies in Sri Lanka

Objectives	Number of Companies				Rank
	High	Moderate	Low	Unimportant	
Maximize sales	23	11	-	8	2
Maximize profits	26	8	-	8	1
Increase market share	20	11	3	8	3
Offer lowest market price	2	12	10	18	6
Serve a given market segment	8	11	11	12	5
Market penetration	6	15	7	14	4

Notes: Ranking was based on values obtained by (high*3) + (moderate*2) + (low*1)

The findings show that maximizing profits, maximizing sales and increasing market share are more important than other objectives for all companies, irrespective of their industry sector, except for the PLT sector. The most surprising finding is that the whole PLT sector considers all the pricing objectives listed here as unimportant, because pricing decisions are beyond the control of an individual company. Consistent with the

views of Waweru et al. (2005), these findings confirm the theory that profit maximization is still considered the main goal of a business firm. In the PLT sector, low attention to 'market penetration' would occur because those companies have already become market leaders and/or are dealing only with export markets. Some companies consider 'market penetration' as high/moderate, probably due to their high competitiveness and/or low market position. Moreover, the lowest consideration on 'offer lowest market price' is due to their strength and express intention as listed companies to compete in the market with competitive prices and high quality products. Considering the objective 'serve a given market segment', 87.5% of the F&B sector indicated this as high/moderately important, probably because of the nature of products. For example, in a large beverage company, there were several product categories with distinct price differences focusing on specific group of customers. The finance executive of the company stated that it always closely consider this objective in pricing decisions because it could identify specific groups of customers with different sensitivity and different income levels.

5.5.6 Target Costing

Contrary to the low application found in the literature in the case of developing countries, and sometimes developed countries, the findings show a rather high application of target costing rating 'often/always' by 45% (19 companies) and 'sometimes' by 17% (7 companies), whereas 38% (16 companies) never/rarely apply it. Waweru et al. (2005) reported 6.4% in South Africa, Drury et al. (1993) 26% in the UK, and Chenhall and Smith (1998) 38% in Australia. In contrast, Sakurai (1989) and Larino (1995) report that 79% of responding companies used target costing in Japan.

In this study, Fisher's exact test show that there is a significant relationship between responding companies who applied target costing and their industry sector, showing a 100% confidence level ($P = 0.00$), because, unlike other sectors, the whole PLT sector does not apply target costing, mainly due to the specific nature of price determination and regular fluctuations of those prices, and also its inability to make adjustment to cost of production because agricultural products such as tea and rubber, on which weather changes may have a significant impact on product cost: all these appear uncontrollable that are most persuasive factors in target costing.

In applying target costing, the CHEM sector reports 100% always/often; DVS reports 80% always/often and 20% sometimes; the F&B sector reports 62.5% often/always and 12.5% sometimes. Apart from the PLT sector, the lowest application (67%) appears in the MNF sector (39% always/often, 28% sometimes). Some respondents state that they sometimes adopt target costing for certain products depending on its practicability for their diversified product lines in operation, suggesting that it is not practical to apply target costing for all product lines in a similar manner; instead, applicability of target costing typically depends on the nature of products and their market positions.

Finance manager of one company in F&B sector stated:

we apply target costing and use target price in pricing our products, so that sometimes it may contain a higher margin and other times lower margin; however, we do not keep any product without a margin.

Consistent with the findings of Wijewardena and De Zoysa (1999) on MA practices of large manufacturing companies in Japan, these findings identify that, as for the manufacturing stage, Sri Lankan companies devote considerable attention to cost planning and cost reduction tools through the application of target costing.

Finance manager of one company dealing with durable products in the MNF sector stated:

We apply target costing based on imported market prices, as we have to sell our products to the head office of the group who import the same products with imported brands and sell them together with our brands in the same markets. So, we are operating in the highly competitive market with other local and imported brands, but we are still in the market successfully competing with such imported brands.

Thus, the findings suggest that target costing is more appropriate for products with competitive markets, as it seems to be very important in keeping aligned product prices with market prices and accompanying quality of products in order to survive in the market. Supporting this view, Sulaiman et al. (2004), in a literature review, report that target costing is said to provide companies with a competitive edge because it provides continuous improvement both at the design and production stages. Moreover, this suggests that, as far as the nature of products and cost/benefit criterion are concerned,

target costing is more appropriate to apply for durable products with competitive markets and for particular product categories, such as certain brands of beverages aimed at specific target group of customers, than would be the case for consumer products such as food products.

5.5.7 Kaizen Costing

The findings show that 62% (36%-often/always and 26% sometimes) of companies adopt Kaizen costing. However there is greater interest in the MNF sector in adopting the technique by 78% of companies, as most are involved in durable products like refrigerators and washing machines, which may require thorough inspection and modification throughout the process, demanding application of Kaizen costing, in order to maintain the quality of output, enabling firms to compete in the markets. The high application in the PLT sector (63%) is probably because firms often deal with international markets where excellent quality is very important. In contrast, the lowest application (33%) is in the CHEM sector, while moderate application appears in both the F&B and DVS sectors. Fisher's exact test reveals no significant relationship between industry sector and adoption of Kaizen costing, but the relationship is significant at a 91.4% confidence level ($P = 0.086$).

Therefore, the findings suggest that, as for target costing, the application of Kaizen costing mostly depends on the nature of products and their market position, and more on durable products rather than consumer products, and products dealt with in foreign markets rather than local markets. However, this does not mean that other companies competing in local markets and manufacturing consumer products have no need to apply Kaizen costing; such companies may also require Kaizen costing in order to get a better quality outcome and hence high customer satisfaction whilst minimizing resources consumed in the process (as in the case of beverages). One large leading company in manufacturing beverages of high quality with a worldwide brand reputation stated that it essentially follows concepts of Kaizen costing at each stage of the production process because of deep concern about the premier quality of output.

5.5.8 Transfer Pricing

The adoption of TP by industry sectors is shown in Table 5.21. The findings show that overall 73.8% companies are practising TP, even though there are differences with respect to each sector, which is consistent with Waweru et al.'s (2005) 67% in South

Africa. Unlike other MA techniques, the necessity, nature and level of practising TP may vary not only among business firms but also across industry sectors, depending on various factors as illustrated in section 5.4.2 above.

Table 5.21 Practice of transfer pricing across industry sectors

Industry sector	Number of Companies		Total
	Yes	No	
F&B	4	4	8
CHEM	3	0	3
DVS	4	1	5
MNF	12	6	18
PLT	8	0	8
Total	31	11	42

The most influencing factor for practising TP by all in the PLT sector is the nature and location of their production processes, because there are some estates in each company functioning with a lack of facilities, i.e., factories required to process tea but essentially dependent on other estates having those facilities by transferring intermediate products or raw tea leaves from one estate to another, and functioning as SBUs in a company.

In regard to TP policies, 20 companies use one method while 11 others use more than one method, particularly in situations where they are dealing with a variety of products and/or with different divisions/subsidiaries. Accordingly, the most common pricing policy is the ‘market price’, applied by 54.8% (18 companies) and slightly lower application for total ‘cost plus mark-up’ (45%) and ‘negotiated price’ (25.8%); least usage is for ‘total cost of production’ (12.9%). This further shows that no-one applies ‘direct cost of production’ and ‘direct cost plus mark-up’ in any circumstance. These findings are consistent with those of Vally (1998), who identified the market price as the most important method in South Africa. These findings are not in line with those of Waweru et al. (2005), who recognized the cost plus method as the most important method in South Africa, or those of Horngren et al. (1999), who reported the cost plus method as the most widely adopted method. However, the findings of this study confirm that the method/methods chosen for TP depend on factors such as the nature of products and situations/associated parties with whom transactions are made, and thus TP policies are set accordingly.

For example, considering the nature of products and processes, all in the PLT sector essentially apply the market price. Thus, the buying estate has no advantage with prices but as a company policy they all practise it, gaining advantages in utilizing factory capacity and other resources to the maximum. Also, one consumer food products company in the F&B sector applies two methods: 'total cost per unit' for products transferred from one division to another for further processing, and 'negotiated price' for products transferred to a distributing company (another subsidiary in the group).

The findings reveal that some companies practise TP with one purpose (45%, 14 companies) while others have multiple purposes. Considering both groups, they mostly use TP for motivating divisional managers to make sound decisions and for evaluating managerial and divisional performance. The other two purposes, 'moving profit between divisions and locations' and 'ensuring divisional autonomy', are considered by 22.6% and 32.3% of companies, respectively. Moreover, four companies specify other purposes, such as minimizing the tax burden, tax planning, and obtaining advantages of bulk purchasing. For example, one F&B Company normally purchases some items (as bulk purchasing) from the outside market at a discount price and transfers them to subsidiaries at market price, gaining advantages of bulk purchasing for the company.

The findings show that 64.5% (20 companies) are allowed to sell/buy products from outside the group that can normally be sold/obtained within the group and 75% of them (15 companies out of 20) require approval from head office. These findings suggest that listed companies are still experiencing TP with a low level of decentralized decision making power in Sri Lanka.

5.5.9 Performance Evaluation

The findings show that all companies practise managerial PE, while 39 adopt divisional PE. With regard to bases used in identifying divisions for PE purposes, 62% of respondents normally use more than one and the rest use only one base. Considering both categories, the most widely used base is nature of products (73.8%), and a slightly lower usage for 'functions' (69%), which is mostly used as a base for managerial PE, while the nature of markets served is the least important (9.5%) and the geographical area is the second lowest base (40.5%). These findings suggest that the most commonly used base is the nature of products in recognizing divisions, probably due to its appropriateness for PE purposes, not only in Sri Lanka but also in other developing and

developed countries i.e., in the UK, 78% (Drury et al., 1993), and in South Africa, 67.3% (Waweru et al., 2005), because, by their nature, there are certain differences between the products in a company in terms of processes, procedures and resources required and the profit margin, so that this base can easily be adopted for PE purposes as more straightforward and objective. Also, through this base, companies can easily identify profitable products with high and low margins and unprofitable products and take action accordingly.

The results of Fisher’s exact test shows a significant relationship between the bases used in recognizing divisions for PE and the associated industry with a 100% confidence level ($P = 0.01$). The PLT sector displays specific circumstances by all companies (100%) adopting ‘geographical area’ as a base due to their nature of operations spread across several estates. In addition, most of the F&B sector (five of eight companies) use geographical area as a base because they mostly function with branches/sales outlets spread through different areas across the country.

In regard to PE measures, Sri Lankan companies normally use more than one measure in both types of PE, as shown in Table 5.22. On inspection, the findings reveal that the importance of each measure appears in a same manner, suggesting sales volume as the most important measure for both types of PE, followed closely by divisional net profit before taxes, and then CM. However, except for EVA, which is the lowest important measure, ROL and ROS are also considered relatively low important measures compared to others.

Table 5.22 Importance of performance measures for divisional & managerial PE

PE measures	Number of Companies								Rank	
	High		Moderate		Low		Unimportant*			
	a	b	a	b	a	b	A	b	a	B
Return on investment (ROI)	14	12	8	6	4	7	16	17	5	5
Return on sales (ROS)	17	13	6	9	7	6	12	14	4	4
Economic value added (EVA)	-	-	7	6	9	12	26	24	6	6
Contribution margin (CM)	20	21	8	8	2	2	12	11	3	3
Divisional net profit before taxes	27	26	3	2	1	-	11	14	2	2
Sales volume	27	29	6	7	-	-	9	6	1	1

Notes: 1. * ‘Unimportant’ represents three companies who do not practise divisional PE and others who practise them but the measure/s appears unimportant for them, probably due to applying their own KPIs.

2. (a) -divisional PE; (b) -managerial PE

3. Ranking was based on values obtained by $(high*3) + (moderate*2) + (low*1)$

These findings are in line with the literature that advocates the application of divisional contribution as the best measure for divisional PE (Waweru et al. 2005; Drury & Tayles 1997; Drury 2000). Sales volume which is the most important measure of PE of this study can be considered as the real causal factor/measure for such divisional contribution.

Some companies typically use their own KPIs mainly for managerial PE and to some extent for divisional PE, rather than the above commonly used measures. Those KPIs mostly relate to non-financial measures, while common measures mostly consist of financial measures. They emphasize that these KPIs are appropriate for this task because they are set largely considering structure and the extent of duties of managers and the nature and range of tasks to be performed in each division/function. Thus, the KPIs may differ position to position and division to division, depending mainly on the factors above. Moreover, as and when required, they also consider competitors' KPIs, if applicable and available for them. Examples of KPIs are: number of orders not handed over to the sales department within 10 minutes of receipt, number of shipments not cleaned within the free period, number of quality defects in processes and in transactions (sales), information security, and new projects. The most influential factor for adopting such specific KPIs is the impossibility of adopting common measures for all divisions/managers. For example, some measures relate only to profit centres or revenue centres; some are only for investment centres. Moreover, they wish to apply the most suitable measures that precisely reflect the real performance of managers/divisions and comply with competitors' measures, and hence address competitiveness prevailing in the industry and sometimes within the group.

Also, the findings indicate that respondents always adhere to the controllability principle when determining divisional contribution, consistent with the literature that managerial performance should only be measured by considering what is within the managers' control (Atkinson et al. 1997). The findings further detect that internal transactions made under TP do not have any great impact on the performance of both parties, the buying and supplying divisions, mainly due to the TP policies implemented.

The findings reveal that almost all respondents normally evaluate divisional (100%) and managerial (93%) performance by comparing actual performance with budgeted outcome and sometimes with other managers in the company/group/similar companies in the industry, and, where applicable, with their own KPIs. However, in both aspects of

PE, some companies use more than one method at a time to compare performance. Thus, this suggests that the companies in Sri Lanka are practising both divisional PE and managerial PE, largely depending on measures that reflect divisional contribution, compatible with the controllability principle and achievement of budgeted outcome.

These findings suggest the soundness of using budget target/budgeted outcome for both divisional and managerial PE, because budgets by their nature present the outcome/performance level that should be expected from each division/manager in a situation where operations take place in prescribed circumstances, so that it precisely matches with the period concerned, the nature of the operations of divisions, and the extent and difficulty of tasks assigned to each divisional manager, all of which encourage the company and respective managers to have fair and accurate PE. This further suggests that Sri Lankan companies are practising PE to accomplish several purposes rather than one; however, they initially expect to take control actions through the process of evaluating and rewarding managers and motivating them to obtain a higher performance for their respective divisions and ultimately for the company as a whole.

5.5.10 Balanced Scorecard

Despite the low level of application of BSC found in some of the literature relating to developing countries (21.2% in South Africa (Waweru et al. 2005); 13% in Malaysia; and 40% in India (Sulaiman et al. 2002), this study finds a high level of application of BSC with respect to PE (64.3% or 27 companies). Supporting these findings, Burns et al. (1999) indicate that 60% of companies in the UK used non-financial measures, and Hoque and James (2000) reveal that, in Australian manufacturing firms, there is a significant level of practice of BSC approaches (perspectives). Also, Horngren et al. (1999) find extensive use of non-financial measures of performance in South African firms.

The findings indicate that 16 companies practise BSC 'as a model' and the rest (11 companies) 'not as a model'; there is a greater tendency towards adopting BSC in large companies than medium-size companies, as illustrated in Table 5.23. Supporting these findings Hoque and James (2000) find a positive relationship between the size of companies and BSC usage: the bigger the company, the more practical it is to use BSC to support its strategic decision making. In this present study, one large beverage

company stated that it applies BSC as a different model specific to its own businesses. Also, a large diversified company in the DVS sector stated that it applies BSC with greater attention for all perspectives as a multi-national company.

Fisher's exact test shows that there is no significant relationship between adoption of BSC and industry sectors (P value = 0.751), as there seems to be slight differences across industry sectors in adopting BSC: in DVS 80%, in F&B 75%, in PLT 62.5%, in MNF 61%, and in CHEM 33%.

Table 5.23 Comparison of practices of BSC in large and medium-size companies

Size	Yes (Number of Companies)		No (Number of Companies)	Total
	As a model	Not as a model		
Large	12	10	9	31
Medium	4	1	6	11
Total	16	11	15	42

Considering four perspectives of the BSC, these findings show the highest interest in financial perspectives and slightly lower in customer perspectives and business process perspectives, while the lowest attention is in the learning and growth perspective. Waweru et al. (2005) indicate exactly the similar ranking with respect to the importance of these four perspectives, suggesting that, as recent empirical evidence reveals (Ittner et al. 1997; Hoque and James 2000; Hoque et al.2001), the financial perspective remains the dominant measure of performance in companies world-wide.

The findings further show that overall Sri Lankan companies still pay lower attention to modifying the BSC in order to cater for EM issues (33%, 9 companies), but the PLT sector has already paid great attention to this aspect and there are moderate views in the F&B sector, while other sectors indicate the lowest attention, as shown in Table 5.24.

Table 5.24 The adoption of the BSC and its modifications for addressing EM issues

Industry Sector	Adoption of BSC (Number of Companies)			If Yes, modifications to the BSC for addressing EM issues (Number of Companies)		
	Yes	No	Total	Yes	No	Total
F&B	6	2	8	2	4	6
CHEM	1	2	3	1	0	1
DVS	4	1	5	1	3	4
MNF	11	7	18	1	10	11
PLT	5	3	8	4	1	5
Total	27	15	42	9	18	27

Moreover, four companies in the MNF sector are planning to attend to this modification of the BSC in the near future, as they have realised the importance of this aspect too.

Accordingly, these findings suggest that the tendency of Sri Lankan companies to adopt their own KPIs that are mostly applicable for PE purposes, because they precisely match with specific characteristics of individual companies, which encourages the high application of the BSC for PE. It further suggests that Sri Lankan listed companies tend to focus more on financial consequences of operations whilst satisfying customer needs through the process of PE rather than on future growth through leaning. Yet the findings demonstrate the least importance accorded training and learning purposes of PE (20%).

5.5.11 Benchmarking

The findings reveal that Sri Lankan companies practise BM at above-average level, with a slightly higher adoption for internal BM rating ‘often/always use’ by 66.7% (28 companies) than for external BM rating ‘often/always use’ by 52.4% (22 companies). In regard to internal BM, the findings suggest that companies tend to demonstrate best practices by certain division/s or by individuals/groups of persons in both manufacturing and non-manufacturing activities to all others in the company and motivate them to adopt those best practices for their own processes for higher performance. The findings further confirm that companies can typically recognize such best practices at monthly meetings through discussions on the progress of each division and influential factors.

This also suggests that companies who deal with export markets tend to adopt external BM by reviewing best practices that can be found among competitors in local and

foreign markets, as they realized that otherwise they cannot survive in such highly competitive international markets. For example, companies in the PLT sector (50% 'often/always' and another 50% 'sometimes' use external BM) continuously address best practices of competitors in local and foreign markets and they all (100%) 'often/always' concentrate on internal BM, too, in order to compete in foreign markets. Also, companies, particularly in the growing stage or newly established companies are stimulated by their competitive markets to find the best practices followed by leading companies towards improving quality of products and processes while maintaining satisfactory margins.

5.5.12 JIT Systems

Unlike other MA techniques surveyed, all respondents say that they do not adopt JIT mainly because of its inadaptability to their manufacturing processes and because of problems with delivery processes and with suppliers experienced in Sri Lanka. This suggests that Sri Lankan companies do not need to adopt JIT, as its drawbacks might outweigh benefits, and as they ensure the soundness of their existing operational cycle without applying JIT. Moreover, findings confirm that, even though they are not adopting JIT, as listed companies competing in both local and foreign markets they are all satisfied with current systems and procedures followed in handling all inventories in their business processes.

5.6 Summary

In regard to RQ I, on understanding the nature and specific characteristics of the sampled companies, this chapter demonstrated the extent of MA practices considered. Then it descriptively analysed and presented the findings pertaining to the nature of MA practices, focusing on selected traditional and modern MA techniques and comparing them, where necessary, across industry sectors/individual companies and also with previous findings in the literature.

Overall, all listed companies in the sample practised both traditional and modern MA techniques (except for JIT) simultaneously, but they focused more on traditional MA techniques (94% of companies) than modern MA techniques (57%). Of five sectors, the PLT sector superficially revealed specific circumstances in this investigation. With detailed analysis of each MA technique, the findings showed that Sri Lankan companies

practise all techniques considered, except for JIT, at a satisfactory level, but it identifies certain differences and specific situations across sectors and sometimes between individual companies in view of the nature and extent of application of these MA techniques. This, however, shows that such companies have been adopting them appropriately in accordance with their own requirements, the situations they face in the industry and the market, and hence in most instances they reach the intended outcome.

Compared to traditional MA practices that show SD of 0.064 and CV of 6.961, there are dissimilarities or high variations on the level of application of modern MA techniques that show SD of 0.174 and CV of 31.812, not only between techniques but also between companies and industry sectors. The findings suggest that traditional MA techniques are still popular among all Sri Lankan companies, irrespective of their sector or nature of business, probably due to their necessity, relevance, lower cost and simplicity, in apply them to any type of business, rather than modern MA techniques. Even though Sri Lankan listed companies are functioning with sufficient resources and well-equipped staff that require adoption of modern MA techniques (ABC, BSC), most reveal that they still see no need to adopt such techniques because they are satisfied with existing systems and applications. Compared to the literature related to other developing and developed countries, overall MA practices of Sri Lankan companies seems, in some aspects, at a high level in both traditional and modern techniques, and sometimes they show a lower level than others. Moreover, the findings sometimes support the literature, but also there can be contradictions in some aspects of MA practices.

The next chapter analyses and discusses the environmental considerations of listed companies by integrating MA practices and EM issues, with a view to answering the remaining research questions, RQs II to VI.

Chapter 6 Analysis and Discussion II - The Involvement of Management Accounting Practices in Responding to Environmental Management Issues

6.1 Introduction

In responding to the first part of the primary research question, and specifically RQ I, a discussion on the nature and extent of MA practices was undertaken. This chapter therefore focuses on the second part of the primary research question, covering RQs II to VI, to explore how and to what extent Sri Lankan businesses identify and respond to EM issues through their MA practices. Thus this chapter is more qualitative and descriptive.

In regard to organisational efforts to track and resolve EM issues, all companies use both MA and FA systems, mostly integrating them at certain levels. As a result of this combination, and of not applying the EMA system, they often consider more than one option, making a simple or considerable adjustment to existing FA/MA systems (Table 6.1), which were designed to focus on routine business activities and not on environmental costs (RQ II, first part). Then, considering motivations to take EM initiatives, the chapter identifies three leading factors: environmental legislation, create a good image for the company and sustainability of the business (Table 6.2) (second part of RQ II).

Overall, all steps in the business process (Table 6.3) have a certain level of environmental impact being illustrating higher impact on to project appraisal, product design and production process than other stages (RQ III). The results (Table 6.3) reveal that all responding companies typically pay attention to EM measures in each stage and take actions in complying with environmental legislation such as the NEA, labour laws, BOI regulations and EMS standards, in addition to applying novel EM strategies and initiatives developed by the public sector through the NEAP. All these EM initiatives are categorised into three main stages: (1) planning – project appraisal and product design; (2) pre-implementation – setting-up machines and surroundings; and (3) implementation – material acquisition, storage and delivery (the production process and storage and delivery of finished goods) (RQ III).

In the planning stage, the study concentrates on regulatory measures undertaken by industries to obtain environment approval, when and where applicable, following

EIA/IEE and EPL procedures under the NEA. In the pre-implementation stage, it focuses on procedures and control measures by companies in setting-up machines and other requirements under the Noise Control Regulations and SWML enacted through the NEA. It further elaborates actions by respondents towards obtaining maximum utilisation of energy and other resources (materials) while ensuring employee safety and health. However, the mainstream EM measures relate to the implementation stage (in the production process), so that, in this stage, the study describes in detail EM measures undertaken under the legislation and standards. As the findings identify certain differences between the PLT sector and other sectors with respect to business processes and EM initiatives, it further elaborates for the PLT sector. It then discusses initiatives by sampled companies towards accomplishing CSR.

The chapter observes the integration of responses to EM issues into MA practices (RQ IV). Considering level of importance that listed companies attribute to the environment (Table 6.4), this demonstrates greater attention on and importance of generating fair business practices, ensuring product quality and environment protection. It shows the difficulty of considering profit to the extent that it is prioritised above environmental-related objectives. The chapter evaluates the ability of management to respond to EM issues (Table 6.5) and their success (Table 6.6) with their MA systems. It also evaluates the importance of MA techniques (Tables 6.7 and 6.8), which confirms that traditional MA techniques are more popular and required than modern MA techniques for both routine planning and control activities, and EM activities, that exhibit less importance and less usage for EM activities than routine activities. Further, it investigates challenges/problems faced with MA systems (Tables 6.9 and 6.10) and the effects of internal and external factors on these (Tables 6.11 and 6.12).

Section 6.9 critically discusses all findings of RQs II – VI. The analysis relating to RQ IV, which demonstrates the main issue of the research, addresses four main aspects: seven company objectives; EM cost categories and stages involved; MA systems and techniques applied; and the nature of industry and businesses. It indicates a lesser capability of management in most companies in orderly identification and response to EM issues and measurement of their attainment, because MA systems of most companies have not been improved appropriately to match environmental costs and related performance measures. Irrespective of lesser challenges with regard to routine planning and control functions, nearly 50% of companies face challenges in managing

environmental costs, perhaps due to defects in their MA systems, lack of expertise (i.e., environmental managers), or lack of awareness among personnel. Overall, the performance of responding companies is at a satisfactory level, the majority succeeding with over 60% achievement during the year (Table 6.13).

6.2 Organisational Setup for MA Practices and Environmental Considerations

By reviewing the evolution of MA outlined by IFAC (1998) and interpretations given on that in the literature (Abdel-Kader and Luther 2004; Waweru et al. 2005), it can be suggested that, particularly in the third and fourth stages of the evolution of MA, there has been effort to incorporate EM into MA practices by focusing on the reduction of waste in resources used in business processes and also generation or creation of value through the effective use of resources and through the use of technologies. Attempts made in these two stages relate to the economic impact of EM issues on which this study is based, and also relate to EM-related cost categories, earnings and savings described by IFAC (2005).

The main difference between conventional MA and EMA is that the latter stresses the importance of environmental costs and supplies information on material flows, which helps to improve economic and environmental performance (UNDSD 2001). However, Staniskis and Stasiskiene (2002) suggest that modification of existing MASs can be relatively inexpensive if they generate significant financial and environmental benefits, and obviously environmental issues should also be reflected in existing FA systems. Supporting this view, Jasch (2003) states that, in practice, many companies do not have a separate cost accounting system, but produce required information on the basis of the FA data from bookkeeping. In this respect, focusing on RQ II, this study investigates the organisational setup of sampled companies for MA practices and their provisions for addressing EM issues.

Relating to the possibility of tracking and resolving EM issues through existing accounting systems, responses are summarised in Table 6.1. Accordingly, the results show that all companies use both MAS and Financial Accounting System (FAS) and most integrate them to a degree, perhaps depending on their own information requirements and available facilities. Some respondents stated that they integrate MAS into FAS, and

MAS acts as a sub-system of FAS. However, they all mostly rely on MASs in obtaining information for making decisions related to routine planning and control activities. This adds to evidence in the previous chapter that 73.8% of companies function with management accountants and the rest with financial accountants, and also that all companies are handling their accounting systems well under the closer supervision of SM, such as a finance director, chief financial controller or general manager (GM)/DGM finance, so that they all have sound MA practices. In addition, as a result of this combination of FAS and MAS, in regard to EM activities they often consider more than one option. Accordingly, the total picture of systems used by each sector is summarised in Table 6.1.

Table 6.1 Accounting system/s companies rely on in providing information for decision making

Industry Sector	Number of Companies						
	Routine planning and control activities		EM Activities				
	MAS	FAS	EMAS	FAS+SA	MAS+SA	FAS+CA	MAS+CA
F & B	8	8	-	5	6	-	-
CHEM	3	3	-	2	3	-	-
DVS	5	5	-	1	2	1	2
MNF	18	18	-	14	4	2	5
PLT	8	8	-	6	6	1	1
Total	42	42	-	28	21	4	8

Notes: **MAS**: MA system; **FAS**: FA system; **EMAS**: EMA system; **FAS+SA**: FA system making simple adjustments for EM activities; **MAS+SA**: MA system making simple adjustments for EM activities; **FAS+CA**: FA system making adjustments for EM activities to a considerable extent; **MAS+CA**: MA system making adjustments for EM activities to a considerable extent.

In this respect, no-one in the sample has an EMA system; instead the most widely used approach is to make a simple adjustment to FAS, called FAS+SA (67%; 28 companies), followed closely by MAS+SA (50%; 21 companies). The least popular is FAS+CA (9.5%), and MAS+CA the second lowest (19%). It further reveals that those who consider FAS+CA and MAS+CA in addressing EM issues (4+8=12 companies) function with a management accountant and/or environmental manager (the DVS, MNF and PLT sectors).

Then considering the nature of MA systems of sampled companies, the study reveals that 90.5% of companies produce information on a 'volume and monetary basis, whichever necessary' and 9.5% 'more on a monetary basis and less on a volume basis for decision making. This suggests that normally companies maintain their MA systems to meet their information requirements. These findings support IFAC (2005) that, to

satisfy information needs of internal management, MA focuses on both monetary and non-monetary information.

Moreover, the results indicate that all companies normally review their MA systems to ensure that they can better respond to current company needs. The widely accepted practice is to review existing MA systems when revision is required (47.5%), i.e., when changes are made in the business processes and costing systems due to changes in product categories and associated manufacturing processes, changes in cost categories and cost allocation processes, changes in MA techniques and procedures applied. Further, monthly and quarterly revisions are also made to a lesser extent, by 28.6% and 16.7% of companies, respectively, typically based on suggestions made at monthly/quarterly progress review meetings. For example, in those meetings, they review their own KPIs regularly to ensure better performance through sound PE systems. However, there is very low attention to semi-annual (2.4%) and annual (4.8%) revisions, proving that, in a rapidly changing business environment, such revision over longer intervals would be pointless.

6.3 Motivations for Considering EM Issues and Related Activities

In regard to RQ II, the study identifies motivating factors for the management of companies to concentrate on EM issues and take action to protect the environment (Table 6.2).

Table 6.2 Motivating factors for company management to consider EM issues and take action in their business processes

Factors	Number of Companies						Rank
	High	%	Moderate	%	Low	%	
Environmental legislation	42	100.0	-	-	-	-	1
Competitors' actions	11	26.2	22	52.4	09	21.4	8
Sustainability of the business	36	85.7	06	14.3	-	-	3
Create good image for the company	38	90.5	04	9.5	-	-	2
Company mission and objectives	22	52.4	20	47.6	-	-	5
Company policies	24	57.1	18	42.9	-	-	4
Influences from society	18	42.9	21	50.0	03	7.1	6
Stakeholders' interest	17	40.5	22	52.4	03	7.1	7

Notes: The ranking was based on values obtained by (high*3) + (moderate*2) + (low*1)

The results above indicate that the most influencing factor for all companies (100%) is environmental legislation. This includes all provisions of the NEA, serving as an umbrella law in addressing a variety of environmental matters, labour laws, particularly relating to safety, health and welfare of employees (under the Factories Ordinance), and other laws associated with specific aspects of the environment relevant for specific industry sectors/companies. All these are enacted in relation to industrial activities in Sri Lanka by way of strategies and actions for prevention and control of environmental pollution. Accordingly, the findings reveal that legislation relevant for all companies encompasses the NEA and labour laws: all in the sample have obtained and continued any EPL required for their businesses according to pollution control measures and criteria, all of which are mandatory under provisions of the NEA.

Further, if the businesses emerged under ‘prescribed projects’, respective companies should follow EIA/IEE procedures from the planning stage in accordance with the NEA. Moreover, industrialists should also initiate and continue their businesses in compliance with all relevant environmental legislation, when and where necessary (see Chapter Three, above). Accordingly, findings show that, besides common legislation, some industry sectors/companies in the sample have to comply with specific regulations. For example, all PLN companies must comply with the Fauna and Flora Protection Ordinance and Forest Ordinance; a company in the F&B sector involved in salt manufacturing initiated and continued its business under regulations of the Coast Conservation Act; and companies functioning under BOI requirements must follow BOI regulations.

The second highest motivating factor is ‘create a good image for the company’, followed closely by ‘sustainability of the business’, rated as high by 90.5% and 85.7% of respondents, respectively. Company policies, and mission and objectives, are at a moderate level (fourth and fifth in the rank), with 57.1% and 52.4% of respondents indicating these as ‘high’. Competitors’ actions seem to be least important, with only 26.2% as high and whilst 21.4% as low.

This further shows that, as far as concentrating on these motivating factors, companies may not have much motivation to consider ‘stakeholders’ interest’ or ‘influence from society’, so that these factors are less in evidence. It suggests that competitors’ actions are not a causal factor in this regard – most companies do not care about competitors’ actions in responding to EM issues. However, one company dealing with durable

products stated that it did strongly note competitors' actions in EM issues because it had to compete with imported products.

6.4 Environmental Impacts Identified in the Business Cycle and EM Activities Undertaken

In response to RQ III, this study investigated the extent of environmental impacts arising at different stages of the business and EM initiatives by responding companies to minimise or avoid those impacts.

6.4.1 The Extent of Environmental Impacts Relating to Different Stages in the Business Process

The level of importance the respondents identified at each stage of the business process is shown in Table 6.3.

Table 6.3 Level of importance of the stages of the business process with respect to environmental impacts

Stages in the business process	Number of Companies and their responses						Rank
	High	%	Moderate	%	Low	%	
Capital investment project appraisal	38	90.5	4	9.5	-	-	1
Product design	31	73.8	11	26.2	-	-	2
Machine set-up	29	69.0	13	31.0	-	-	3
Material acquisition, storage and delivery	19	45.2	23	54.8	-	-	4
In the production process	31	73.8	11	26.2	-	-	2
Storage and delivery of finished goods	22	52.4	16	38.1	4	9.5	5

Note: The ranking was based on values obtained by $(\text{high} \times 3) + (\text{moderate} \times 2) + (\text{low} \times 1)$

The results highlight that, with regard to environmental impacts, the most important stage is capital investment project appraisal, followed by product design and production process, which indicate a similar importance relating to environmental impact, signified by 73.8% of respondents as high. Machine set-up stage also has considerable impact, with 69% high and the rest moderate. The other two stages have shown comparatively less importance, with 'storage and delivery of finished goods' the least important. However, overall the findings demonstrate that all steps contain a certain level of environmental impact at moderate or above-average level across five industry sectors, even though the necessity and extent of those activities may differ.

6.4.2 EM Activities Undertaken to Mitigate Environmental Impacts of Listed Companies

This section elaborates EM measures by those companies at different stages of their businesses to address environmental pollution, and the legislation and motivation behind these. The results reveal that all responding companies typically pay attention to EM measures at each stage of the process and take actions required in complying with environmental legislation (NEA, labour laws, BOI laws) and standards (SLS ISO 14001: 2004 EMS certification and accreditation). Moreover, those companies apply novel EM strategies and initiatives by incorporating policies and strategies developed by the public sector through the NEAP. All these EM initiatives are considered in the following sections in three principal stages, planning, pre-implementation and implementation, covering all stages in Table 6.3.

6.4.2.1 Planning stage: Capital Investment Project Appraisal and Product Design Stages

As described in Chapter Three, it is mandatory for all industries in Sri Lanka to obtain environment approval, when and where applicable, following EPL and EIA/IEE procedures regulated by the CEA and other authorised bodies. The results indicate that two companies operate under BOI regulations, encountering BOI laws and procedures, apart from CEA, from inception to the operational phase and throughout the business' lifetime to ensure that required rectification/mitigation measures are adequately implemented for protecting the environment. Once obtaining an EPL, all companies must renew this licence throughout the lifetime of the business, and if anyone violates conditions of the EPL, legal action can be taken by relevant authorities against the industrialist (see Chapter Three).

This shows the NEA provisions in action in encouraging companies to select and design business projects in an environmentally friendly manner. It can provide a greater contribution towards protecting the environment because decisions and actions taken in these initial stages may have excessive lifetime impacts in every aspect, including the environment, on business process and surroundings. Such greater importance and attention by companies in their business planning stage may be attributed to the provisions of NEA that make it mandatory for all industrialists to obtain environmental approval for their projects, following EIA/IEE procedures from the conception phrase, and to follow EPL procedures from the commencement of operations throughout the business process.

6.4.2.2 Pre-implementation Stage: Setting-up Machines and Surroundings

In this stage, all companies essentially follow procedures and control measures prescribed under the Noise Control Regulations of the NEA in setting up machines to control noise emissions. All companies have obtained SWML by applying prescribed measures to manage under the NEA. Thus, the findings show that, following the EPL, IEE/EIA procedures and applicable NEA provisions, labour laws, and other relevant laws (BOI regulations), all companies have taken initiatives to set up machines and surroundings so as to protect the environment from noise emissions, ensuring safety and health of workers. For example, most companies have specific equipment to alleviate noise, particularly inside the operations area, so as to provide a healthy working environment. Some, who particularly deal with high environmental sensitive processes and/or operate machines with excessive noise emissions, state that they have decided not to operate such machines after 10.00pm and instead they typically operate with less noise emission at night to avoid difficulties encountered by neighbours.

Moreover, where possible every company takes actions to replace old with new machines in order to avoid excessive noise and high energy consumption associated with older machinery. Finance managers of two companies in the DVS sector reveal that they have taken initiatives in securing machines to ensure maximum utilisation of energy and other resources and avoiding or minimising waste: Finance manager of one company explains their strategies thus:

We apply certain strategies in setting up machines and surroundings to save energy consumption of machines. For this purpose, a sustainable energy manager has been allocated to each company in the group appointed under the Sri Lankan Sustainability Energy Authority. Each manager has formed an energy management team which works to reduce energy wastage through awareness programs, by applying ABC, we divide spaces into cost centres based on machines, so that costs arising from that area goes to those particular machines, considering an individual machine as a separate activity, and allocating machine-related costs such as electricity, furnace oil, to that particular machine. Some machines produce more than one product with different volumes and thus those costs are allocated to different products based on volumes of each product items.

Further, we have fixed up separate electricity meters for each machine in order to save energy: at month's end, it automatically counts energy consumption. Thus, we can just read meters and identify usage. We identify product items and related volumes processed on each machine and allocate energy costs accordingly to those products. Further, we have fixed plant-wise electricity meters in the factories, e.g., the soap section has a separate plant and a meter, and we calculate energy usage separately in each plant, and prepare plant-wise bills too.

The company's finance manager further stated that, through such strategies, they could accurately measure energy consumption and easily assign responsibility of operations to employees, so that all, from labor and supervisory level to managerial level are self-motivated to regulate their processes in the most effective way, contributing to saving energy consumption and minimising associated costs, and ultimately protecting the environment.

6.4.2.3 Implementation Stage: Material Acquisition, Storage and Delivery; the Production Process; and Storage and Delivery of Finished Goods

The results indicate that, compared to previous two stages, most EM actions relate to implementation. The most important stage is the production process and the least important is storage and delivering of finished goods with regards to EM issues. All companies have obtained an EPL and maintain it throughout the operation, requiring them to operate in accordance with NEA provisions. They all apply EM measures to prevent and control pollution in every aspect under legislation. In the renewal of the EPL, the CEA or LA investigates whether the companies have violated conditions of a previous EPL, and if any violation is observed, the CEA or LA requests the company to take relevant pollution control measures in order to secure renewal of an EPL. After ensuring conformity of all aspects recommended, renewal of EPL is considered (see Chapter Three). A team of CEA/LA carries out monitoring at regular intervals, inspecting industries and going through reports on wastewater analysis, noise/vibration measurements and efficiency/evaluation of pollution control systems adopted.

Accordingly, through this EPL process, companies are conscious that, if they continue to violate EPL conditions, legal action will be initiated in terms of cancellation or suspension of the EPL, rejection of an application for renewal of the EPL, sending legal notices and filing a case, all of which lead to termination of the business. Moreover,

findings show that all companies have obtained SWML and manage their scheduled waste in accordance with the NEA and CEA. Thus, all companies generate, collect, transport, store, recover, recycle or dispose of waste properly, protecting air, water, soil, ground water and noise levels from pollution. Most procedures and criteria of SWML also cover the EPL.

The study identifies the following as key EM activities taken and strategies applied at this implementation stage by most responding companies, motivated by and complying with licensing strategies, other provisions of legislation and standards. In reviewing these, the findings identify differences between the PLT sector and other industry sectors, because, unlike in other sectors, manufacturing processes of PLT sector happen on estates where the workers live, with a home and village on the same premises. Thus it outlines EM initiatives and strategies separately for the PLT sector and other sectors, as set out below.

i) EM Activities made for efficient use of resources and minimising waste and pollution

PLT sector

- **Energy:** Introduce sensor lighting for tea factories (lights are switched on automatically in response to the presence of workers at night in staffing the withering process); use low-voltage lighting, reduce unnecessary bulbs and conduct energy audits; install wood-fired hot water generators and wood-fired steam boilers.
- **Water:** Implement actions to retain enough rainwater for use for every acceptable task in factories, such as cleaning machines without chemicals; as estates have enough natural water, diversify inputs to hydro power.
- **Raw materials:** Factories take green leaves count and act to reduce waste; reprocess refused tea to produce a level of tea in separate machines and then identify waste, and use such waste as compost (free fertiliser used for plants); no waste relating to rubber except for acid water, but purify it to remove water content which can be used for gardening; use firewood from rubber to produce tea so that rubber is identified as an environmentally friendly crop (after five years timber becomes firewood).

Other Industry sectors

- **Energy:** Energy conservation initiatives are practised at business unit level, which includes monitoring energy, use of energy efficient lighting and equipment and utilisation of renewable energy sources (some companies have installed separate electricity meters for each machine and plant based on production section (lines) and by business unit wise, so as to monitor energy consumption; (the most commonly used primary energy source by those sectors is the national grid); switch off air conditioning prior to a specified time, e.g. 15 minutes before leaving the office; use energy-efficient CFL bulbs throughout the premises; produce by-products through power generation (e.g., burned ash from power generation used to manufacture cement, rather than channel to sea); supply own power with generation plants (e.g., finance manager of a cement manufacturing company stated that they generate power for their operations and sell excess to national bidders); more use of furnace oil than electricity to generate steam for use in converting materials things to liquid, as the electricity rate is higher than that of furnace oil; replace old machines with high electricity consumption with energy efficient machines (probably also reducing noise); operate high electricity consumption machines in off-peak hours, operate noisy machines by day and close them at night; use solar power/red light to reduce energy cost; reduce electricity consumption by opening windows and using glass to reduce darkness inside office areas; use biomass instead of gas; use hydro power instead of diesel (finance manager of a food processing company stated that they are in the process of completing conversion of the diesel power generator farm to hydro power, and they are installing upgraded technology in the plant that contributes towards enhanced efficiency and increased utilisation of by-products); use electricity and furnace oil in the production process.
- **Water:** Take action to optimise usage of water in production processes; wherever possible, seek to re-use water after treatment (e.g., finance manager of a F&B company stated: “We have adopted stringent water conservation measures for ‘dairy product’ using water from effluent treatment plants for its entire production and operational needs”; another finance manager of a company in the same sector stated: “We use previously used water for washing salt to wash later stock that gains two advantages: saving water and adding salterns to salt, as it uses saltern water to wash salt”); Operate water treatment plants, recycling water and minimising waste;

purify used water through water treatment plants and reuse it for gardening and cleaning machines in factories; implement used water recycling system to use it for cleaning components (e.g., finance manager of a cable manufacturing company stated that they, with such a system, used recycled water to cool hot cables in the process).

- **Raw materials:** Eliminate environmentally unfriendly raw materials from the manufacturing process; purchase and store raw materials ensuring maximum use and minimising wastage; employ recycling for used cans /bottles by collecting them from consumers and recycling to produce the same or any other products; launch firm-wide initiatives to reduce use of paper materials (e.g., encourage use of double-sided printing; move from printed to electronic materials for training events and conferences); sell waste plastics only for recyclers who use them for their own manufacturing purposes; minimise waste of materials by recycling them; use as input waste of one product line for another product line.

For example, finance manager of a cable manufacturing company in the MNF sector stated: “We use waste from the product line of 5000m cables for product lines producing 1000m and 100m, getting advantages of product lines with different sizes”; Further, finance manager of an F&B company operating with renewable resource use stated: “With the assistance of training, practical knowledge and experience obtained, now we are changing traditional practices of extracting natural resources (saltern) in order to get maximum outcome in an environmentally friendly manner. Thus, instead of ‘shallow based systems’ now we practise ‘deep tank systems’ that provide high volume with high quality and high yield, but the time taken for the process is longer so that have to wait longer time to get yield”.

ii) Pollution control measures and preventive EM activities

PLT Sector

- **Maintaining wastewater filtering system:** Filter used water before release to the street; construct effluent treatment plants at factories to preserve the environment with minimum harm, and label them separately, i.e., new waste segregation unit, waste water channelling pits and drains, solid waste segregation unit, CFL bulbs and tube lights (florescent lights) collection centre; create drainage systems, solid waste

systems, garbage disposal systems in estates (company management has taken actions to dispose of garbage properly, even though estate workers/householders have no such systems, and thus estates can mitigate wastage).

- ***Internal audits at factories:*** Investigate compliance with environmental standards, and criteria in operations (most PLT companies maintain a ‘hot line audit’ by authorised outside parties who can access premises over 24 hours to detect violation; they investigate widely, environmental violation, malpractice, getting permits and licences and non-compliance with audit rules and regulations, and report to top management of companies for necessary action; however, this hot line audit is not linked to internal audit).
- ***Taking actions towards emission and effluent management, solid waste management and forestry management:*** Purify used water and reuse it for gardening and cleaning machines; maintain wastewater treatment plants for rubber factories and farm oil (finance managers of majority of companies indicate that: “We do not put wastewater of rubber factories anywhere; instead we remove all waste properly- when the capacity is not enough in the estate, use bowsers to transfer them into another treatment plants in Colombo”).
- ***Creating a safe and secure work environment:*** Conduct awareness programs on employee occupational health and safety; train tea pluckers, rubber tappers and oil palm harvesters on health and safety attributes of their place of work; conduct First Aid Awareness programs for employees; ensure that workers always use full kit/helmets for safety; obtain insurance for all aspects of companies separately, such as factories, workers, machines, stocks; continuously train workers on how to use machines properly to minimise hazards (finance manager of a company emphasises: “It is a must to train boiler operators because if it blasts due to improper use, everything destroys within few minutes and thus, preventive actions are a kind of investment for the future. As per labour laws, we strictly follow safety and security measures”).
- ***EM activities through Fairtrade Certification***

Two PLT companies have obtained and maintain Fairtrade Certification for some of their estates, offered by Fairtrade Labelling Organizations, an international body

founded in Germany, which empowers and guarantees a better deal to producers. There is an independent body for environmental audit to ensure that the company meets the conditions of the certificate. Some EM activities that companies must perform for this certification include: conducting research on bio-diversity by hiring PhD-qualified researchers; preserve jungle; ensure that the company does not use chemicals for cleaning machines; filter wasted water before discharge to the street. Fairtrade certification ensures that producers and traders comply with Fairtrade standards. In addition to the Fairtrade minimum price, this system guarantees a premium to the company (producer). Finance managers of two companies comment:

When buyers purchase company tea from the auction, apart from the price at the auction, the buyers offer a premium to the estates that continue this system. Annually auditors come to these estates and investigate whether conditions of this program are achieved or not. Main conditions are: these premiums ought to be used only for community development so that they invest them for social, economic or environmental improvements of the estates; and 20% of the premium received goes to the management to ensure the sustainability of this certification system. Moreover, Fairtrade offers a more sustainable solution for farmers, workers, and their families to improve their livelihoods.

Thus, this suggests that, through this program, companies are encouraged to take EM initiatives covering some of those costs with this premium. It further shows that the concept of Fairtrade goes beyond a simple economic transaction. At the heart of Fairtrade are long-term relationships between producers and buyers, enabling producers to strengthen their businesses and diversity and their sources of income.

○ ***EM activities through Ethical Tea Partnership:***

Two companies have continued their membership of Ethical Tea Partnership. It enables them to work towards improving tea sustainability, the lives of tea workers, and the environment in which tea is produced. Sri Lanka is one of 40 member countries of Ethical Tea Partnership which currently run tea sustainability programs across 16 countries, including Sri Lanka. This monitoring program is based on continuous improvement in environmental and social provisions, as outlined in the Ethical Tea Partnership Global standard, and is supported by third-party independent auditing. That organisation, under its environmental provisions for monitoring and

certification, performs activities relating to EMS, agrochemicals, soil, ecosystems and water conservation, and energy use and waste management. Ethical Tea Partnership thus helps tea producers increase their performance to international social and environmental levels set down in the Ethical Tea Partnership Global standard.

○ ***Briquetting:***

Companies in the PLT sector undertake briquetting projects made from factory waste materials. The positive aspect of using briquettes as fuel lies in the minimal impact on the environment compared with fossil fuel. It is more economical than other fuels because it contains low moisture, low ash and is of high density. Also, it is easy to handle and convenient for transport and storage. It is cheaper than heavy furnace oil, steam coal, firewood, etc., and extremely low in sulphur. Accordingly, briquettes help businesses meet environmental objectives.

○ ***Working towards obtaining SLS ISO certification and accreditation:***

Three companies have obtained and one company has applied for 14001-EMS certification and accreditation, while others are complying with this. In addition, some have obtained or will obtain other ISO certification relevant for the sector: two companies have rain forest alliance certification, and one has ISO 9001: 2008-certification for rubber manufacturing factories.

○ ***Action towards preserving forests:***

Even in harvesting timber under forestry and replanting programs, firms strictly follow standards and procedures of EPL, IEE and /or EIA. Accordingly, companies themselves support their solid fuel requirements by planting trees in an environmentally friendly manner, securing some self-sufficiency in fuel for manufacturing tea at their own factories (one company reports 25% use).

○ ***Renewable energy projects and energy conservation initiatives:***

PLT companies have developed many hydro power projects, as they have enough natural water to use, with a view of increasing renewable energy generation, energy conservation and energy efficiency, thereby enhancing green energy generation and utilisation of the industry and the country. Finance manager of one company stated:

We are currently operating two mini hydro power plants to the national grid and the anticipated carbon emission reduction from one MHPP is estimated at 1170 tons of CO₂ (Carbon dioxide) Also, we are in process of implementing four new such projects. We have assigned an engineer with Master degree on Renewable energy and he intruded and implemented hydro power systems instead of electricity, before that they didn't know that this hydro power projects would be such profitable.

The PLT sector usually develops environmentally sustainable methods and adheres to environmentally friendly technologies in relation to agriculture and cultivation.

Other sectors

For pollution control and preventive actions, commonly used measures: implementing effluent treatment plants; fixing up noise control equipment; establishing the best available odour (smell) control systems in factories; providing workers with masks to minimise risk and ensure safety; measure and control lighting and noise levels; in processing, measuring emissions from boilers (CO₂); taking actions to mitigate dust impacts and measure them; creating sound barriers in the factory to alleviate pollution; and taking measures for dust control and effluent control. In addition, there are the following initiatives and strategies applied for pollution control and prevention of environment harm:

○ ***Implementing cleaner production concepts and creating cleaner production team:***

Most companies follow cleaner production concepts and in some instances they have created a team to implement and monitor them. Finance manager of an F&B company explained:

We implemented cleaner production concepts in collaboration with 'European Switch Asia' funded by European Union – we give targets for water, electricity, furnace oil, and implement options and monitor them, giving suggestions to minimise wastage. Also, these initiatives are audited in order to minimise consumption. For this purpose, the company has created a cleaner production team, representing all levels of employees, and they should implement those projects and reduce wastage. Moreover, our CEO has a particular interest to implement those cleaner production projects, and, as a

result, we received ‘National Green Awards’ from the CEA and a ‘European Switch Asia Sustainability Award’ for these activities. Moreover, we are working towards obtaining ISO 14001EMS certification. However, according to the nature of the products, there is no large wastage, so that there is no need to proceed with bio gas.

○ ***Implemented power generation systems, manufacturing power houses and biomass projects:***

Biomass is agricultural waste products used as a source of fuel. Few companies in the MNF sector use their own biomass power generation instead of hydro power. Finance manager of a cement manufacturing company in the MNF sector said that “Our general manager and finance manager evaluate carbon projects and we have a technical training centre to train construction workers and other technical staff too”.

○ ***Taking actions considering ozone depletion and global warming:***

Finance manager of a MNF company dealing with durable products stated in the annual report:

We have two main concerns globally: ozone depletion and global warming. In 2012, we introduced new refrigerators under the GEO series and this uses the R600A gas (... as the refrigerant in the new product line), which does not result in global warming and has no impact on ozone depletion. It also has enormous electricity savings, like 20% energy savings from a refrigerator. This is the gas used in developed nations and recommended for use in the future. We are proud; we are the first manufacturer in South Asia to adopt R600A gas in its products. Our engineers and industry experts work tirelessly to achieve ever-greater efficiencies in energy consumption of our refrigerators and continue to make energy savings every year. We are looking to extend the use of this refrigerant across our entire range of refrigerators.

○ ***Appoint a cross-functional team and form energy management team:***

Finance managers of five companies representing DVS and MNF sectors indicated that they have developed cross functional teams, a combination of different personnel with different expertise (e.g., finance, production, sales, brand, quality, environment), so that they can easily develop sound decisions in every element,

including EM measures. Also, eight companies in the DVS, MNF and F&B sectors have formed an 'energy management team' to work with reducing energy wastage through awareness programs. All such teams are centered on production and maintenance departments for decisions and follow-up actions. A company spreads duties across various teams, along with training and educating the workforce regarding the new EM concepts and their importance.

Finance manager of a MNF company stated:

Challenges of energy (as demand increases globally) encouraged us to strengthen our 'sustainable energy policy' through a well-established energy management system. We need to turn towards renewable energy to sustain our production. Thus, we already installed a renewable gas unit in the factory premises, reducing LPG consumption by 50% cylinders per year. This is a win-win situation, as input to the gas unit is food refused at the canteen. This unit also generates liquid fertiliser as a by-product.

- *Consultation with reputable specialists in the field and have them factories regularly and develop environmental policies and action plans for the company:*

Finance managers of most companies in all sectors stated that they consult reputable specialists in the field and thus regular visits to the factory have given management the proper guidance required. With this effort and commitment they can develop environmental policies and action plans for the company.

Examples of such environmental policies of companies are:

X is committed to continually improve its EMS by reducing the generation of waste, optimising usage of resources and disposing waste effectively.

The company shall continually improve its EMS by establishing environmental objectives and targets and reviewing them periodically.

X is committed to comply with applicable legal requirements and other requirements related to environmental aspects.

X shall document the policy and communicated to all employees and make available to the public on request.

(Source: Company annual reports, 2012/2013)

○ ***Working towards obtaining SLS ISO 14001-EMS certification and accreditation:***

Almost all companies are working with this certification by adopting its guidelines and standards in their business processes. This is an independent acknowledgement of a company's sustainable business operations. The findings identify that nine companies have already obtained EMS certification and accreditation whilst all others are working towards this. One MNF company with this certification was awarded a 'Merit certificate' in the large-scale manufacturing category in 2012, at the 'National Cleaner Production Competition', in recognition of their sound, environmentally friendly manufacturing practices. Complying with EMS certification and accreditation means that those companies are essentially taking all kinds of possible EM measures and are innovative in their business processes to ensure green businesses while creating a green environment.

For example, finance manager of the MNF Company explained:

Since we have obtained ISO 14001 EMS certification in late 2011, we have embarked on a new journey towards being a revolutionary business in a green economy. Based on ISO 14001: 2004 EMS, and supported by numerous resource efficient and cleaner production techniques, we have improved company processes to minimise environmental impacts from the point of raw material transportation to final product distribution. We will optimise use of raw materials, water and energy and minimise and control all waste. We believe that environmentally friendly energy sources, such as solar energy, have great future potential and we will consider extending our support for such projects. Working closely with the 'National Cleaner Production Competition' we could implement many cleaner production practices, including: process modification; waste elimination; energy savings; waste reuse potential and even achieved raw materials savings. We continuously improve its environmental performance by reducing the impact on the environment and by preventing pollution through economically feasible and technologically practical processes (Annual Report 2012/2013).

- ***Create awareness among all employees regarding company responsibilities towards a green environment and communicate environmental policy stakeholders and the community:***

All companies have taken initiatives regarding awareness on environmental policies, and recognized their responsibilities by conducting awareness programs, training programs and frequent discussion at team, department/division and board level. All companies publish their EM measures, strategies applied for pollution control and protecting the environment, EM-related achievements, awards, certifications, accreditations, appreciation and future endeavors in their annual reports, reserving a separate section called 'CSR activities' or 'sustainability report'. Through such communication processes, the company management and all employees are motivated to continue and improve such EM strategies and measures while securing company reputation in an environmental perspective.

iii) Research and Development (R&D) activities relating to environmental issues

Some major R&D activities undertaken by sampled companies are outlined as follows.

PLT sector

- ***Research under Fairtrade certification:***

Companies with Fairtrade certification undertake studies through PhD-qualified researchers in the jungle, as a certification requirement. They investigate biodiversity in the jungle around estates, to determine whether firms are using chemicals in their machine-cleaning processes and whether they are filtering wastewater before discharge.

- ***Research on the use of organic fertiliser:***

Organic fertiliser is better for estate agriculture than chemical fertiliser from an environmental perspective. Thus, PLT companies do research to confirm its appropriateness for plants and crops and also to identify cost impacts for the company. As plants take time to answer or be familiar with organic fertiliser, researchers need certain time to learn the effects of organic fertiliser on plants. Thus, as a strategy they first identify a model for testing and then practise it. They apply organic fertiliser step by step, mixing it with other inorganic compounds (chemical

fertiliser) by increasing the proportion of organic fertiliser gradually. They realise that use of chemical fertiliser adversely affects the soil, and so is unsuitable for growing plants and it further causes water pollution and other environmental damage. They have also found that the costs of using chemical fertiliser are high than that of organic fertiliser.

For example, finance manager of one PLT company explained:

Once undertaking research, we are now using organic fertiliser and it is succeeding with high crops and low cost, and also it has extensively reduced soil impact and water pollution. If we use chemical fertiliser, we can get crops the first five years, but after that it reduces productivity and, further, at a certain stage the land is absolutely not suitable for growing plants.

○ ***Site-specific fertiliser test:***

All companies undertake new R&D projects to test soil samples of different sites to recommend suitable fertilisers for each site. For rubber and tea, companies collect samples of crops, in process and in finished products from estates through to the head office, and test them for further improvement. They all believe that R&D is essential for their improvement.

○ ***Research undertaken focusing on high-priced tea and rubber products:***

When a company receives a high price for its tea or rubber at auction, other estates or companies carefully observe the processes followed, with a view to identifying specific procedures and strategies that led to such high prices. It is more convenient, they find, to do such research on estates within a company, based on better outcomes of their own estates, than to do it across companies, because of competition.

Other Industries

Most companies in those sectors believe that it is more feasible and cost-effective to implement EM strategies and measures recommended by authorised bodies, such as the CEA, rather than doing research on the same by themselves. Because most of these are based on research by government institutions, as noted in earlier sections. These recommendations derive from large-scale research projects initiated by R&D divisions of such authorities and most include them in EPL procedures for implementation as a

requirement, so that all companies should essentially adopt such measures. Most respondents are of the view that they normally make developments or improvements for their business processes, but rarely undertake research on EM issues because they have no proper infrastructure and qualified staff in the relevant fields. However, the following R&D activities can be identified in the sample companies.

o ***R&D with renewable resources:***

Companies involved in utilising renewable resources undertake R&D projects to identify new technologies and systems to ensure the sustainability of the business while protecting the environment. Finance manager of a salt manufacturing company stated its experience:

We usually undertake research, and so we could initiate construction of deep tanks in a newly acquired land area by developing new techniques to protect salt in rainy season and also to enhance the production capacities. Another significant benefit is these tanks provide 'brines' (salt water) for shallow crystal harvest operation, where necessary. We have determined saltern development activities, many of them involving construction of newly acquired land areas, adjoining the developed saltern, so that we can maximise yield, brine usage, and synergy in operations.

o ***R&D with Agro -inputs:***

Finance manager of a company in the CHEM sector stated:

We have a separate R&D Company in the group who engages in research fulltime to identify new products and product improvements that can be initiated in a healthy manner. That research is on 'how to bring new products to farmers'. For this purpose, they go to paddy fields and select a sample to cultivate and use chemicals. Then, the research team test the success and environment impacts, and other impacts. Based on outcomes of such experiments, new agro-inputs go to the market. Also, the R&D division has ties with multinational research-based companies from the world to introduce innovative crop protection solutions to [Sri Lankan] farmers. Their main focus is to promote target specific, low toxic, low persistent, safe products to [Sri Lankan] agriculture.

6.4.3 Initiatives made towards Achieving Corporate Social Responsibility (CSR)

In responding to the question whether companies have taken any initiatives for CSR (environmental perspectives), the findings indicate that all respondents typically recognise this aspect as an important activity they should attend to while business processes are going on. Thus, this section illustrates some of the important CSR activities separately undertaken by PLT sector and other four sectors.

PLT sector

- ***Creating ‘conductive work environment’:*** Throughout all estates and work stations make sure that employees are working in a quality environment with adequate protection; cultivate polite behaviour in the work environment, i.e., being polite in all interactions; ‘chasing’ to be abolished, all discussions to be held with seating facilities for all, avoid confrontation and use conflict resolution through negotiation towards a win-win solution; conduct health and medical camps with the support of non-government organisations, at estate level for associates and family members; conduct awareness programs to prevent HIV/AIDS in plantation society; maintain medical files for each employee working in high-risk areas such as factories, herbicide/chemical spraying and similar areas of vulnerability; ensure the betterment of women (women play a significant role in plantations, representing 70% of work groups generally) by conducting awareness programs for women to update their knowledge on money management, work-life balance, income generation and home initiatives, and establishing ‘women empowering teams’ in estates, proving that women can bring a significant change in the community they live in with the development of their core values, which helps them enhance the quality of their family lives and hence productivity of estates.
- ***Training and development:*** Instruct employees, through educational programs, of the need to take precautionary measures and to become more aware of the various issues relating to the work place safety; introduce safety protective gear, chemical storage systems; conduct career guidance programs for estate communities, allowing them an opportunity to select employment according to their educational background; establish vocational training centres for differently abled people; make available frequent opportunities for continuous learning and skill development, create

perception among employees where they appreciate the balance between work life and family life.

- ***Activities to uplift living conditions of estate people:*** Enhance the nutrition level of associates, encouraging their home gardens for the cultivation of vegetables and other crops, ensuring that the food consumed is clean and uncontaminated with toxic elements; conduct awareness programs for pregnant mothers to convince them of the importance of nutritional values of the food they consume and to feed their children accordingly; introduce self-sustaining projects, such as producing greeting cards, envelopes, paper bags, tea handling bags and allow sale of these products at plantations.
- ***Enhancing infrastructure of estates:*** Initiate water management projects, forming deep drains to retain water throughout periods of drought (because, being in plantation agriculture, where the estates are also home to families of estate workers, water sustainability is a priority for basic human consumption and sanitary needs); ensure tree planting campaigns.
- ***Maintaining Biodiversity:*** All companies to take into consideration and take initiatives, while continuing their businesses, to maintain biodiversity in their estates and surroundings.
- ***Engaging in rural community development projects:*** As plantations are always linked with village community activities in addition to the business, they frequently engage in such activities to enhance the livelihood and living standards of estate people, such as: constructing housing scheme, homes for senior citizens; initiating sanitation and water schemes for estate workers, cultural and religious activities; organising recreation activities, providing free medical facilities for estate communities; establishing retirement villages (after retirement they live in the same home), allowing them to cultivate a small area, pluck tea leaves and sell them to the company so that they earn income; giving priority to children of existing employees before outside recruitments is undertaken whenever an employment opportunity arises in estates and head office; assisting with welfare activities, i.e., child care centres, mid-day meals, milk, school books, shoes; conducting programs to educate workers and employees on children's rights and parents' responsibilities; establishing reception halls/community centres in estates to facilitate workers to

organise social occasions, official meetings and family functions, cultural and religious functions, Christmas day celebrations, drama performances on productivity improvements; conducting sports clubs, co-operative societies to assist workers with goods and equipment on easy payment schemes.

The PLT sector believe that such CSR activities, implemented particularly for workers and their families, greatly influence improving their knowledge, attitudes and social values and in raising the socio-economic condition of the estate community, all of which will ultimately have an impact on their own satisfaction in their lives and their working environment, hence improving productivity of estates while protecting the environment. Through such practices, improved productivity, driven by the effective and efficient utilisation of resources, is a key factor that enables companies to make profit.

Other sectors

As in the PLT sector, most companies undertake CSR activities by means of community development projects to assist schools, hospitals, temples and village communities; they take initiatives to create a protective healthy working environment, and conduct awareness programs for employee safety and health and for raising their socio-economic condition. In addition, the following CRS activities have been undertaken by responding companies.

- ***Activities for protecting natural resources:*** Finance manager of a salt manufacturing company stated that it implemented a ‘mangrove’ strategy (using the tropical evergreen tree of the tidal coast) in coastal areas, such as Puttalama (removing mangroves is prohibited under the NEA). They further conduct workshops to support and educate small-scale salt suppliers about environmentally friendly practices. Another finance manager of a DVS company stated that it had implemented projects to grow plants in rural areas and help people there by providing water and other necessities. Finance manager of a company dealing with durable products in the MNF sector who introduced new refrigerators with no impact on global warming and ozone depletion commented:

Most people today are concerned about high electricity tariffs, so if we can produce some products with low power consumption, we can create

competitive advantage by creating a good image. By introducing such environmentally friendly durable products, we have already achieved social responsibility for the society. Moreover, we provide training opportunities for students of technical colleges and the National Apprentice Board as a career development measure.

- ***Activities towards pollution control in the society:*** Finance manager of an agro-inputs company revealed that it is involved in activities such as: conducting workshops to educate youngsters on ‘prevention against the deadly mosquito’, emphasising the importance of a clean environment; conducting workshops in collaboration with the Department of Agriculture to educate farmers on weed ecology and integrated weed management practices; initiating a ‘Pesticide Container Recycling Program’, in collaboration with the Department of Agriculture, MoE & Crop Life of Sri Lanka, taking into account the increased number of accidents, due to empty glass containers lying around, and reduction of pollution; initiating a waste management program with an aim of implementing proper waste management systems in a number of public organisations (the Sri Lanka Army, schools, municipal councils, the Sri Lanka Coconut Research Institute and cricket stadiums). In 2012, for example, a total 850 plastic barrels were donated to these institutions to be used as garbage bins and for making liquid fertiliser. This program helped in reducing the spread of dengue fever and in educating people in manufacture and use of ‘compost’ fertiliser.

Further, a company in the DVS sector also introduced collection of e-waste which is highly toxic to environment and the collection of paper for recycling. Finance manager of a MNF company stated that they have initiated an e-waste disposal system, in which they inform the people about handing over their used electrical items (computers, plastics) to the nearest showroom or branch for recycling.

- ***Celebrating world environment day (5th June):*** Together with this celebration, most companies initiate tree-planting campaigns on company premises with the participation of all employees, which will contribute towards offsetting their carbon footprint. Finance manager of one company stated that it celebrated ‘environment day’ in 2012, together with thousands of other green organisations throughout the world.

- **Conduct professional training programs in collaborating with Universities:** A cable manufacturing company with a memorandum of understanding (MOU) with the engineering faculty of a university has a program for increasing the skills and knowledge of electricians. This suggests that such professional training and educational qualification help increase the skills and earning capacity of these electricians in an environmentally friendly manner. Under the MOU, the university has provided a research desk at the faculty to contribute to the R&D requirements of the company and, in turn, the company is providing in-plant training for final year students of the faculty to enhance their academic knowledge with practical, hands-on work experience.
- **Maintaining Biodiversity:** Few companies are involved in such projects. For example, finance manager of one F&B company stated:

The group is committed to conserving biodiversity, wherever possible enhancing it through adherence to governmental laws and to best practices relating to conservation and protection of environment. For this purpose, the group has identified, through research, one location as an area of high biodiversity, where large-scale development has not been planned for the site in view of its environmental sensitivity.

Also, finance manager of an agro-input company in the CHEM sector stated that it mainly focused on maintaining biodiversity with its R&D.

These findings suggest that CSR activities undertaken by the companies greatly affect their good image and hence sustainability of their business; additionally, some CSR initiatives help them protect the environment. It is further clear from annual reports that some companies present their CSR activities together with EM initiatives and related achievements under the same heading in a sustainability report.

6.5 Considering Responses of EM issues Together with MA Practices

The sections above describe EM considerations and actions by responding companies for pollution control and environmental protection and also their CSR activities. Thus, in this section it investigates whether there is any connection between such EM actions and MA practices of listed companies with a view to answering to RQ IV.

6.5.1 The Manner and Ability of Companies in Responding to EM Issues through their MA Practices

It is already verified that all listed companies in Sri Lanka take all necessary EM measures to prevent and control environmental pollution, motivated by environmental legislation and ISO standards, and sometimes, to meet requirements of international collaboration and of outside buyers, particularly when companies deal with export markets. The level of importance that responding companies attribute to the environment in the decision making process is shown in Table 6.4.

Among the objectives considered, respondents have shown greater attention to and importance of (95.2%) generating fair business practices closely by ensuring product quality and environment protection. Through such practices, they concentrate on gaining reputation for the company with green business. Energy conservation is also given somewhat higher prominence, whereas profit making is considered at a moderate level, because they have realised that it is difficult to be more concerned about profit when they give priority to environment-related objectives, as EM measures are essentially associated with expenses. Community involvement is considered the least important.

Table 6.4 Level of importance companies attribute to the environment with regard to seven company objectives in their decision making process

Company objectives	Number of Companies and percentages						Rank
	High	%	Moderate	%	Low	%	
Fair business practices	40	95.2	2	4.8	-		1
Reputation with green business	28	66.7	14	33.3	-		4
Protection of the environment	33	78.6	9	21.4	-		3
Profit making	20	47.6	22	52.4	-		6
Energy conservation/efficiency	26	61.9	16	38.1	-		5
Community involvement	14	33.3	24	57.1	4	9.5	7
Product quality	36	85.7	6	14.3	-		2

Notes: The ranking was based on values obtained by (high*3) + (moderate*2) + (low*1)

According to Jasch (2003), there is a lack of standard definition of environmental costs and thus, depending on various interests, a variety of costs may be included by different groups. Thus, considering the following cost categories (a – e in Table 6.5) outlined by IFAC (2005), the ability of management in responding to EM issues within MA systems is summarised in Table 6.5.

Table 6.5 The ability of management in responding to EM issues within MA systems

Cost categories	Five stages relating to identifying and responding to EM issues									
	Identifying relevant cost items (1)		Measuring associated costs/savings/ Earnings (2)		Identifying EM activities (3)		Planning activities with cost/revenue estimates (4)		Taking actions & measuring costs/savings/ Earnings (5)	
	No. of firms	%	No. of firms	%	No. of firms	%	No. of firms	%	No. of firms	%
a) High	40	95.2	37	88.1	22	52.4	21	50	22	52.4
Moderate	2	4.8	5	11.9	20	47.6	21	50	20	47.6
Low	-	-	-	-	-	-	-	-	-	-
b) High	37	88.1	30	71.4	18	42.9	21	50	21	50
Moderate	5	11.9	12	28.6	24	57.1	21	50	21	50
Low	-	-	-	-	-	-	-	-	-	-
c) High	37	88.1	28	66.7	19	45.2	23	54.8	22	52.4
Moderate	5	11.9	14	33.3	23	54.8	19	45.2	20	47.6
Low	-	-	-	-	-	-	-	-	-	-
d) High	31	73.8	23	54.8	17	40.5	18	42.9	20	47.6
Moderate	11	26.2	19	45.2	22	52.4	22	52.4	17	40.5
Low	-	-	-	-	3	7.1	2	4.8	5	11.9
e) High	13	31.0	9	21.4	8	19.0	9	21.4	10	23.8
Moderate	15	35.7	16	38.1	18	42.9	13	31.0	12	28.6
Low	14	33.3	17	40.5	16	38.1	20	47.6	20	47.6

Notes: a) Material costs of product outputs; b) Material costs of non-product outputs (costs of energy, water and other materials that become waste and emission); c) Waste and emission control costs; d) Prevention and other EM costs; e) R&D costs.

The results indicate that almost all companies show the highest ability (95%) in identifying precisely the relevant cost items in the category (a) materials, followed closely by other cost categories (b) and (c), and slightly less ability for (d) with existing MA/FA systems. However, compared to stage 1, this indicates slightly less potential in measuring associated costs/savings/earnings of those cost items, with a pattern showing reducing ability of management gradually from category (a) to (e). Moreover, compared to previous stages, this indicates less potential (but screening the ability at above average level) in stages 3 to 5 relating to all cost categories except for R&D, which shows noticeably least ability and attention with respect to all stages, from identifying cost items to taking EM actions, for the reasons discussed above.

6.5.2 Evaluating the Success of EM Initiatives in Managing Environmental Costs

In relation to the recent accounting period, the success of EM initiatives undertaken towards managing environmental costs with respect to cost categories (a – e in Table 6.6) is summarised in Table 6.6.

Table 6.6 Evaluating the success of EM initiatives undertaken by companies towards managing environmental costs in 2012/2013

EM activities relating to cost categories	Criteria for evaluating success of EM activities									
	Attainment of planned activity level (1)		Adhered to planned costs (2)		Minimised waste & emissions (3)		Maximised savings/earnings (4)		Minimised non-value added activities (5)	
	No. of firms	%	No. of firms	%	No. of firms	%	No. of firms	%	No. of firms	%
a) High	15	35.7	16	38.1	15	35.7	14	33.3	13	31.0
Moderate	27	64.3	26	61.9	27	64.3	28	66.7	29	69.0
Low	-	-	-	-	-	-	-	-	-	-
b) High	16	38.1	14	33.3	16	38.1	18	42.9	14	33.3
Moderate	26	61.9	26	61.9	24	57.1	21	50.0	24	57.1
Low	-	-	2	4.8	2	4.8	3	7.1	4	9.5
c) High	16	38.1	15	35.7	16	38.1	16	38.1	15	35.7
Moderate	26	61.9	24	57.1	24	57.1	24	57.1	23	54.8
Low	-	-	3	7.1	2	4.8	2	4.8	4	9.5
d) High	11	26.2	11	26.2	10	23.8	9	21.4	8	19.0
Moderate	31	73.8	27	64.3	28	66.7	29	69.0	30	71.4
Low	-	-	4	9.5	4	9.5	4	9.5	4	9.5
e) High	6	14.3	5	11.9	5	11.9	5	11.9	5	11.9
Moderate	17	40.5	18	42.9	16	38.1	18	42.9	16	38.1
Low	19	45.2	19	45.2	21	50.0	19	45.2	21	50.0

Notes: a) Purchase of natural resources (Materials); b) Use of materials that become waste & emission; c) Waste and emission control; d) Preventive EM activities; e) R&D

Reviewing these results, it is obvious that, overall, the success level of EM initiatives is at above average level in relation to all cost categories and criteria. However, it shows rather higher achievements (well above average) in managing costs of categories (a), (b) and (c) compared with (d) and (e), and experiencing the least potential for R&D. The findings suggest that the responding companies are able to achieve their EM initiatives at these levels with existing MA/FA systems and firming up with continuous investigation and compliance monitoring processes undertaken by the CEA and other bodies through EPL procedures and EMS standards, and with related internationally agreed compliances. But in relation to different criteria investigated, no considerable differences between them were identified.

6.5.3 Significance of MA Techniques for Decision Making Process Relating to Routine Planning and Control Activities and EM Activities

Focusing on RQ IV, the responses to this concern are summarised in Tables 6.7 and 6.8.

Table 6.7 Level of importance of MA practices in making decisions relating to routine planning and control activities

MA Techniques	Routine planning and control activities - Number of Companies								Rank
	High	%	Moderate	%	Low	%	Unimportant	%	
<i>Traditional MA practices</i>									
Budgeting	40	95.2	2	4.8	-	-	-	-	1
Standard costing	34	81.0	8	19.0	-	-	-	-	2
Product costing	40	95.2	2	4.8	-	-	-	-	1
Product pricing	31	73.8	3	7.2	8	19.0	-	-	4
Transfer pricing	10	23.8	16	38.1	5	11.9	11	26.2	7
Performance evaluation	32	76.2	10	23.8	-	-	-	-	3
<i>Modern MA Practices</i>									
ABC system	16	38.1	4	9.5	2	4.8	20	47.6	9
Target costing	13	31.0	13	31.0	8	19.0	8	19.0	6
Kaizen costing	8	19.0	18	42.9	5	11.9	11	26.2	8
Balanced score card	7	16.7	16	38.1	4	9.5	15	35.7	10
Benchmarking	13	31.0	20	47.6	9	21.4	-	-	5
JIT systems	-	-	-	-	-	-	42	100	11

Notes: The ranking was made based on values obtained by (high*3) + (moderate*2) + (low*1)

The results indicate that overall, traditional MA techniques are more popular and imperative than modern MA techniques in providing information for routine planning and control activities, and EM activities demonstrating less importance and hence less usage of all traditional and modern techniques for EM activities than the former activities. With respect to routine planning and control activities, budgeting and product costing are most important for almost all companies, but show slightly less importance for standard costing, performance evaluation and product pricing. Only two DVS companies use budgeting and product costing at a moderate level, as they have to depend on other explicit schedules and plans based on demand and specific orders from buyers in export markets. They use budgeting mostly for financial planning, performance management and cost control purposes. Except for the PLT sector (due to its specific nature of pricing decisions, as illustrated in the previous chapter), all

consider product pricing a highly important technique. Also, it shows rather less importance for TP than other techniques, as 11 companies in the sample do not apply transfer pricing.

Table 6.8 Level of importance of MA practices in making decisions relating to EM activities

MA Techniques	EM activities - Number of Companies								Rank
	High	%	Moderate	%	Low	%	Unimportant	%	
<i>Traditional MA practices</i>									
Budgeting	32	76.2	10	23.8	-	-	-	-	1
Standard costing	23	54.8	15	35.7	4	9.5	-	-	3
Product costing	21	50.0	21	50.0			-	-	2
Product pricing	4	9.5	12	28.6	21	50.0	5	11.9	5
Transfer pricing	1	2.4	3	7.1	18	42.9	20	47.6	9
Performance evaluation	13	31.0	21	50.0	8	19	-	-	4
<i>Modern MA Practices</i>									
ABC system	4	9.5	9	21.4	6	14.3	23	54.8	8
Target costing	4	9.5	16	38.1	12	28.6	10	23.8	6
Kaizen costing	1	2.4	9	21.5	15	35.7	17	40.5	8
Balanced score card	2	4.8	6	14.3	15	35.7	19	45.2	8
Benchmarking	2	4.8	14	33.3	20	47.6	6	14.3	7
JIT systems	-	-	-	-	-	-	40	100	10

Notes: The ranking was based on values obtained by (high*3) + (moderate*2) + (low*1)

As for routine planning and control activities, the findings suggest that budgeting is extensively important for EM activities in relation to all cost categories investigated (a – e in Table 6.5). Product costing and standard costing are more important than other techniques in planning production process, considering EM-related costs too. PE indicates above average application, probably due to there not yet being established environment-related performance measures by most companies, and product pricing appears identical, as the whole PLT sector and some in other sectors do not use the techniques for EM decisions. Transfer pricing shows least importance due to lower applicability for EM actions.

Considering modern techniques relating to routine activities, the results confirm that benchmarking is of utmost important for all sectors. Aside from the PLT sector, target

costing is reasonably used by all, when and where possible, in planning and control production processes, ensuring profit margin and high quality. Likewise, with respect to EM activities, benchmarking is considered by all sectors at moderate level, and the PLT sector aside, all have shown above average prominence for target costing. However, ABC has shown rather less importance for making decisions relating to both aspects, probably due to approximately 50% of companies not using the technique. With respect to all routine and EM activities, the use of Kaizen costing and BSC is at a lower level than other techniques, mainly because these techniques were not applied by nearly a half and a third of companies consistently, and JIT systems are unimportant at all (none apply it).

6.6 Challenges or Problems with MA Systems in Responding to EM Issues and Routine Planning and Control Activities

Following IFAC (2005), this study focuses on investigating EM challenges associated with MA systems in listed companies in Sri Lanka. Thus, the responses obtained for RQ V are summarised in Tables 6.9 and 6.10.

Table 6.9 Influence of challenges or problems associated with MA systems on routine planning and control activities

Challenges/ Problems associated with MA systems	Influence on Routine planning and control activities - Number of Companies								Rank
	High	%	Moderate	%	Low	%	Unimportant	%	
a)The existing MA system provides incomplete/ inaccurate cost information	-	-	4	9.5	32	76.2	6	14.3	5
b)There is a communication/ knowledge gap between accounting and other staff	-	-	4	9.5	32	76.2	6	14.3	5
c) Materials use, flow and cost information are often not tracked adequately	-	-	6	14.3	32	76.2	4	9.5	4
d) Quality /output	-	-	9	21.4	29	69.0	4	9.5	3
e) Wastes and emissions	-	-	11	26.2	27	64.3	4	9.5	2
f) Complaints	-	-	11	26.2	28	66.7	3	7.1	1

Notes: The ranking was based on values obtained by (high*3) + (moderate*2) + (low*1)

Table 6.10 Influence of challenges or problems associated with MA systems in responding to EM issues

Challenges/ Problems associated with MA systems	Influence in responding to EM activities - Number of Companies								Rank
	High	%	Moderate	%	Low	%	Unimportant	%	
a) The existing MA system provides incomplete / inaccurate cost information	-	-	17	40.5	20	47.6	5	11.9	5
b) There is a communication/ knowledge gap between accounting and other staff	3	7.1	19	45.2	17	40.5	3	7.1	1
c) Materials use, flow and cost information are often not tracked adequately	-	-	13	31.0	26	61.9	3	7.1	6
d) Quality /output	-	-	16	38.1	25	59.5	1	2.4	3
e) Wastes and emissions	-	-	19	45.2	22	52.4	1	2.4	2
f) Complaints	-	-	15	35.7	25	59.5	2	4.8	4

Notes: The ranking was based on values obtained by (high*3) + (moderate*2) + (low*1)

In regard to routine planning and control activities, the results show that the challenges faced by Sri Lankan listed companies mostly appear at a low level, but nearly 50% of companies operate with challenges at a moderate level in responding to EM issues with their current MA systems. The highest challenges on EM issues emerge with item (b) communication/knowledge gap among staff involved.

6.7 Reviewing the Effect of Internal and External Factors on MA practices and on the MA and EM Challenges or Problems

The literature (e.g., Nawrocka & Parker 2009) suggests that MA practices and the MA and EM challenges or problems faced by firms are determined by several internal and external factors, and thus CF for the study was made, interpreting these aspects too. Accordingly, in response to RQ VI, the results obtained are presented in Table 6.11 and Table 6.12.

Considering current MA practices of listed companies, the findings indicate considerably more impact from internal factors than from external factors. All internal factors are high impact, but there is slightly less impact from EM and MA systems. Relating to external factors, in most circumstances these show low impacts from environmental legislation/regulations and social cultural influences and, in some other

instances, these two are unimportant, as MA is mostly concerned with decisions and activities relating to internal management. However, there is somewhat greater impact from two other factors: competitors' actions and stakeholders' interests.

Table 6.11 The impact of internal and external factors on current MA practices

Factors	Impact on the current MA practices - Number of Companies							
	High	%	Moderate	%	Low	%	Unimportant	%
Internal factors								
a) Mission, goals, & objectives of the company	32	76.2	10	23.8	-	-	-	-
b) Company policies	31	73.8	11	26.2	-	-	-	-
c) EM systems & MA systems	27	64.3	15	35.7	-	-	-	-
d) Knowledge, awareness & dedication of staff involved	31	73.8	11	26.2	-	-	-	-
External factors								
a) Environmental regulations/ legislation	-	-	-	-	31	73.8	11	26.2
b) Social cultural influences	-	-	-	-	33	78.6	9	21.4
c) Competitors' actions	3	7.1	9	21.4	23	54.8	7	16.7
d) Stakeholders' interests	2	4.8	10	23.8	23	54.8	7	16.7

Table 6.12 The level of impact of internal and external factors on the MA and EM challenges or problems

Factors	Impact on the MA and EM Challenges/problems - No. of Companies							
	High	%	Moderate	%	Low	%	Unimportant	%
Internal factors								
a) Mission, goals, & objectives of the company	1	2.4	27	64.3	14	33.3	-	-
b) Company policies	2	4.8	23	54.8	17	40.5	-	-
c) EM systems & MA systems	3	7.1	27	64.3	12	28.6	-	-
d) Knowledge, awareness & dedication of staff involved	-	-	29	69.0	13	31.0	-	-
External factors								
a) Environmental regulations/ legislation	33	78.6	9	21.4	-	-	-	-
b) Social cultural influences	9	21.4	22	52.4	11	26.2	-	-
c) Competitors' actions	2	4.8	19	45.2	21	50.0	-	-
d) Stakeholders' interests	3	7.1	16	38.1	23	54.8	-	-

In relation to MA and EM challenges/problems, the results indicate that except for environmental legislation (78.6% of companies indicate as high), the impact of other internal and external factors is at moderate level in most instance and in some cases it is at low level.

6.8 Evaluating Organisational Performance in View of MA Practices and EM Activities

To complete the investigation, respondents were asked to indicate the level of achievement in the recent accounting period, in view of their current MA practices and EM initiatives. The responses are summarised in Table 6.13.

Table 6.13 Level of achievement of organisational performance relating to EM activities with current MA practices

Organisational performance measures	Level of achievement compared to expected outcome - Number of Companies								
	41-60%	%	61-80%	%	81-100%	%	Over 100%	%	Total
a) Increased savings & earnings	5	11.9	12	28.6	22	52.4	3	7.1	42
b) Reduction in costs	8	19.0	17	40.5	16	38.1	1	2.4	42
c) Improved quality of output	1	2.4	4	9.5	35	83.3	2	4.8	42
d) Increase in market share	4	9.5	17	40.5	19	45.2	2	4.8	42

The results indicate that, except for a few cases, overall achievement of performance in relation to these four measures (a – d in Table 6.13) were at a satisfactory level of success, the majority having over 60% achievement, during 2012/2013. Compared to other measures, the Table shows slightly less achievement for reduction of costs while gaining higher performance for improving quality of output. However, in total, closely 40% of companies could manage costs over 80% of targets. The main reason is that they usually give priority to performing EM initiatives, to comply with environmental legislation, standards and procedures, all of which are more concerned about the quality of output than associated cost impacts.

6.9 Findings and Discussion

This section continues focusing on RQs II to VI.

RQ II: Do listed companies concentrate on EM issues in their business process and why?

The findings suggest that all listed companies concentrate on EM issues and related actions in their decision making process as presented above.

In terms of motivation regards to considering EM issues, the findings identify environmental legislation, creating a good image for the company, and business sustainability as the three principal causal factors, as illustrated in Table 6.1. It is no surprise that companies essentially concentrate on EM issues and related actions as a result of complying with the NEA, which has been implemented by Sri Lanka as a signatory to the Multilateral Environmental Agreement, chiefly focusing on industry sectors. This further suggests that these companies may have a better understanding of the importance of protecting the environment, because almost all have realised that such considerations and actions towards protecting the environment greatly influence creating a good image and maintaining business sustainability in a situation where environmental concerns are increasingly becoming contentious, in Sri Lanka and globally. Further, almost all companies are voluntarily seeking SIS ISO 14001: EMS certifications and accreditations and, in some instances, other EMS-related standards (SLS ISO 14004; SLS ISO 19011) as indicated in Chapter Three. Findings report that nine companies have already obtained this EMS certification and accreditation while others are working towards it.

These attempts confirm that listed companies are moving towards green businesses that will greatly and favourably affect business sustainability while also creating a good company image. Wilmshurst and Frost (2001) find a similar situation in Australia that a number of specific environmental issues have already been incorporated into many companies' accounting systems, although motivation for adoption is likely either to be directly related to regulatory requirements or to areas of potential cost savings. Considering environment-related MA as one component of introducing sustainable development and strengthening EM within the business, Bennett and James (1997) suggest that environment-related MA can make a contribution to both business success

and sustainable development. Supporting to these suggestions, Bennett et al. (2011) reveals that skilled accountants and the extended use of the central accounting systems can assist businesses to manage their environmental and sustainability performances.

Such prominent attention to these three motivating factors may be attributed to actions taken by all listed companies in incorporating a separate 'Sustainability Report' into their annual reports. This section highlights their EM-related innovations, strategies and actions in complying with environmental legislation and standards, and EM-related achievements, national and international awards and future plans for prevention and control of environmental pollution. This reporting practice is supported by the NGRS, developed under the 'National Plan of the Haritha Lanka Program', initiated in 2011 by the MoE (see Chapter Three).

In addition to these motivating factors, responding companies are further motivated to take EM actions because they have realised that, through such EM initiatives, they are able to utilise resources (energy, water, materials) more efficiently, and hence reduce costs and increase savings and earnings. Wilmshurst and Frost (2001) also identify that cost savings are possible in many of areas, such as efficient use of energy, waste management and minimisation of pollution, and site clean-up and contamination, as a result of careful monitoring. UNDSO (2001) argues that, by identifying, assessing and allocating environmental costs, EMA allows management to identify opportunities for cost savings. In consistent with these opinions, Vasile and Man (2012) induce that although the EM activities of an economic entity give rise to certain costs, they can also bring benefits and savings. Moreover, Waweru et al. (2005) report that business firms have been striving to reduce waste in their production processes, and hence reduce waste, using modern MA techniques together with traditional MA techniques.

Thus, review of annual reports reveals that most companies periodically measure their sustainability performance in relation to economic, environmental and social aspects and formally disclose them, assuring the public (including all stakeholders) that they are moving towards green businesses while satisfying customer needs. Therefore, this suggests that the objective of NGRS is succeeding, in addition to legislation, and encouraging such EM performances, since Sri Lankan listed companies enthusiastically disclose their innovations, strategies and actions towards protecting the environment to the public. In the annual reports, this separate section is variously labelled, mostly as

'Sustainability Report or 'CSR Activities' but sometimes as 'Environment, Health and Safety' or under other suitable headings.

All responding companies report their EM-related activities and CSR activities together in this section. Through such a reporting practice, they trust that these activities reflect very positively on the company image and hence long-term survival. In support of these findings, Kokubu and Nashioka (2005) reveal that Japanese corporate environmental accounting was oriented to external reporting rather than internal management function. However, these findings are inconsistent with those of Tilt (2001) who argues that Australian public companies give lower priority to disclosing environmental performance data to external parties (i.e., in annual reports) than to reporting on them internally. Also, Frost and Wilmshurst (2000) reveal somewhat different findings on such environmental reporting practices, but consistent with prior research that reporting is more likely to occur particularly in environmentally highly sensitive firms; however, the adoption of environment-related MA does not appear to be driven solely by this factor.

These finding are supported by De Mel and Sirimanne (2009), that some institutions contribute to the protection and preservation of the environment through their CSR programs and that most company annual reports now document how corporate activities influence the environment while also disclosing the measures applied towards protecting it. The ultimate aim of such reporting is probably to enhance the image of the company and its sustainability and hence also contribute to sustainable development of the country.

The findings further reveal that there has been a trend in listed companies to incorporate such EM considerations and actions into their mission, vision, objectives, policies and core values, assuming that such actions greatly influence their good image and business survival. This can, further, be justified by reviewing annual reports of listed companies, some of which are reported below:

A F&B company stated: "the primary objective that drives the [name of company] green business is to reduce, re-use and recycle energy, plastics, water and all other natural resources that we use in our day-to-day business practice. Through the 'Green Business' program, the [name of company] is

committed to minimising its environmental impacts throughout our entire supply chain, from the farm to the trolley”.

A PLT company stated: “We take into account and strive to maintain the balance between economic success, sound social responsibility, and environmentally friendly solutions in our short- and long-term decision making and business planning... The company has consistently increased the quality of life, while serving our employees and the environment... [Name] is committed to conserve the environment and significant amount of endeavours have been initiated and some of them are already in process at every estate to develop environmentally sustainable methods and to adhere to environmentally friendly technologies in terms of agriculture and cultivation”.

A PLT sustainability report stated: “We ensure to continue our bottom line objectives extent beyond profits to include people and planet. We believe that sustainable profit require the integration of social equity and environmental responsibility to economic growth”.

A PLT company stated in ‘Our vision’: “We will take a path no one has walked before and many will want to follow”; in ‘Our path’: “Fully utilise the technological advancements and land resources in an eco- friendly manner to respect and understand the community in which we do, celebrate the diversity and the power of our people”.

Core values of a PLT company include: “We will contribute positively to the long-term sustainability and development of the external community and the environment we operate in. Be innovative and strive for continuous improvement in whatever we do...”

Core values of a multi-national company in the DVS sector say: “We will contribute to the prosperity of future generations by creating economic value, while minimising the impact on the natural environment and ensuring sustainable growth. We will discharge our corporate social responsibilities with vigour and will enthusiastically support initiatives to uplift health, education, arts and the environment in the communities that we do business in”.

A company in the CHEM sector stated: “Our mission as a manufacturer of... is to expand our business through value addition and quality assurance with a commitment to the society to continuously improve management and performance in the areas of health, safety and the environment”.

Thus, these findings suggest that Sri Lankan listed companies are taking a proactive stance towards environmental protection by implementing strategies and actions according to their corporate policies, objectives and missions, all of which are motivated chiefly by the environmental laws enacted in the country. Also, they all enthusiastically report such proactive stances in their annual reports in order to ensure a good image and business survival. As of this study, Tilt (1997) identifies environmental law as the major influencing factor on companies’ policy development and environmental activities. However, Schaltegger and Burritt (2010) recognise legislation as one of the six main factors that influence management to consider sustainability issues. Moreover, Jalaludin et al. 2011 reveal that accountants were pressured by their customers, shareholders, head office and the government, in terms of environmental performance and then this pressure influences company policies and MA practices including EMA adoption.

RQ III: In which stages of the business process do environmental impacts sensibly occur, and what are current EM activities undertaken in these stages to mitigate such impacts?

In regard to environmental impacts, the findings reveal that the most influencing and crucial stage is the capital investment project appraisal stage (90.5%), followed closely by product design and production process (73.8% each), even though these three stages are highly influential in relation to environmental perspectives. The reason for such fewer responses for subsequent stages is the nature of products and processes in different industry sectors. For example, companies requiring fewer processes involving lower environmental impact (e.g., companies engaging in manufacturing food products, cables) consider those stages as moderately important. However, such very high importance for the planning stage may be justified when the project appraisal stage provides for the industrialists and authorities a decision point for such a long-term investment project: whether it should continue or not insofar as this concerns environmental impacts and associated legislation. Also, if anyone takes an undesirable

decision at this stage, it adversely affects in the long run, not only the business entity, but also the environment. Upon selecting a business, the industrialists should also decide how and with what scope does the firm commence and operate by adopting control measures within the regulatory frame, to the extent considering associated impacts on the environment.

Upon selecting an investment project, it is also very important to consider the way of designing the products by applying strategies to minimize or avoid environmental impacts identified under legislation, standards and criteria, because the decisions and actions taken at these two stages may have disproportionate lifetime impacts in every aspect, including environmental, on the business process and surroundings. Such a greater importance and attention at the planning stage may be attributed to the provisions of the NEA, which makes it mandatory for all industrialists to obtain environmental approval for their projects under EIA/IEE procedures, from conception, and EPL procedures from commencement of operations and throughout the business process. Supporting these findings, Zubair (2001), reviewing over 500 EIA and IEE reports in Sri Lanka, comments that introduction of the EIA process to Sri Lanka has been successful and robust in integrating environmental and other public concerns into project planning. He further recommends legal, policy, administrative and technological measures to avoid shortcomings identified.

The production process itself involves greater environmental impact (73.8%) because it continuously discharges waste and emissions to the environment. Thus, government authorities in Sri Lanka have been initiating all possible EM strategies and actions through EPL and SWML procedures. This can further be demonstrated by reviewing EM initiatives undertaken by industries under stage III, the implementation stage (as illustrated in this chapter). The machine set-up stage also involves a considerable impact (69%) in terms of noise and waste of material and energy, so that Noise Control Regulations have been incorporated into the NEA and should be followed by all industrialists in setting up machines for manufacturing. However, In regard to the other two stages, material acquisition, storage and the delivery stages have shown comparatively less importance: 'storage and delivering of finished goods' is seen as the least important.

Findings thus assure that all steps in the business process contain certain levels of environmental impacts at moderate or above average level across five industry sectors,

suggesting that the importance and span of EM measures required at each stage may vary based largely on the nature of the business. Moreover, the nature and extent of such EM measures by individual companies vary between the stages of the business process, with the greater extent at stage III, implementation, than planning and pre-implementation stages, as outlined in previous sections.

EM activities undertaken at these stages

The findings show that, empowered by the NEA and other environmental laws, standards, accreditations and policies, authorities such as the CEA, BOI, SLSI and SLAB have been executing all necessary strategies and measures, from project concept throughout operations, mainly via EIA/IEE and EPL procedures, to prevent and control environmental pollution of industrial activities. The findings thus reveal that all responding companies take required EM actions to comply with environmental legislation. In addition, all companies enthusiastically apply EM measures in their business process, motivated by SLS ISO 14001: 2004 EMS, as discussed. Moreover, findings reveal that almost all are applying novel EM strategies and initiatives by incorporating policies and strategies developed by the public sector through the NEAP.

Two companies initiated under BOI requirements have followed BOI regulations, in addition to the Regulations of the NEA (IEE/EIA procedures), to obtain approval for proposed sites for the business and for building planning. Thus stipulated environmental requirements such as pollution control measures and effluent treatment plants were incorporated into the plan at site-approval stage. Also, prior to the commencement of production on a commercial scale those companies have obtained an EPL, issued by the EMD of BOI with the concurrence of the CEA, subject to the installed pollution control devices operating properly. The findings thus, further show that companies operating under BOI requirements experience lesser impacts from the planning stage throughout the entire operation than do other companies, because BOI grants approval for sites and projects to the extent that they can recognise a possibility of alleviating identified environmental impacts through compliance monitoring of EIA/IEE conditions imposed in approving the project. Another factor influencing such a lesser impact is that the BOI has already initiated all infrastructures in the industrial zone, taking EM measures to prevent and minimise pollution by installing drainage systems and effluent treatment procedures in the zone.

EPL procedures, mandatory for all companies in starting and continuing their businesses, play a significant role in managing industrial activities in an environmentally friendly manner, because authorities such as the CEA, LA and BOI strictly follow EPL regulations in granting approval and carrying out compliance monitoring of conditions constantly through renewals and cancellations or taking legal action against violations.

However, the extent of such EM impacts and related actions may vary across industries and across companies in the same industry, depending on the nature of the business and its environmental impact potential. For example, the PLT and CHEM sectors are associated with environmentally highly sensitive businesses than are other sectors, thereby requiring more EM initiatives. Moreover, even within the same industry, varying degrees of environmental potential are associated with individual companies. For example, a cable manufacturing company dealing with lease impacts requires few EM measures, while a cement manufacturing company with greater impacts requires many to mitigate pollution, even though both are in the MNF sector. In addition, findings show that the extent of EM measures undertaken is determined by factors such as top management interest, awareness and experience in the field, infrastructure and resources available (for example, companies functioning with a cross-functional team, biomass projects, renewable energy projects, a R&D section for EM), international collaboration (by PLT companies and agro-input companies).

Therefore, in such a regulatory framework, the authorities are accorded ample provisions to take all necessary initiatives on industrial activities to protect, manage and enhance the environment, while also stimulating industrialists and others to regulate their operations in conformity with environmental needs. Further, SLS ISO-EMS certification and accreditation procedures influence industrialists by motivating them to take EM measures. These actions are discussed under the following three stages.

Stage I: Planning: capital investment appraisal and product design

When considering EM actions and procedures in the planning stage, the findings suggest that all listed companies have undertaken required EM measures to prevent and control environmental pollution in capital investment appraisal and product design. These actions are backed by EPL and EIA/IEE procedures in granting environmental approval. These EPL and EIA/IEE procedures are thus major planning tools that help

identify possible effects of a particular business on the environment at an early stage, and then undertake appropriate strategies and actions to avoid or minimise unacceptable impacts, thereby allowing the industrialist to design and initiate proposed business ideas in an environmentally friendly manner. This further suggests that, through such environmental recommendation procedures and licensing procedures, companies must select and plan their businesses so as to protect the environment, initiating appropriate preventive and control measures at the earliest stage before starting the business process.

Findings further indicate that in applying EM procedures some companies have to follow other laws and procedures specific to their own industrial activities. For example, a salt manufacturing company follows requirements of the Coast Conservation (Amendment) Act No. 57 of 1981 from planning stage through to operations and also the EIA requirement is subject to the discretion of the Director, Coast Conservation Department. Thus, purchasing land to obtain saltern for manufacturing, as renewable resources, requires this be done in accordance with recommendations of the Wildlife Conservation Department, the Coast Conservation Department and the Archaeological Department, in addition to complying with common legislation under the NEA. The managing director of salt company further stated that, even though weather patterns affect saltern operations (as renewable resources), they have designed a saltern development architecture in a way that impacts from changes of weather pattern are minimised in the long run. Salt manufacturing is also undertaken in accordance with all applicable legislation. Moreover, companies in the PLN sector stated that, apart from the NEA, they must comply with related laws like the Fauna and Flora Protection Ordinance and Forest Ordinance in planning their agricultural enterprises.

Stage II: Pre-implementation

The environmental potential of this stage (setting-up machines and surroundings) may be identified via. the noise control regulations. The findings show that all companies have initiated required control measures according to the regulations to protect the environment from noise. In addition, in accordance with the EPL, IEE/EIA procedures, labour laws and other relevant laws, all companies have taken suitable actions in this stage to control noise inside and outside the factories, fixing specific equipment to create a healthy working environment, alleviating noise inside the operation, deciding

not to operate noisy machines after 10.00pm, and keeping only machines with less noise on at night to avoid difficulties encountered by neighbours. Further actions by respondents at this stage ensure safety and health of workers and minimise the waste of energy and costs, assuring maximum utilisation of energy.

It is shown from a DVS company that, through such initiatives as assigning sustainable energy managers, forming energy management teams and making them aware them, and frequently measuring and monitoring energy consumption by machines and in plants, it is possible for companies to save energy and costs while minimising pollution. Jasch (2003) similarly emphasises the importance of managing material flow balance in physical units of material, water and energy within a defined system boundary, i.e., specific machinery, products and cost centres. This study also shows that application of ABC would assist companies to identify and measure such costs precisely and take control measures to ensure the efficient use of energy in those processes. Jasch (2003), however, further argues that, after fixing systems to ensure material flow balance, it will then become the task of process technicians, but not necessarily accountants, to trace the necessary data. This suggests that, as this process assists companies to measure energy consumption accurately and readily assign responsibility for operations to the relevant person or group, everyone from the factory floor to managerial level will be self-motivated to regulate their processes in the most effective way to save energy, minimise associated costs and thereby protect the environment.

Stage III: Implementation

The findings reveals that through legislation and regular compliance monitoring by authorities, companies are always influenced in this stage to operate every function properly, taking all possible EM actions throughout the process from material acquisition to final delivery (see section 6.4.2). In addition, there has been a trend in Sri Lanka for all companies to take EM actions voluntarily, by motivating themselves through ISO 14001: EMS certification and accreditation schemes. Most companies have been taking initiatives to create and maintain sound EMS according to the guidelines of this standard.

a) EM initiatives against industry sectors/companies

Compared to the other four sectors, the findings suggest that the PLT sector is involved in somewhat more EM activities. The main reason is the nature and length of operations

and their impacts on the environment. Operations of the PLT sector are carried out with real natural resources in a green environment covering a large geographical area. For example, all estates facilitate provision of adequate natural water, so that they have implemented hydro power generation projects using excess water to meet their energy requirements after satisfying water needs in manufacturing and for estate people. Thus, estates always directly interact with village communities and other infrastructure in their manufacturing, which is spread widely and hence environmental sensitivity is high, involving a larger scope than other sectors.

Considering R&D, the PLT sector also exhibits more research than other sectors. The reasons are that agriculture provides more opportunities and infrastructure to undertake R&D, and there is a greater necessity because the processes of the sector involve a greater impact on the environment than do other sectors.

Besides, the CHEM sector shows somewhat greater involvement in EM activities in terms of pollution control and preventive measures and in R&D than others. This trend may be due to the high environmental sensitivity to fertilisers and sector integration with agriculture. For example, one agro-inputs company in the sector demonstrated a notable contribution to EM actions and R&D by assisting a separate R&D company in the group which involved fulltime research.

Moreover, such a greater involvement in R&D and other EM activities in the PLT and CHEM sectors may be attributed to international collaboration by most companies, as signatories to international environmental agreements and membership of such organisations. Some have obtained certification and accreditation for their businesses by conforming to global standards and satisfying independent auditing by international organisations, such as Ethical Tea Partnership and Fairtrade certification, in addition to SLS ISO 14001- EMS certification and accreditation. Moreover, this trend may be affected by the export market, which all in the PLT sector entirely depend on. Agro-inputs companies in the CHEM sector are also connecting with the international research community and complying with international standards for better solutions. For example, an agro-inputs company imports fertiliser in compliance with Euro-American standards, and manufactures them according to globally accepted standards, based on recommendations and formulation guidelines from crop research institutes in Sri Lanka.

However, there is greater variances between individual companies in other sectors, F&B, DVS and MNF, with regard to the extent of environmental impacts and EM actions due to variations in their environmental sensitivity: some companies undertake environmentally highly sensitive businesses (cement, saltern manufacture), while others have less sensitive businesses (e.g., garments, because they wholly depend on imported materials and there are no emissions in the manufacturing process; and cables, which involve less wastage in materials, and less emissions in the manufacturing process).

b) EM initiatives *versus* different cost categories

Compared to the other four cost categories, R&D undertaken with environmental perspectives appears at a considerably lower level for a number of reasons: first, government authorities such as the CEA, MoE and Forest Department continuously engage in research and, based on that, they apply strategies and take actions through regulations, guidelines, training programs and EPL procedures against pollution; some companies state that they do not have the infrastructure, proper understanding or access to undertake research on environmental issues, but they do undertake developments in areas identified to minimise pollution and preserve the environment.

Most companies have the expectation that government authorities will do the research for them. Such low attention may also be attributed to absence of legislation and lack of qualified staff (only seven companies (16.7%) have an environmental manager). However, findings show that almost all companies are operate their businesses sustainably by taking all necessary measures to prevent and control pollution, driven by legislation and standards.

c) CSR activities *versus* industry sectors/companies

The findings indicate that all respondents typically recognise this aspect as an important activity they should attend to during business. NGRS also suggests the use of ISO 26000 standard for guidance on social responsibility. In CSR activities, the PLT sector differs from other sectors, probably for the same reasons identified with respect to EM measures. The leading feature is that their manufacturing processes occur on the estates where workers and families also live and thus, unlike other sectors, most CSR activities centre on the estates and the community. Almost all companies disclose such CSR initiatives in their annual reports, in the manner and for the reasons already discussed: image and survival.

d) Overview of EM initiatives *versus* different stages of the business process

Overall, when considering EM measures undertaken by companies relating to the three main stages, the findings indicate that they all take suitable EM actions, when and where necessary, and comply with legislation, standards and any internationally made agreements or collaboration (in the PLT sector). These actions lead to avoiding or minimising the means and degree of pollution that occurs in proposed industrial activities to a greater extent. Most such EM measures and strategies at the planning stage (stage I) are regulated by local legislation and conditions (IEE/EIA and EPL procedures). At the pre-implementation stage (stage II), EM measures and strategies are mainly concerned with noise control under the Noise Control Regulations.

In addition, some companies have initiated strategies such as setting up meters for individual machine and production lines, adjusting operating time (between peak and off peak hours), replacing machines in order to control energy waste, ensuring efficient use and hence cost savings. Also, apart from such initiatives, companies are influenced by labour laws to take all precautionary actions to ensure the safety, health and welfare of employees.

At the implementation stage (stage III), EM measures taken are largely based on EPL procedures, SWML procedures and the SLS ISO 14001 EMS certification and accreditation scheme. Such EM measures may also sometimes be backed by certification and accreditation by other international organisations, which is largely the case in the PLT and CHEM sectors, for example, Fair Trade Certification, Ethical Tea Partnership, and Rain Forest Alliance Certification for PLT companies, and Euro American Standards for Agro-input companies. Such a substantial commitment to comply with environmental legislation may be attributed to the fact that no violation of conditions of an EPL and no cancellation of an EPL were found in this study in any company investigated.

e) Involvement of MA practices in EM actions taken in different stages

Findings suggest that EM actions at this implementation stage mostly relate to environmental cost categories cited by IFAC (2005), which are considered in this study (Table 6.5). Thus, it demonstrates that MA practices are mostly involved in providing information for EM actions taken at stage III. It also suggests that MA practices may be

concerned with the pre-implementation stage, but to a lesser extent, as companies can take actions at that point in machine set-up and operating them so as to use energy and materials efficiently and hence minimise related costs. However, EM actions taken at the stage I do not show any connection with MA practices.

RQ IV: How and to what extent do listed companies identify and respond to EM issues through their MA practices?

The discussions above show that all listed companies have been initiating all essential EM measures in line with requirements. Thus, the discussion demonstrates the contribution of MA systems in responding to EM issues. Accordingly, it discusses and analyses the manner and extent to which Sri Lankan listed companies respond to EM issues in five main aspects: systems and procedures applied, seven company objectives, EM cost categories and stages involved, MA systems and techniques applied, and the nature of industry and businesses.

a) Systems and procedures applied:

In this respect, as none use EMA systems, they all made adjustments to existing MA/FA systems to a lesser or greater extent with a view to obtaining information for EM-related decisions and actions. Also, it is apparent that, in situations where they make simple adjustments for EM activities, they do this more with FAS than with MAS; if they make adjustments to a considerable extent for EM activities, the trend is to do this with MAS rather than FAS. In this regard, most companies depend on more than one option, as illustrated in Table 6.1, because they all operate both MA and FA systems on occasion, integrating them to provide information for routine planning and control activities. In the same manner, they mostly depend on both MA and FA systems in responding to EM issues. Jonäll (2008), in a theoretical study, conveys supportive findings that emphasise the greater involvement of MA than FA for gaining a better environmental performance.

The findings further suggest that, supportive to the views of IFAC (2005), typically all companies maintain their MA systems adequately for their own information requirements to provide information on volume and/or monetary basis, whichever is necessary in their circumstances. There is further evidence in Table 6.1 that companies tend to be used both systems, MA and FA, in making adjustments for EM activities.

They all essentially review their existing MA systems when such changes are needed in order to satisfy present-day information needs and hence attain performance targets. Furthermore, it shows the necessity of having an investigation into information systems on a regular basis, monthly or quarterly, at board level, to see whether changes are needed in existing MA systems, considering anticipated changes in the business process and performance measures applied and possible changes that ensued or may ensue in relation to these. Such a regular investigation and action help entities ensure the soundness and completeness of information provided through these systems, which are essential for effective decision making, and hence help achieve goals and objectives.

Supporting these findings, Tuanmat and Smith (2011) and Laitinen (2006) find that changes in MA practices are associated with good financial performance because the business environment changes continuously. This process will ultimately improve organisational performance, because effective MAS can help managers to better coordinate business activities and provide useful information for them to make sound decisions.

b) Seven company objectives considered

The findings suggest that most companies have accorded greater importance to environmental-related objectives than to others such as profit making. Almost all (95%) give the highest attention to developing fair business practices and, further, most focus on product quality and environmental protection, thereby gaining reputation for a good image through green business. Energy conservation is also given somewhat higher prominence (61.9% of companies), as they have realised that such measures assist them to respond to EM issues while saving costs. For example, most PLT companies, motivated by their reliance on natural resources of water and land, have prioritised energy-saving projects such as hydropower and biomass projects. The remainder considers these measures at a moderate level, suggesting that it may not be possible to consider energy conservation measures at a higher level because of the nature of their business (e.g., garments), lack of resources and knowhow, and lower interest and commitment of management.

The findings show that it is rather difficult to give greater concern to profit, to the extent that this relates to environmental issues, because EM measures incur expenses. However, nearly 50% of companies do have a focus on profit as well as environmental-related objectives due to their perception that profit is required to survive in the

business. Most respondents who consider profit at a moderate level think that profit may be downgraded when they prioritise environmental objectives. For example, Finance Manager of a DVS company (garments) said:

Even if we can earn profit without making an effluent management system, we do not do so, because we produce for export markets where environmental consideration is really observed as a requirement. Therefore, as a policy we have to consider vastly the environmental aspects (objectives) while giving rather less attention to profit and hence have survived in the international market with a good image for over 50 years.

This suggests that, as far as focusing on environmental-related objectives, companies have no need to focus more closely on community involvement.

c) EM cost categories and stages involved

In relation to EM cost categories investigated, the findings confirm that any kind of EM costs incurred can be classified into the five categories (Table 6.5) identified by IFAC (2005). Accordingly the findings suggest that listed companies are experiencing, with existing MA/FA systems, the highest capacity (95%) to identify cost items precisely, in (a) materials (natural resources used for output), with an identical capacity in (b) identifying waste of material, energy and water, and then (c) waste and emission control actions. However, there is slightly less capacity in (d) identifying preventive EM actions; and the least potential is in (e) R & D. However, compared to stage 1, identifying relevant cost items (Table 6.5), it indicates slightly less potential in measuring associated costs/savings/earnings of those cost items in a pattern that shows reducing capacity of management gradually from category (a) to (e). Moreover, compared to stages 1 and 2, there is indicates rather less potential (but showing the ability at above average level) in stages 3 to 5 relating to all cost categories except for R&D.

The findings regarding the different potential experienced in each cost category may be attributed to the practice adopted by responding to EM issues by adjusting existing FA/MA systems (Table 6.1), even in a situation where no one has separate accounting systems such as EMA. These findings are further supported by the fact that companies have established their MA/FA systems predominantly focusing on information

requirements for routine planning and control, but not EM considerations. Supporting this, Schaltegger and Burritt (2000) indicate the importance of designing a MA system that is capable of satisfying the needs of different managers seeking different information, including environmental information, as the pressure increases on managers to comply with tighter environmental legislation and to be aware of corporate environmental impacts on stakeholders.

Even in such a situation, as most companies explained, they practise with greater potential in identifying relevant cost items (stage 1) of categories (a) and (b), because material costs of output and waste of material (energy, water and material) can usually be readily considered as cost components of normal business processes rather than EM cost items. Similarly, waste and emission control costs (c) and preventive EM costs (d) under existing accounting systems appear as overhead not EM costs. However, such an accounting system does not adequately support all cost categories (a) to (e) in measuring associated costs/savings/earnings of cost items (stage 2) and incurs further difficulties in dealing with subsequent stages (3 to 5) (identifying EM actions, and planning and implementing them from an environmental perspective). These findings typically support the views of UNDSO (2001) that environmental issues may arise with traditional MA systems because they attribute EM costs to general overhead accounts so that this hides EM costs from management and thus it tends to underestimate the extent and growth of such costs.

IFAC (2005) states that, despite the increasing concern for environmental issues globally, there is a growing consensus that conventional accounting practices simply do not provide adequate information for EM purposes. However, agreeing with Staniskis and Stasiskiene (2002), it can be suggested that such MA systems used by responding companies suit them in responding to EM issues, because they seem inexpensive to the extent that they provide required information for both routine business activities and environmental purposes.

Such a lower capability experienced by responding companies may further be attributed to lack of qualified personnel in the field, lack of awareness and knowledge/communication gaps among personnel (Table 6.10) about environmental impacts and possible preventive and control measures. As described in the previous chapter, EM activities of most companies are being monitored by middle or senior management assigned to other functions such as production, quality assurance, technical or financial.

The other dominant factor behind such a lower capability is the greater involvement of government authorities to regulate initiatives, because all companies can take necessary EM actions under legislation and guidelines and in compliance with monitoring processes. Thus, the major concern is whether companies operate with EM actions by complying with such regulations, but not whether they incorporate these into their accounting systems or are concerned for cost impacts. However, Wilmshurst and Frost, (2001) reveal that cost-benefit analysis is most commonly undertaken by many listed companies in Australia by incorporating environmental concerns to assist in decisions relating to efficient use of energy, waste management and minimisation of pollution, and site clean-up and contamination.

The findings further show that, even though no one in the sample is practising with an EMA system, nearly 50% of companies have shown high potential at all stages, from identifying cost items to taking EM actions with respect to all cost categories, except for R&D, using existing MA/FA systems. In most cases, such companies are involved in highly environmentally sensitive business so that they have to take EM actions to a greater extent, with proper planning and control systems, compared to companies operating as less sensitive businesses. Frost and Wilmshurst, (2000) reveal that adoption of environmental-related MA procedures does not appear to be driven solely by the environmental sensitivity of the business in listed companies in Australia, even though environmental reporting is more likely to occur in such firms.

Most companies who have shown high potential are applying ABB and ABC systems (i.e., most companies in the PLT and CHEM sectors and some in other sectors), and as a result, they can better respond to EM issues, too, identifying relevant cost items, measuring associated costs properly and, accordingly, identifying, planning and implementing EM initiatives, whilst managing costs efficiently. These findings are consistent with the literature (UNSD, 2001; IFAC, 2005). Bennett and James (1997) also argue that the emerging consensus is that practical environmental-related MA is closely related to the development of ABC.

R&D shows noticeably least ability and attention in respect of all stages, mainly due to lack of knowhow, infrastructure and limited access to undertake research. However, such a very low attention to and capacity for R&D may be backed by expectations that government will do the work for them. However, when considering individual companies and sectors, there is a rather higher capability indicated by most respondents

in the PLT, CHEM and DVS sectors and some in the MNF and F&B sectors, due to the nature of their business, as described in previous sections. Some companies particularly involved in less environmentally sensitive businesses state that it is sufficient and cost effective to undertake EM initiatives according to guidelines and recommendations from regulatory bodies rather than doing the same thing themselves. This is consistent with Wilmshurst and Frost, (2001) who argue that cost-benefit analysis is most commonly undertaken by many companies in Australia by incorporating environmental concerns to assist EM-related decisions.

Considering overall the success level of EM initiatives of companies (Table 6.6) in the recent accounting period (2012/2013), it looks to be at above average level in all cost categories and criteria, stressing lower level compared to the ability of management in responding to EM issues. It shows, nevertheless, rather higher achievement (well above average) in relation to cost categories (a), (b) and (c), rather than (d), and (e) showing the least potential for R&D. As with investigation of the ability of management, fewer than 50% of companies succeed in their EM initiatives at higher level in all categories (except for R&D), and most of those are involved in highly environmentally sensitive businesses. Also, most companies who succeed greatly here state that they have implemented EM initiatives with proper understanding and awareness, as well as managing such activities with properly established planning and monitoring processes and using specific performance measures, assisted typically with ABB and ABC systems (in the PLT sector), and rarely with traditional costing systems or both systems. Supporting these findings Wilmshurst and Frost (2001) emphasise the possibility of applying tools such as life cycle analysis, activity based costing and cost-benefit analysis for environmental performance evaluation.

The findings suggest that, in general, the responding companies are able to succeed in their EM initiatives at moderate levels using existing MA/FA systems and simplifying these continuous investigation and compliance monitoring. Some respondents (indicated as moderate) explained that they could succeed (high) in certain EM actions but could not reach the expected level in others, so that in general they would rate their success level as moderate. The findings further suggest that such a response of 'moderate level' with regard to success of EM initiatives may be predominantly caused by nonexistence of performance measures for EM purposes. This situation may be a result of the regulatory monitoring regime, which ensures compliance. Consequently,

they are used to being satisfied with the feedback of authorities as confirming the success of their EM actions. The lesser capacity of management in responding to EM issues may also have an impact on their success and its perception.

d) MA systems and techniques applied

Compared to routine activities, the application of MA techniques for managing environmental costs appears at a low level. No companies in the sample operate with EMA systems. Similarly, IFCA (2005) states that in the real world EMA ranges from simple adjustments to existing accounting systems to more integrated EMA practices that link conventional physical and monetary information systems. A similar situation can be found in the literature i.e., Staniskis and Stasiskiene (2002), but they suggest that modification of existing MA systems can be relatively inexpensive if they generate significant financial and environmental benefits by reflecting environmental issues; (Jasch (2003). Also, it is apparent that in situations where they make simple adjustments for EM, they do this more with FAS than with MAS; conversely, if they make adjustments to a considerable extent for EM, the trend is to do it with MAS rather than FAS. Most companies depend on more than one option, as shown in Table 6.1, because they all operate both systems, sometimes integrating them to provide information for routine planning and control activities. Thus, in the same manner, they mostly depend on both MA and FA systems in responding to EM issues, too.

For routine planning and control activities, the findings suggest that budgeting is very important for EM activities in relation to all cost categories investigated. Further, product costing and standard costing have exhibited greater importance in planning and controlling products and associated costs, considering EM-related costs, in ensuring the efficient use of resources by minimising waste. Product costing assists companies to manage costs of pollution control and preventive EM activities to a lesser extent, because satisfactory levels of requirements and the importance of such activities are largely determined by legislation, guidelines and standards, so that companies may have little control over the costs of such EM activities. Even though performance evaluation is greatly helpful for routine planning and control activities, the findings indicate its above average application in addressing EM issues because most companies have not yet fully established performance measures relating to EM activities. This inclination is greatly influenced by the compliance monitoring process by regulatory bodies. In this

respect, transfer pricing shows the lowest application, confirming its unsuitability for EM purposes.

The findings suggest that, except for the PLT sector, sectors have shown above average prominence in target costing with respect to EM activities, particularly in planning and controlling production processes that ensure efficient use of materials, water and energy by minimising waste. Benchmarking is applied by some companies in adopting sound EM measures, such as extraction methods or using natural resources with minimum wastage in a sustainable manner, initiating pollution control measures and taking preventive actions. Most PLT and CHEM companies apply best practices adopted from other estates or companies and from international collaboration.

Even though all companies have not been using ABC, those who apply the technique use such information to a larger extent to make sound decisions in managing environmental costs. This finding is confirmed in the literature (Frost and Wilmshurst, 2000; UNDSO, 2001; Staniskis & Stasiskiene, 2002, 2006; Wilmshurst and Frost, 2001; Russell et al., 1994), which has reported the lower capability of traditional MA systems in adequately monitoring and allocating environmental costs. However, the use of ABC for EM activities has shown rather less importance compared to routine activities, probably due to a lower concern about EM activities when designing their systems. Compared to other sectors, the PLT sector uses ABC systems more prominently in managing environmental costs in relation to all EM cost categories, because they are already familiar with all activities and related costs throughout the whole business process. The PLT sector is, as discussed, more environmentally sensitive and thus more responsive to EM issues than other sectors.

However, with regard to EM decisions, Kaizen costing and the balanced scorecard are accorded lowest importance, which can be compared to their moderate application for routine activities. The findings further reveal that, except for budgeting, all techniques considered have shown their inapplicability for R&D. Respondents state that, in a situation where R&D (with environmental perspectives) receives least attention by listed companies, they use budgeting for R&D to the extent that they have planned and implemented. JIT systems are unimportant for both routine and EM activities, as no companies apply it.

e) *The nature of industry and businesses undertaken (highly sensitive versus low sensitivity)*

The findings recognise the nature of industry and business as an important factor influenced in determining the level of capability of companies in responding to EM issues through MA practices. Thus, almost all PLT and CHEM companies and some in other sectors have shown a greater ability for all cost categories in identifying and taking EM actions, mostly due to their serious attention to pollution control and preventive EM measures because they are involved in environmentally highly sensitive businesses. Moreover, such a greater ability of the PLT sector may be attributed to their sound MA systems, with the application of ABC and ABB for all companies, available expertise specific to the agriculture sector, greater involvement in R&D, greater impact of operations over wide areas, international collaboration and its requirements, and specific interest and commitment from top management of some PLT companies with considerable knowledge and foreign exposure in the field. Accordingly, the ability of management in the PLT sector in responding to EM issues is high in all these aspects.

In regard to the CHEM sector, finance manager of agro-inputs manufacturing company stated:

We are involved in providing more environmentally sensitive crop protective solutions to the market, rigorously conforming to highest international standards, i.e., Euro-American standards, in addition to following guidelines of the Crop Research Institute of Sri Lanka and other environmental legislation. Also, we are surprisingly undertaking R&D projects with the assistance of a separate R&D company in the group and [we are] always committed to testing their product before entering the market.

This indicates that, within this framework, the ability of the management of this company in responding to EM issues is high in every aspect, assisted by their sound MA system, particularly the ABC and ABB systems.

Further, a MNF company (cement) has shown high capability in identifying and responding to EM issues in all cost categories and stages, because, as a business involved in environmentally highly sensitive operations, they operate with all necessary EM measures very effectively, with the assistance of wide-ranging MA systems with

ABC and ABB systems. Moreover, they have required know-how and commitment for addressing EM issues successfully in a well-organised manner. They have eco-friendly power generation systems to supply power to their own factories and sell excess power nationally, too, so the ability to plan these activities is high, and they earn extra income from such eco-friendly projects while saving energy. It has considerable cost savings too.

Finance manager of another MNF company producing building materials stated:

We have a large data base in the group with an environmental manager who is handling all EM activities properly, equipped with lots of experience and foreign training. Thus the company is capable of identifying any EM issues precisely and taking suitable actions, ensuring protecting the environment, while minimising pollution to the maximum possible. However, we have no research, as government authorities do the same, but developments are there, considering guidelines and requirements given by such authorities, market changes, new trends and associated environmental impacts, so that we satisfy market requirements, ensuring sustainable business.

The finance manager of a DVS company dealing with garments for export said:

The environmental sensitivity of our businesses is low, as they entirely depend on import markets for raw materials, so that we do not need to be concerned about local natural resources. Also, operations do not contain much water and emissions like other industries, such as cements chemicals. Moreover, as we produce garments for export markets, we have no flexibility in choosing materials with cheaper prices. The type and quality of materials are exclusively determined based on customer requirements by the buyers as per each purchase order received from international markets. Thus, relating to material costs, this has no effect on the local environment and no control over it, and thus we just do things based on customer requirements of each order. Therefore, the ability and necessity of management to take EM measures for use of materials is at moderate level, but relating to cost categories (b), (c) and (d), it is high for all stages. R&D is also low, as we do not require research relating to manufacturing processes and local markets from an environmental perspective.

Finance manager of another company dealing with durable products in the MNF sector states:

Relating to cost categories (a), (b), (c), and (d), the ability of management to identify cost items and measure costs is high, but we are paying less attention (at a moderate level) to identifying and planning EM activities, because the CEA introduces for them all necessary EM approaches, devices with proper guidance, so that the company usually takes actions accordingly. Regarding R&D, the CEA engages in such activities and they provide necessary recommendations to improve the processes and take actions and thus there is no need to pay much attention to research. Besides, we do certain development in the processes, when and where necessary, enabling enhanced knowledge on new methods, technologies obtained through training programs at both local and international level and using information from other sources, i.e., Head Office, subsidiaries, competitors.

Accordingly, the findings suggest that the ability of management in identifying and responding to EM issues is mostly determined by factors such as type of EM cost categories (probably high potential for (a), (b), (c), more than (d), and least potential for (e)) and stages (probably high potential for stages (1) and (2) more than (3) to (5)), the nature of businesses (high or low environmental sensitivity), soundness of the MA system (those applying ABC and ABB, such as in the PLT sector, have greater capability than those without such applications, and those who planned MA/FA systems considering environmental costs have more ability than those not considering this aspect in designing them), strength of EMS, know-how, awareness and commitment of staff, infrastructure available, and attitudes of associates.

Moreover, the findings suggest, that in identifying and planning EM actions, companies with less environmentally sensitive businesses in most instances rely on actions taken by authorities like the CEA in providing recommendations, guidelines and procedures. The same behaviour critically appears in relation to R&D activities of those companies. Therefore, they have shown less responsiveness, less effort and less capability in management in responding to EM issues and placing least emphasis on research. But almost all companies do improve their processes, assisted by research and using enhanced knowledge and information on new methods obtained from other sources, to

assure society that they have taken all required EM initiatives to ensure sustainable businesses.

Moreover, as with the findings on the ability of management, most companies in the PLT, DVS and CHEM sectors and a few in others have shown greater success in their EM initiatives, mainly assisted by their sound MA/FA systems, wide-ranging performance measures, richness of expertise and resources, and greater commitment of staff involved in EM issues while managing associated costs properly. The findings further suggest that overall a moderate level of success is demonstrated by the rest of the companies in EM initiatives, predominantly caused by nonexistence of performance measures for EM purposes because they typically depend on evaluation by regulatory bodies.

RQ V: To what extent does management of listed companies confront challenges or problems with their MA systems in identifying and responding to EM issues and in performing routine planning and control activities?

Using the issues identified by IFAC (2005), this study now answers RQ V.

Findings suggest that, irrespective of lower challenges with regard to routine planning and control functions, nearly 50% of companies face those challenges at a moderate level in managing environmental costs, because most operate with MA systems focused on information requirements of normal business processes rather than environmental-related costs and information. No company has an EMA system; all provide information for EM-related decisions by generally making simple or more complex adjustments to existing MA/FA systems (see Table 6.1), which are mostly traditional systems. These findings support the literature (IFAC, 2005; Russell et al., 1994) that recognises limitations and challenges in collecting, evaluating and assigning environmental cost data effectively in a traditional MA system, thereby leading to decisions being based on missing, inaccurate or misinterpreted information. In support of these findings, Vasile and Man (2012) also demonstrate that traditional accounting methods are not proficient to provide a suitable framework to identify all the necessary data, and hence, many potential environment-related costs are likely to be concealed within indirect costs.

However, as a result of being exceedingly concerned about EM issues and taking required actions through compliance with regular monitoring, overall they can manage such challenges at a moderate or low level, as shown in Table 6.10.

The greatest challenges in EM issues emerge with item (b), the communication/knowledge gap between accountants, environmental personnel and technical staff. It is essential to have collaborative involvement of all these personnel and no such gap if they are to handle EM issues successfully. Supporting IFAC (2005), however, the findings suggest that in most companies there have been differences in terms of knowledge and awareness, information access and structures, which lead to challenges in making sound decisions on EM initiatives and control measures. Three companies indicated that this was unimportant for them, because they have established a 'cross functional team', as described in previous sections, to overcome the communication/knowledge gap.

In regard to waste and emissions, findings show that some companies could not with certainty identify environmental-related actions and costs with their existing MA systems; rather they just consider them as a kind of overhead, so that they face challenges in managing such costs. Similarly, but to a lesser extent, those companies believe that their traditional MA systems may provide inaccurate or incomplete information on environmental costs, probably due to less attention to and less capability in identifying such costs separately from normal overheads. These findings reaffirm UNDSO (2001), IFAC (2005) and Vasile and Man (2012). However, most companies using ABC stated that such challenges are at a low level or unimportant. Some indicated that they faced challenges in quality or output, as they are more concerned about product quality than environmental aspects – garments is a case in point. Also, some companies experienced challenges at interpersonal and interdepartmental level, because of their lesser capacity in dealing precisely with EM issues because of a communication/knowledge gap. However, findings indicate that a few companies could minimise such problems by using cross functional teams.

For example, Finance manager of one leading company in the DVS sector stated:

Complaints from internal management are very low as we have cross functional teams. They discuss all crucial matters with adequate information and knowledge as each team consists of experts from all required fields, i.e.,

finance, environment, quality, technical support, so that we are capable of making sound decisions. Further, as we apply ABC, and all are aware in every aspect, including EM aspects, no challenges appear with the existing MA system. But challenges on quality and output appear at a moderate level because quality and costs are difficult to maintain at the same time. Because EM initiatives require incurring certain costs, most of them are uncontrollable by the company.

Finance manager of a MNF company stated:

We have created a MA system considering cost behaviour, cost items, direct and indirect costs relating to routine operational cycle, so that we could not consider much the real costs impact of environmental activities. Thus, it would create problems or challenges as far as being concerned about managing environmental costs with this MA system. We believe that all employees, from higher level to lower level, as a team should have a certain level of awareness on environmental issues, related EM activities and their cost impacts, in order to take suitable actions on them. Otherwise we can't evaluate the employees' performance and EM projects successfully.

Finance manager of another MNF company commented:

Generally we are satisfied with our current business operations and working environment. All employees work well and are paid satisfactorily. Environmental consideration is also very high. However, as we haven't appropriate accounting systems for EM considerations, we have faced certain challenges in managing EM activities relating to wastes and emission control.

The findings suggest that, as a consequence of not having an EMA system at all, and not assigning environmental managers in most instances, problematic situations, particularly in tracking material use, flow and costs information relating to EM considerations and actions, may arise. This situation is further exacerbated by limitations of existing MA systems designed for normal business processes rather than environmental matters, and the knowledge gap of the personnel involved. The ultimate outcome of all these is that those entities face challenges or problems in managing environmental costs in using existing accounting systems and with their current staff.

RQ VI: What are the perceptions of managers of listed companies regarding the impact of internal and external factors on MA practices and on MA and EM challenges or problems faced by them?

Relating to current MA practices, the findings indicate considerably more impact from internal than from external factors. Most companies stated that knowledge, awareness and dedication of staff are very much affected, because improvement in MA systems/practices primarily depends on this factor. Finance managers of three companies who established MA systems in the recent past stated that they needed to improve their existing MA systems, so that they are giving more attention to this and encouraging staff involved, allowing them to enhance their knowledge and awareness through training programs, workshops and discussions with internal and external experts in the field.

External factors show greater impact from competitors' actions and stakeholders' interests than environmental legislation and social cultural influences. Finance managers of two companies stated that they consider competitors' actions with regard to their MA practices, by sharing experiences with friends in other companies, in an informal way, regarding new procedures, new techniques and new systems that those competitors have recently applied, and their success level and associated problems and issues. They further explained that this kind of information sharing had advantages for both parties and that stakeholders' interests are also important in certain situations in meeting stakeholders' information needs. Moreover, some revealed that they had personal contact with other companies in other industries (not competitors), so that they shared experience on MA practices with them. Thus, the findings suggest that, through such approaches, they can share knowledge and experience indirectly with competitors and also with unrelated industries, which helps both parties to improve their existing MA systems.

In relation to MA and EM challenges/problems, the results indicate that, except for environmental legislation (which 78.6% of companies indicate as high), the impact of other internal and external factors is at moderate level in most instances and in some cases it is at a low level. As indicated in previous sections, all companies have been undertaking all required EM measures in accordance with legislation. However, in managing costs of such EM actions through use of their MA systems, almost all companies face challenges or problems. Because these MA systems were initiated

largely based on information needs of normal business processes rather than EM actions and related costs. These findings are also supported by a situation where most companies confronted a deficiency in well-organised EMS systems and a total lack of EMA systems. Thus, this has the greatest impact from environmental legislation on such MA/ EM challenges. Findings further suggest that current EM and MA systems may have above average impact on those challenges.

There has been an inclination in companies to include EM objectives and considerations into their mission, goals, objectives and policies, so that the results show a moderate impact from those factors on MA/EM challenges. Knowledge, awareness and dedication of staff also indicate an average impact, because they require ability and dedication to improve MA systems, but there remains insufficient potential for this in some companies. However, in a situation where all companies are essentially taking required EM initiatives by complying with environmental legislation, other external factors such as competitors' actions and stakeholders' interests seem to be immaterial, whereas social cultural influence has a high impact, typically in companies with environmentally highly sensitive businesses. These findings agree with the literature: Nawrocka and Parker (2009) report that MA practices and challenges, and the success of EMS and its challenges, depend on internal and external factors such as management style, company goals and operating environment, culture, stakeholders, the economy and legislation.

Thus, the findings make it clear that, even though it is requirements to take EM initiatives to prevent and control pollution in compliance with environmental legislation, MA systems of most companies have not been improved so as to satisfy information needs, and this has created challenges in this respect through the current MA systems. Yet the findings further suggest that companies, particularly in the PLT sector, could minimise challenges by being practising modern MA techniques, such as ABC and ABB systems. However, more commonly they do not consider environmental costs separately from other costs.

6.10 Evaluating Organisational Performance in View of EM Initiatives

The study evaluates the performance achieved by responding companies relating to EM initiatives in the accounting period 2012/2013 (see Table 6.13). All companies have implemented EM initiatives, depending on the environmental sensitiveness, to prevent and control pollution by ensuring efficient use of natural resources: materials, water and energy in their business operations. Moreover, most have specifically identified and implemented renewable energy projects and energy conservation projects such as biomass, hydro power and briquetting projects (in PLT estates) and other cleaner production projects. The study evaluates the performance of such EM initiatives compared to the expected level relating to measures: increasing savings and earnings, reducing costs, improving quality of output and increasing market share.

Overall, performance in relation to these four measures was at a satisfactory level, with the majority achieving more than 60% success during the year. Compared to other measures, there was slightly less achievement of 'reduction of costs' and a much higher performance for 'improving quality of output'. However, in total, almost 40% of companies could manage costs across 80% of their targets. The main reason is that, in performing EM initiatives, they normally give priority to conforming to environmental legislation, standards and procedures, all of which are more concerned about the quality of output than associated cost impacts. A lower achievement in cost reduction may further be affected by difficulties faced by companies in managing costs of pollution control measures and other protective actions because of their immaturity, lack of know-how and awareness in the field and inadequacy of MA/FA systems.

Finance managers of some companies, particularly those dealing with export markets (the PLT sector and garments), stated that they were more concerned with quality of output than managing costs because it was vital to their market survival that they retained a good brand image. The PLT sector shows less performance than others in reducing costs because of the high costs associated with EM actions on estates, such as water treatment plants and waste disposal systems managed covering large geographical areas, and uncontrollable factors that impact both EM measures and normal operations, such as adverse effects of weather changes.

However, as a result of initiating a variety of eco-friendly projects, such as energy savings, renewable energy and briquetting projects by most in the PLT sector and by

some in other sectors, 60% of companies could achieve over 80% performance relating to increase in savings and earnings. This achievement may be attributed to the greater commitment by those companies, motivated by EMS certification and accreditation and resources available for them to move to green businesses.

For example, one company in the MNF sector could manage costs over 100% (see Table 6.13) by implementing comprehensive energy savings projects. Finance manager of the company stated:

We have well-managed power generation systems to supply power to our own factories and sell excess power to national bidders too, so that we have been able to earn extra income from selling biomass and carbon credits, in addition to saving energy consumption. It has considerable cost savings. Moreover, we can reduce our cost of production (cement) with these power generating projects. But improving the quality of products was problematic with the issue of input quality in the year.

For this company, savings/earnings and market share rated over 100% success (it increased its market share by 30% in the year, exceeding the target of 20% of increase), but quality of output was at 81-100%.

A multinational company in the MNF sector indicated over 100% performance relating to 'increased savings and earning' and 'improved quality of output' with eco-friendly projects and other EM initiatives because it paid greater attention to quality of products expected in international markets than to costs. Two other measures, reduction of costs and increasing market share, reached 61-80%, perhaps due to a lesser capability in controlling costs of EM initiatives and difficulties in competing in international markets with higher costs than expected. Their main focus was on EM initiatives in accordance with local and international legislation, and they had to follow sustainability targets strictly, with zero land fill, and other international standards, such as Hong Kong standards prescribed by the UK parent company in UK, in addition to local standards.

Another two MNF companies who have been undertaking many cleaner production projects and EM initiatives effectively with SLS ISO 14001 certification and accreditation indicated over 100% performance: one achieved over 100% for increased savings and earnings, but only 41-60% in cost reduction and 81-100% for the other two

measures; another reached over 100% for improved quality of output, but 81-100% for the other three measures. This suggests that in most cases it is more difficult to achieve targets in relation to reduction of costs than for other measures, due to lower capability in managing costs of EM measures while maintaining required quality.

However, in total, almost 40% of companies could manage costs at above 80% of targets, assisted by efficient cost control systems through efficient use of resources other than using power generated with their own projects. For example, one leading company in the DVS sector stated that it could increase savings and earnings and reduction in costs at an 81-100 % level. Even though it had some challenges with highly competitive markets, because of its efficient control systems for monitoring power usage, the production line and water reuse, and a greater concentration on environmental aspects, it could achieve satisfactory performance. With its good brand image and with competitive prices it could increase market share for some products at a higher level but not so for other products, so that on average they could achieve 61-80% of targets set for the period.

Quality of output shows the highest achievement, reaching above 80% of targets by about 88% of companies, due to their greater attention to product quality, as almost all companies are in highly competitive markets and some are entirely depend on export markets while others are in both local and foreign markets. As a result of executing EM actions such as energy savings and briquetting projects in the PLT sector, reuse of water and use of waste to produce by-products like fertiliser and other forms of products, associated savings and earnings seemed at a satisfactory level, reaching more than 80% by nearly 60% of responding companies. This indicates that the remaining 40% could only reach a lower level (below 80%). Such a lesser performance in some companies may be attributed to their deficiency in performance measures relating to EM actions and MA/FA systems where environmental costs have not been considered in their design. In the case of market share, 50% of companies reached above 80% of targets, but this depended on factors such as the nature of the markets, market position, and the impacts of EM initiatives on quality of products, costs of products, good image and survival of the business. The literature on these performance measures shows that the ultimate results of such EM initiatives and accounting systems may have internal impacts on organisational performance and external impact on the society (IFAC, 2005; Wilmshurst & Frost, 2001; Melnyk et al., 2003).

The findings, in turn, suggest that, even though the achievement of performance of EM initiatives seems at satisfactory levels, this generally shows the extent of success as depending only on what companies planned in the year. Thus, it does not imply whether they consider all relevant actions or not, considering their own level of environmental sensitivity and other requirements. Moreover, in certain instances, respondents may have difficulties in identifying and measuring environmental performances separate from performance of normal business due to not having properly set performance measures and accounting systems. Thus, these findings may further be affected by absence of appropriate performance measures and properly designed accounting systems that are essential to providing comprehensive information for making sound decisions.

6.11 Summary

This chapter answered RQs II to VI, elaborating how and to what extent Sri Lankan business firms respond to EM issues through their MA practices. All listed companies take EM measures in their business process to prevent and control pollution by making adjustment to existing FA/MA systems, which were designed primarily to focus on routine business activities, not on environmental costs. No company had an EMA system. This leads to lower potential and challenges experienced by most companies in responding to EM issues. Considering motivations to take such EM measures, the chapter identified three leading factors: environmental legislation; creating a good image; and sustainability of the business.

The findings detected differences between the PLT sector and other industry sectors: there was greater potential in the PLT sector relating to the extent of environmental impacts and EM measures initiated, the ability of management in managing associated costs and impacts, and also the success level of such initiatives, largely due to the specific nature of businesses (high environmental sensitivity) involved in agriculture, the application of modern MA techniques (such as ABC) and international collaboration and agreements made in markets. The CHEM sector shows greater potential in these areas for the same reasons, because of the nature of agro-inputs. However, there appear greater variances between individual companies in the F&B, DVS and MNT sectors, largely due to variances in environmental sensitivity,

commitment and interest of management, staff awareness and availability of qualified personnel. Irrespective of the high involvement of the PLT and CHEM sectors, there was less attention on R&D compared to other EM initiatives shown by most companies in other sectors due to their lack of knowhow and infrastructure and limited access to research, as well as their greater expectation that government authorities would do the research the companies needed. Yet most of them undertook developments in their processes with the help of the CEA.

Through such EM initiatives the responding companies largely focused on preventing and controlling pollution within the regulatory framework. Further, in certain instances, they expected through such EM initiatives to get maximum utilisation of resources (energy, water and materials), and ensuring employee safety and health. The findings make it clear that, even though EM initiatives to prevent and control pollution must be taken, MA systems of most companies have not been improved accordingly. In most instances, it is thus clear that there are challenges such as communication/knowledge gap among staff, and with current MA systems in managing environmental costs properly (see Table 6.13). Such deficiencies associated with MA systems may be attributed to the lower capability of management experienced in most companies in identifying and responding to EM issues and in measuring success with their MA systems. Yet companies mostly in the PLT sector could comparatively minimise those challenges, while showing greater ability than others, by using modern MA techniques (ABC, ABB), even though, in certain settings, they do not consider environmental costs separately from other costs.

This study confirms that traditional MA techniques are more popular and relevant than modern MA techniques in providing information for routine planning and control activities and EM activities, but it demonstrates less importance and less usage of all techniques for EM activities than for routine activities. However, through such MA practices and EM initiatives, the majority could satisfy over 60% achievement compared to the expected level, but slightly less achievement for 'reduction of costs' (see table 6.13) when considering performance during the year 2012/2013.

In performing EM initiatives, listed companies in Sri Lanka normally give priority to conforming to environmental legislation, standards and procedures, all of which are more concerned with the quality of output than associated cost impacts (see Table 6.13), and thus they may pay less attention to MA systems and information provided by

them. However, this study suggests that such a serious commitment by all responding companies to complying with environmental legislation is confirmed by the absence of violations of conditions of the EPL or any cancellation.

Chapter 7 Summary, Conclusions and Recommendations

7.1 Overview

The main purpose of this study was to investigate the nature and extent of MA practices and their contribution in addressing EM issues in listed companies in Sri Lanka.

Chapter One formulated the primary research question and then identified research questions to address it. On this basis, a conceptual framework was formulated. A review of the relevant literature in Chapter Two enabled construction of a theoretical foundation for the study.

Chapter Three focused on environmental considerations, with particular emphasis on Sri Lanka, and centering on strategies formulated and actions taken to protect the environment by means of laws, regulations, standards, policies and procedures structured predominantly for industrial activities and development projects.

Chapter Four described the research design and justified the appropriateness of the MMR approach for this study. The MMR approach is designed with two paradigms 'QUAN + qual' and 'QUAN → qual'. A sample of 42 companies was selected, using multi-stage purposeful sampling method. This sample represents five industry sectors, food and beverages, chemicals, diversified, manufacturing, and plantation, out of twenty sectors listed on the Colombo Stock Exchange as at 30 April 2012. A sample from manufacturing and related industry sectors was selected for this study because these sectors have the most significant impact on the environment. The study employed a questionnaire survey. To corroborate the responses to the survey, interviews and discussions were conducted concurrently or subsequently with company officials. The study applied a 'personal visit approach' to each company to collect data in order to secure an acceptable response rate and quality of data. The survey data were tabulated and analysed using SPSS software, bar charts, frequency tables, and Fisher's exact test, 'thematic analysis' and 'content analysis' were employed in the analysis of descriptive data.

Chapter Five presented results of the analysis and findings related to MA practices. Chapter Six discussed the implications of MA practices and responses to EM issues by the selected companies.

The findings suggest that traditional MA techniques are still popular among Sri Lanka companies, irrespective of their sector or the nature of their businesses, even if they practise both types of techniques (other than JIT systems) simultaneously. As far as EM issues are concerned, all companies conduct their businesses in a viable manner by taking necessary EM measures to prevent and control environmental pollution in compliance with legislation and standards. Of the five sectors, the plantation sector exhibits circumstances specific to it in the investigation.

When the contribution of MA practices in addressing EM issues is considered, almost all listed companies in Sri Lanka address their EM issues by making small adjustments to existing accounting systems because no-one has established an EMA system. These adjustments are mainly made to budgeting, standard costing, product costing, performance evaluation and ABC. Even though it is vital to pursue EM initiatives, MA systems of most companies have not been improved for the purpose of considering environmental costs and related performance measures. Consequently, although listed companies are able to reasonably identify and measure environmental-related costs, company management has paid less attention to and shown less capability in planning EM activities and taking action, largely because they do not have an appropriate accounting system and there is a deficiency of know-how and the requisite infrastructure. The lack of attention by listed companies may largely be due to their belief that government authorities take responsibility for planning and initiating all required EM measures on their behalf.

The following sections present (1) significant findings and conclusions, (2) recommendations for business entities to overcome weaknesses identified and to improve systems, procedures and policies implemented in relation to MA practices and to EM initiatives for protecting the environment, (3) implications of the thesis, (4) limitations of the study, with suggestions for future research, and (5) overall conclusions and recommendations.

7.2 Significant Findings and Conclusions

The major findings stem from two analysis chapters, Chapters Five and Six. Chapter Five elaborates the nature and extent of MA practices, focusing on selected traditional and modern MA techniques. Chapter Six focuses on EM measures initiated and strategies applied by the sampled companies to protect the environment, while also tracking motivating factors behind them, such as complying with legislation and survival of their businesses. The chapter then investigates the contribution of MA practices and associated challenges or problems in addressing EM issues of listed companies and the internal and external factors affecting them. This section continues to summarise the major findings and derive conclusions on these concerns in relation to three main phases that cover the primary research question, as follows.

7.2.1 The Nature and Extent of MA Practices

MA systems, staff involved and their views on MA practices

The findings show that all companies use both a MAS and FAS, generally integrating them at particular levels (in some instances, a MAS acts as a subsystem of a FAS), depending on the companies' information requirements and the facilities available to them. However, they all typically rely on MASs in obtaining information for making decisions relating to routine planning and control activities. Findings are that the majority (73.8%) function with management accountants and the remainder with financial accountants. Under such arrangements, finance executives and accountants of most of the companies generally take the view that they handle their accounting systems well under the close supervision of a SM, such as a finance director or chief financial controller. This therefore suggests that listed companies are experiencing sound MA systems and practices in the case of routine planning and control activities. It further concludes that, even though Sri Lankan listed companies are functioning with sufficient resources and are well-equipped when it comes to staff required in any adoption of modern MA techniques, such as ABC and the BSC; some still do not see a need to adopt these, because they are satisfied with existing MA systems and applications.

The nature and extent of MA practices adopted in listed companies

The findings demonstrate that traditional MA techniques are still more popular (adoption in 94% of the sample) than modern MA techniques (adoption by 57%) among

listed companies in Sri Lanka, in a situation where they are all practising both types of techniques at a satisfactory level. Despite the above average application of modern MA techniques, no company has adopted the JIT system, possibly due to its inappropriateness in the Sri Lankan business environment. These findings support the literature: for example, Hyvonen (2005), Angelakis, et al. (2010), Chenhall and Langfield-Smith (1998), Waweru, et al. (2005), Sulaiman et al. (2004), and Abdel-Kader and Luther (2004). Findings show that listed companies tend to adopt more than one costing system by incorporating both traditional and modern MA techniques as complements or alternatives to one another, depending on their specific requirements, differing costing purposes and the interest of management. TCAS seems to be the most popular costing system in both situations: as a sole costing system and as a combination with other costing systems. The most popular combination is the application of TCAS with an ABC system. This argues that, in most instances, these two techniques can be suitably applied to any type of business processes to produce the information required for costing purposes. Such a combination may be attributed to sophistication in applying rather complex systems in total, such as ABC as a complement, and a need to ensure the accuracy of costs derived through traditional systems, as an alternative. Companies who apply multiple costing systems, including job costing, process costing and batch costing, mostly represent diversified companies with a range of products and also companies with products of a specific nature (typically, here, garments).

Moreover, in relation to different industry sectors, specific characteristics can be identified in the application of MA techniques in each sector. The PLT sector is highlighted in this respect, due to the specific nature of the industry and markets served. For example, all in the PLN sector apply ABC and ABB, whilst the other four sectors practise them at moderate level or below. In turn, irrespective of the 100% application of the product pricing technique by other sectors, pricing decisions in the PLN sector are affected by factors outside the control of individual companies, so that they have to rely on prices determined at auctions. Such specific circumstances surrounding the application of MA techniques might owe their origins to the establishment of the sector in Sri Lanka during the colonial period, under British rule.

The findings suggest that any company, irrespective of its industry sector, would be likely to apply traditional MA techniques, such as BUD, STD, PC and PE, due to their necessity, simplicity and less costs that are involved, rather than most modern MA

techniques, such as target costing, BSC. The findings conclude that business firms would have more freedom and/or choice in adopting modern MA techniques rather than traditional MA techniques. This trend is confirmed with high variations shown in the level of application of modern MA techniques (SD: 0.174; and CV: 31.812) compared to that of traditional MA techniques (SD: 0.064; and CV: 6.961), not only between techniques but also between companies/industry sectors. It also concludes that, normally, traditional MA techniques, such as BUD, STD, PC, PP and PE (except for specific situations like the PLN sector), appear to be essential for any type of business entity to apply in achieving its targets, because most of these techniques are directly linked with normal business functions.

Further, there is a tendency to apply modern MA techniques (BSC, BM and ABC) by large or multinational companies (sometimes acting as market leaders) that mostly enjoy a greater reputation for their brands in local and foreign markets and serve, in particular, international markets. This trend might be due to their greater importance and the challenges faced in creating a competitive advantage in operating in such complex, lengthy business processes and markets. The findings conclude that, consistent with most of the literature, traditional MA techniques remain popular in Sri Lanka, irrespective of the sector, principally due to their necessity and relevance to any type of business, the lower costs associated with them and simplicity in applying them, as compared with modern MA techniques.

The findings thus conclude that listed companies in Sri Lanka are capable of adopting any of the most appropriate MA techniques, whether traditional or modern, by applying precise systems or approaches and making changes or modifications to them as required, and compatible with their own purposes, policies, product lines and associated processes, structures, market positions, and the specific nature and conditions of the industry sector and the markets served. The study concludes that listed companies are satisfied with the MA practices adopted, regardless of whether they are traditional or modern techniques, because they could achieve their goals and targets satisfactorily through such practices. The findings thus conclude that it is important to examine, and justify, whether business entities are capable of adopting certain MA techniques through making adjustments and improvements, and following specific paths that accord with their own purposes, structures, requirements, specific circumstances and accompanying restrictions, and hence that they can ensure the achievement of intended

outcomes, rather than focusing on whether they have chosen traditional or modern MA techniques.

7.2.2 EM Considerations and Actions of Listed Companies, and Related Motivating Factors in the Sri Lankan Context

The findings show that, aside from global pressure, Sri Lanka itself has realised the importance of protecting the environment whilst development projects and industrial activities are in train. This can further be confirmed by reviewing environmental-related laws, regulatory measures and SLS ISO EMS standards that are structured and practised in Sri Lanka for environmental protection. Of these, the NEA is the most important umbrella law for addressing a variety of environmental matters; other laws deal with specific aspects of the environment. The CEA, administered by the MoE, is the key central government body empowered by the NEA to regulate for preserving the environment and minimising pollution. Moreover, Sri Lanka has been able to initiate and implement a number of policies and strategies under the NEAP towards SD which considers environment protection as important as economic and social development.

Findings reveal that all companies should take appropriate EM measures at each stage of the business process, by motivating legitimately with environmental legislation such as NEA and enthusiastically with standards i.e. SLS ISO 14001: 2004 EMS certification and accreditation. Sometimes these EM actions are influenced by internationally made agreements and collaboration, such as Fairtrade Certification and Ethical Tea Partnership. Through such motivation and action, management of listed companies has an understanding of environmental impacts of their business processes and on possible EM measures to be applied against pollution in accordance with legislation and standards. However, in most instances as yet, there exist gaps and deficits among personnel in companies in terms of knowledge, experience and understanding of environmental impacts and ways of planning and monitoring EM measures. This tendency appeared in undertaking EM measures and related deficiencies experienced by personnel involved in, is largely affected positively and negatively by CEA's involvements in planning and regulating EM initiatives, measuring EM performances of companies, and taking appropriate action under the EPL and SWML procedures.

Findings suggest that all steps in the business process (Table 6.3) contain a level of environmental impacts, and demonstrate a greater impact on planning, design, machine

set-up and the production process than on other stages. With reference to the three stages considered in the analysis that covering all these steps in the business process, the findings suggest that Sri Lanka is capable of mitigating such impacts to a greater extent by mostly applying IEE/EIA procedures, EPL procedures at the planning stage, noise control regulations at the pre-implementation stage, and EPL and SWML procedures at the implementation stage. These findings agree with those of Zubair (2001).

This suggests that stage I (planning) is the most influential and critical, because the decisions and actions taken (by granting approval for industrial proposals) involve adverse life-time environmental impacts, since they arise from unsound decisions. The main concern at stage II is to control noise effects inside and outside the manufacturing plants in accordance with regulations. Companies also consider what action they might take in setting up machines and surroundings, so as to justify effective utilisation of resources (materials, energy) and thus minimise costs. When considering the extent of EM measures, these show greater extensiveness at the implementation stage than at previous stages.

However, the impact and length of EM measures required at each stage largely depend on the nature of the business (environmental potential), showing a greater extent in the case of environmentally highly sensitive businesses, such as in the PLN and CHEM sectors; other sectors demonstrate variations between companies, because each sector consists of companies with different environmental potential – high, moderate or low.

Moreover, the study reveals that almost all companies periodically measure their sustainability performance in relation to economic, environmental and social aspects. And they present their EM-related and CSR activities together in their annual reports, thereby assuring the public that they are moving towards green businesses while continuing to meet customer needs. These findings are supported by those of De Mel and Sirimanne (2009) in the same context. With regard to environmental performance, as mentioned above, listed companies are assisted by frequent CEA evaluations, in addition to their own. These reporting practices are supported by the NGRS, initiated by the MoE in 2011. There appears to be a trend in listed companies to incorporate such EM considerations and actions into their mission, vision, objectives, policies and core values. Thus, through such EM measures, and strategies and reporting proactive stances and achievements to the public, listed companies strongly believe that this exercise

considerably influences in creating a positive company image, hence ensuring survival of the business.

Such a commitment by Sri Lankan companies to such EM initiatives and strategies can be further demonstrated by the absence of violations of EPL conditions and, as far as this study could determine, absence of any EPL cancellation. This study concludes that such actions lead to avoidance or minimisation of the causes and extent of pollution in proposed industrial activities to a greater extent, from the preliminary stage before starting a business and then also throughout the business process. Thus, it concludes that all these attempts by government authorities and companies confirm that they are moving towards green businesses. Motivating factors behind such EM initiatives are principally compliance with legislation (always locally and sometimes internationally in law and any agreements), creating a positive image for the entity and survival of the businesses through obtaining or working towards EMS certification and accreditation. This trend can further be shown in the companies' environmental reporting practices.

Moreover, the study concludes that companies are motivated to take such initiatives because they have realised that these lead to maximum utilisation of resources (energy, water and materials) and hence produce savings to the company while also preserving natural resources for society. In some instances, it has identified where company management has initiated its own energy savings projects and other EM measures beyond any requirements in law or standards. Findings conclude that this trend is mostly due the particular interest, specific knowledge and experience of the top management, such as the chief executive officer, the availability of expertise in the field and availability of resources and infrastructure. These initiatives mostly appear in the PLN and CHEM sectors but rarely in other sectors.

The findings relating to motivation for EM action are supported by the literature (Bennett & James, 1997; Wilmshurst & Frost, 2001; UNDSO, 2001; Tilt (1997); Schaltegger and Burritt (2010); Vasile and Man (2012). In addition, findings on environmental reporting practices are consistent with those of Frost and Wilmshurst (2000) and Kokubu and Nashioka (2005); however, Tilt (2001) presents a different view in the case of Australian public companies, which give a lower priority to external than internal reporting on the environment.

7.2.3 The Involvement of MA Practices in Responding to EM Issues of Listed Companies

Findings suggest that environmental cost categories examined in this study, as outlined by IFAC (2005), mostly relate to EM actions at the implementation stage and to a lesser extent the pre-implementation stage, but have no connection with the planning stage. Thus, the study concludes that the involvement of MA practices in responding to EM issues can be investigated mostly through linking them with stage III, where the majority of EM initiatives fall.

In managing environmental costs, because no sampled company has established an EMA system; they all depend on MA and FA systems, mostly integrating them at some level, although these have been designed predominantly for routine business activities, not for managing environmental costs. Consequently, this leads to lower potential and some challenges for most companies in responding to EM issues via their current MA systems. Thus, the findings show that, even though it is essential to take EM initiatives to prevent and control pollution, the MA systems of most companies have not been improved accordingly to incorporate environmental costs and related performance measures that are required for any business entity in effectively addressing EM issues. Schaltegger and Burritt (2000) similarly argue for the importance of designing a MA system in such a way as to better respond to EM issues under the same conditions.

These deficiencies in MA systems lead to challenges and lower management capability in most companies in identifying EM initiatives and planning and implementing them by measuring associated costs, savings and earnings. Such a lesser capability is further influenced by the lack of expertise in the field, a lack of awareness, and the existence of a knowledge and communication gap among the staff. It also reveals rather less potential for the measuring success level of EM initiatives undertaken via MA systems. Furthermore, such lower potential that appeared in measuring performance is due to firms' not establishing EM-related performance measures.

All these practices are further affected by the CEA's involvement in identifying, planning and regulating EM initiatives, and measuring and reporting environmental performance of listed companies through EPL procedures and other related actions. The study concludes that listed companies mostly depend on CEA involvement and feedback, because through such evaluation companies can justify their achievement in meeting EM requirements, managing the business in compliance with legislation, which

is considered the most influential factor for all companies in responding to EM issues. This trend influences listed companies in paying less attention to MA systems in handling EM measures and managing associated costs.

However, compared to other sectors, the PLT sector has shown greater ability in this regard, applying suitable EM strategies and taking actions as an industry that deals with agricultural products and with international markets. Such a greater ability in the PLN sector is influenced by their full application of modern MA techniques (ABC, ABB) and greater involvement in managing environmental costs because it is a sector with high environmental potential and with international collaboration and agreements. Consequently, PLN companies are more capable of addressing EM issues more effectively, facilitated by appropriate MA systems, than are other sectors. The CHEM sector has also shown a somewhat greater ability in this regard, mostly due to the same factors. However, in some settings, just like most companies in other sectors, PLN companies also do not consider environmental costs separately from other costs.

Consequently, the findings suggest that, compared to their role in routine business activities, MA techniques have been accorded less importance and ability, and hence a lower level of usage, in companies managing their environmental costs. However, the study concludes that MA techniques such as budgeting, standard costing, product costing, ABC, ABB and benchmarking can make a greater contribution in addressing EM issues, but a lower contribution by applying Kaizen costing, BSC, transfer pricing and JIT systems. Even though responding companies have not established PE systems for EM initiatives, it is clear that PE techniques can also make a greater contribution in handling EM initiatives effectively.

The study determines that, in performing EM initiatives, listed companies in Sri Lanka normally give priority to complying with environmental legislation, standards and procedures, all of which are more concerned with the quality of output than with associated cost impacts (see Table 6.13), and thus they may pay less attention to incorporating such environmental costs into their MA systems or establishing appropriate MA/EMA systems that are capable of providing information required for managing environmental costs precisely. Schaltegger and Burritt (2000) agree. Such a very considerable commitment by all responding companies can be further demonstrated by the absence of EPL violations and cancellations.

7.3 Recommendations for Business Entities

- Actions are needed to improve awareness among all personnel on environmental impacts in handling business activities for a desired outcome. Also, awareness needs to be improved in the workforce on appropriate mechanisms that can be used to identify and measure such impacts and related costs, and to take control measures in terms of actions and strategies to prevent and control environmental pollution. All personnel need to be convinced of the necessity of conforming to relevant legislation, standards, policies and procedures.
- In order to improve awareness of these concerns, the study proposes the following: conducting awareness programs and workshops; displaying notices in the workplace and emailing employees with specific messages on protective and control actions or strategies to reduce environmental impacts and means of minimising wastage and increasing energy savings, and the targets to be achieved; and ensuring participation of relevant personnel in training programs and workshops outside the company at national and international level, while stressing the importance of EM in the present-day business world.
- It also recommends establishment of ‘cross functional teams’ in business entities to handle EM activities that can more easily regulate the function effectively because the teams incorporate expertise in fields such as technical, environmental, accounting, production and quality improvement. The results of the study show that few companies operate with such cross functional teams in managing their environmental costs.
- It further suggests establishment of ‘energy management teams’ in order to search for and implement energy saving mechanisms or projects and to encourage them to work towards creating green businesses.
- It strongly recommends designing MA/FA systems that consider EM actions and associated costs and, if possible, establishing EMA systems to facilitate the function should be encouraged. There also need to be proper performance evaluation systems that combine routine business activities with EM activities.

In this respect, it suggests establishing KPIs and modifying them as and when required, considering changes in the business processes and markets, and specific situations and requirements; thus they can effectively measure real performance of all functions and of personnel responsible. This study reveals that such specific KPIs are more appropriate for the PE function than commonly used measures such as ROI, ROS or sales volume. Further, better performance would follow if this was complemented by rewards systems or penalties, including for environmental performance.

- There needs to be specific consideration by management about improving systems so as to identify and measure environmental costs, and accordingly identify suitable EM activities, and plan and implement them in order to prevent or control pollution. Systems enabling the management to evaluate the success level of such EM initiatives and identify factors affecting them that lead to taking corrective action need improvement. For this function, it is proposed that companies review their existing EMSs and accounting systems periodically, considering environmental aspects and requirements as well as their normal business activities, and improve systems appropriately for functioning in a green environment.
- It is recommended that all business entities incorporate environmental aspects into their mission, goals and objectives, and company policies, and motivate their workforce towards achieving them. The results show that most companies tend to consider such issues and values and include them in their annual reports.
- Finally, it is recommended to assign EM responsibility to all employees in the business entity where it appears feasible for them to take and manage EM actions, because in this respect a team effort would be more realistic and effective than reliance on specific personnel or group attempts: environmental impacts may derive from actions of anyone in a company or the society and also affect them all without being bounded internally in or externally to the business entity.

7.4 Implications of the Thesis

Although some research has been undertaken relating to EMA practices, the literature review revealed that the least attention has been paid to investigating MA practices and their incorporation in addressing EM issues. In this regard, no studies were found in the literature relating to a developing country, Sri Lanka. Therefore, it appears to be the first study exploring the integration of MA practices and responses to EM issues empirically in the Sri Lankan context, and perhaps in other developing countries too. Therefore, this thesis, based on an empirical study, makes a contribution to the literature, to practical knowledge on the phenomena under investigation and to consideration of the research methods to be applied, and also to particular firms investigated which represent five industry sectors, and to policy makers for making decisions in their respective arenas more specifically, as outlined on the following phases.

7.4.1 Theoretical Implications

This study contributes to the literature on how and why different industries apply MA techniques, sometimes with modifications, in accordance with their own purposes and circumstances. In turn, it contributes to exploring why different companies/industries cannot apply certain MA techniques and thus proposes alternatives for them. Importantly, this study makes a considerable contribution to the literature by ascertaining categories of environmental costs derived through industrial activities, and strategies applied and actions taken towards managing them by incorporating MA systems.

7.4.2 Contribution to Knowledge on MA Practices and their Involvement in Resolving EM Issues

MA practices

This study provides an understanding on different ways and approaches to be followed in applying MA techniques by listed companies in different industry sectors operating under different organizational/ industrial contextual influences and social structural influences. Moreover, it provides knowledge on non-applicability of certain MA techniques for particular companies/industry sectors due the specific nature of their

businesses, markets, market positions and agreements, and therefore provides further understanding on alternatives that should be followed in handling such functions and their eventual impact: for example, non-applicability of product pricing methods for the PLN industry and thus considering the prices determined at respective auctions for pricing decisions. Accordingly, this research provides insight into the importance of exploring the appropriateness, specific manners and reasons for applying or not applying certain MA techniques for particular companies/industry sectors rather than exploring how many of them apply or do not apply certain MA techniques or methods: for example, application of different methods for product pricing decisions by different companies/industries based on their specific nature of products and markets.

EM issues and involvements of MA practices in managing environmental costs

This thesis initially contributes to the knowledge on environmental impacts and issues associated with industrial activities, and on strategies to be applied and initiatives to be pursued by industries to prevent and control environmental pollution while managing related costs, and the motivating and legislative factors affecting such responses. This study could further provide considerable contribution to the knowledge on types of environmental costs that could be identified relating to industrial activities and ways of managing them by incorporating with existing MA/FA systems. Moreover, this thesis convincingly argues for the importance of considering EM issues, taking actions and applying strategies by industries in complying with legislation, standards, policies and procedures in any country towards protecting the environment. It also provides insights on the level of importance and appropriateness of applying certain traditional and modern MA techniques in addressing EM issues, compared to routine planning and control activities of business entities. It further adds to understanding on problems and challenges faced by industries with their MA systems in addressing EM issues and in handling normal business functions, and internal and external factors affecting them.

7.4.3 Contribution to Knowledge on the Application of MMR Approach for MA Research

This study provides understanding on the application of the MMR approach in addressing research questions associated with quantitative and qualitative characteristics by means of required data, methods of collecting and analysing data, so

as to provide complete descriptive analysis and substantial findings and hence reach sound conclusions on the phenomena under investigation. This helps researchers understand means of presenting, analysing and interpreting both quantitative and qualitative data more effectively in the context of MMR design. It also provides insights to researchers in determining how and at which point of interface to integrate core and supplemental components properly, to obtain desired outcome in terms of meaningful interpretations and findings in the context of MMR design by maintaining validity and reliability adequately.

7.4.4 Implications for Business Firms in the Industries and for Policy Makers

This thesis provides insights and directions to business entities with justifications and examples from different industries for examining relevancy, importance, and applicability or non-applicability of MA techniques for them, if applicable, the different approaches to be followed and factors to be considered in such applications, and, if not, alternatives to be followed, in accordance with their own setup, requirements, specific circumstances in the business processes, and other involvement and agreements made within the company or industry sector and outside collaborations in relation to markets both at the national and international level.

Moreover, this thesis contributes to relevant companies/business entities by providing understanding with evidence on how to identify and manage environmental costs associated with their businesses, by incorporating existing MA/FA systems. It shows business firms the increasing importance of considering EM issues and taking actions to resolve them, in complying with environmental legislations, standards, policies and procedures structured in the country, so as to survive in the highly competitive business world, while also securing a good image for their brands. Together, they can recognise appropriate EM measures and strategies to be applied and their implications in achieving business goals.

Further, this thesis encourages the management of those entities to improve awareness among environmental managers, accountants, technicians, functional managers and executives regarding EM issues and essential preventive and controlling measures to be applied, and their implications in terms of savings costs, earning revenues, expanding market share and improving quality of products or businesses and hence ensuring survival of businesses with a positive image. Such initiatives help them to strengthen

the relationship among those personnel who are essential for managing environmental costs properly ensuring higher performance for the entity. Moreover, this study provides some insights and inspiration for management of companies to improve their existing MA/FA systems or establish EMA systems and considering EM costs, which could enable them to manage environmental costs suitably. In addition, this thesis will provide some guidance to relevant authorities and policy makers to prescribe suitable regulations, policies, measures towards protecting the environment and ensuring sustainable development of businesses and the country.

In summary, the thesis makes a considerable contribution to the empirical literature, to knowledge on the phenomena under *investigation* and on the application of MMR design for MA research, and also to business entities and policy makers by providing valuable findings, directions, evidence and justification, covering different industry sectors and the important aspects to be considered in the context of MA practices and EM considerations and actions. Overall, this thesis provides directions to scholars with required evidence and justification to undertake further research on the phenomena under consideration.

7.5 Limitations of the Study with Suggestions for Future Research

Two major types of limitations, theoretical and practical, were encountered, although these limitations do not undermine the overall validity and reliability of findings of this study.

Theoretical limitations

This study mainly investigates the internal impacts of EM issues that relate to economic impacts (costs) of a business entity, so that it provides insights for researchers who choose to focus on external (societal) impacts of such issues and the role of management in addressing them.

The study does not focus on examining the appropriateness and adequacy of legislation, standards, policies and procedures in Sri Lanka, or their deficiencies, in considering EM issues and taking measures to protect the environment. Thus, there is room for future research to explore these aspects in the same or different contexts.

Practical limitations

This study is limited to five industry sectors out of twenty listed on the Colombo Stock Exchange as at 30 April, 2012, and thus there is a need to focus on other industry sectors to explore whether there have been any similarities or differences or specific situations in those sectors in regard to the phenomena under consideration.

This study also covers medium and large business entities, because all listed companies represent these two categories, but there are a number of small business entities in Sri Lanka that contribute strongly to gross domestic product (GDP). Thus there is a need to continue investigations on the same research area in the same context but focusing on the small business sector.

It would be valuable to undertake case studies to investigate the types of environmental costs associated with different industries and how to improve their accounting systems by incorporating such environmental costs in order to address EM issues precisely.

The study also encourages researchers to undertake the same approach in relation to other developed and developing countries where different socio-economic and environmental circumstances apply with relevant legislation, different resources and different geographical locations.

7.6 Overall Conclusion and Recommendation

Traditional MA techniques remain popular in business entities in Sri Lanka. Companies have realised from experience that they can adopt these techniques in their decision-making processes by making adjustments and modifications, and by applying different approaches, in accordance with their own systems, structures, requirements, specific circumstances and other involvements and agreements that are relevant to the industry sector and market nationally and internationally, and hence achieve their intended determinations. This does not mean that modern MA techniques may not have such capabilities and flexibilities for adopt by firms. The study concludes that it is important to focus instead on whether particular MA techniques, either traditional or modern, are applicable for a particular entity or industry sector, and, if so, to explore which modifications are needed and which approaches are to be followed in applying them, so as to provide any requisite information more effectively, rather than examining the

possibility of adopting specific MA techniques (with more attention to modern techniques) to satisfy intended requirements.

The study determines that, in performing EM initiatives, listed companies in Sri Lanka normally give priority to complying with environmental legislation and EMS standards and procedures, which are more concerned with the quality of output than with associated cost impacts (Table 6.13). In addition to fulfilling these requirements, the major motivating factor behind this practice is their belief that such compliance is of utmost importance for their business survival in a competitive world through securing a good image for the entity and its brands. Thus they have paid less attention to managing environmental costs by incorporating them into MA systems or by establishing EMA systems, or rely on information provided by such accounting systems in addressing EM issues. The major reasons for such responses are lack of awareness among staff involved (accountants, technicians), a lack of expertise in the field (environmental managers), and a lack of appropriate PE measures for EM initiatives (KPIs).

Finally, this study argues for developing a suitable MA/EMA system for companies that is capable of addressing EM issues effectively, in addition to assisting routine planning and control decisions. Moreover, it suggests creating suitable organisational systems to improve awareness in the company workforce on the importance of protecting the environment from pollution, applicable control measures and the procedures to be followed in applying such measures, and on the practicality of MA systems in effectively handling such ecological issues, which are the subject of great concern globally today. It is further recommended that business entities assign EM responsibility to all employees through a sound monitoring system, because this will be more realistic and effective than assigning the responsibility to individuals or a group, since environmental impacts may derive from actions of anyone in a company or society and are unbounded.

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Important legislation, laws and authorities, in charge of supervision, regulation and/or enforcement in Sri Lanka

Laws and what they cover	Authority in charge of supervision, regulation and/or enforcement
<p>National Environmental Act No.47 of 1980 (as amended by Acts No.56 of 1988 and 53 of 2000) and the Regulations under the Act.</p> <p>Establishes the Central Environmental Authority (CEA) and defines its powers, functions and duties. Provides overall environmental protection legislation, including licensing procedures, environmental standards and project approval procedures.</p>	Central Environmental Authority
<p>Fauna and Flora Protection Ordinance No. 2 of 1937 (as amended by Act Nos.49 of 1993, 12 of 2005) and the Regulations under Ordinance.</p> <p>Provides for the conservation of plants and animals, which have been declared as protected species. Empowers the Minister to declare any area of State Land as a National Reserve or Sanctuary.</p>	<p>Department of Wildlife Conservation,</p> <p>Director General of Wildlife Conservation</p>
<p>Forest Ordinance No.16 of 1907 (as amended) and the Rules and Regulations under the ordinance.</p> <p>Consolidates the laws relating to forests and to the felling and transportation of timber. Empowers Minister to declare any area of State land as a Reserved Forest, Conservation Forest or a Village Forest.</p>	Forest Department, Conservator General of Forests
<p>Mahaweli Authority of Sri Lanka Act No.23 of 1979 (as amended) and the Regulations under the Act.</p> <p>Established the Mahaweli Authority of Sri Lanka and provides for the conservation and maintenance of the physical environment of Mahaweli Area, including watershed management, soil erosion and the protection of reservation areas.</p>	Mahaweli Authority of Sri Lanka
<p>State Lands Ordinance No. 8 of 1947 (as amended) - Parts VI, VIII, IX.</p> <p>Provides for how State Lands and their resources, including lakes rivers and streams, should be allocated, used and managed. Also provides for the declaration of State reservations.</p>	Ministry of Agricultural Development, District Secretaries
<p>Mines and Mineral Act No. 33 of 1992 Regulates mining, exploitation, processing, trading and export of minerals.</p>	Geological Surveys and Mines Bureau
<p>Irrigation Ordinance No.32 of 1946 (as amended) – Part VI.</p> <p>Deals with environmental aspects of water, irrigation and land use in irrigated agricultural activities.</p>	Irrigation Department
<p>Water Resources Board Act No. 29 of 1964 (as amended).</p> <p>Establishes the Water Resources Board and sets out its duties, which include promotion of afforestation, preventing the pollution of rivers, streams and the other water courses, and formulation of national policies relating to the control and use of water resources.</p>	Water Resources Board

<p>Coast Conservation Act No.57 of 1981 (as amended)</p> <p>Identifies Coastal Zones and regulates activities within such zones.</p>	<p>Coast Conservation Department, Ministry of Fisheries and Aquatic Resources</p>
<p>Marine Pollution Prevention Act No.35 of 2008</p> <p>Provides for the prevention, reduction, and control and management of marine pollution in the Territorial Waters of Sri Lanka, any other maritime zone, the foreshore and the coastal zone of Sri Lanka. Also provides for the establishment of the Marine Environment Protection Authority.</p>	<p>Marine Environment Protection Authority</p>
<p>Fisheries and Aquatic Resources Act No. 2 of 1996 (as amended)</p> <p>Makes provision to protect and conserve fisheries and aquatic biodiversity in marine and freshwater areas, for the declaration of fisheries reserves and imposes licensing and registration requirements with regards to fishing. Defines the terms 'Sri Lankan Waters'.</p>	<p>Ministry of fisheries and Aquatic Resources, Directors of Fisheries and Aquatic Resources</p>
<p>National Heritage Wilderness Areas Act No. 3 of 1988</p> <p>Provides for the declaration, protection and preservation of any area of State land with unique ecosystems, genetic resources or outstanding natural features as National Heritage Wilderness Areas.</p>	<p>Forest Department, Ministry of Agricultural Development</p>
<p>Soil Conservation Act No.25 of 1951 (as amended).</p> <p>Provides for the conservation of soil resources, mitigation of soil erosion and the protection of lands against flood and drought.</p>	<p>Ministry of Agriculture Development</p>
<p>Plant Protection Act No. 35 of 1999.</p> <p>Provides for the prevention of wild plants, weeds and plant diseases and controls the introduction of new plant species.</p>	<p>Department of Agriculture</p>
<p>Felling of Trees (Control) Act No.9 of 1951 (as amended)</p> <p>Provides for the prohibition, regulation and control of the felling of specified three species, including cultivated tree species such as Jack.</p>	<p>Forest Department, Ministry of Agricultural Development and Agrarian Services</p>
<p>Flood Protection Ordinance No. 4 of 1924 (as amended)</p> <p>Provides for the protection of areas from flood damage and empowers the Director of Irrigation to declare any areas as a flood area.</p>	<p>Ministry of Irrigation and Water Management, Director General of Irrigation</p>
<p>Water Hyacinth Ordinance No. 4 of 1909</p> <p>Provides for preventing the importation, introduction into and dissemination in Sri Lanka of the plant known as Water Hyacinth.</p>	<p>Department of Agriculture, Sri Lanka Customs</p>
<p>Control of Pesticides Act No. 33 of 1980 (as amended)</p> <p>Provides for the licensing and regulation of the import, packing labelling, storage, formulation, transportation, sale and use of pesticides.</p>	<p>Registrar of Pesticides</p>
<p>Atomic Energy Authority Act No. 19 of 1969</p> <p>Provides for the establishment of the Atomic Energy Authority, which is empowered to control and regulate the importation, exportation, production, acquisition, transportation, treatment, storage and disposal of radioactive materials.</p>	<p>Atomic Energy Authority</p>

<p>Health Services Act No. 12 of 1952 (as amended)</p> <p>Provides for the regulation of the environmental aspect of human health.</p>	Department of Health Services
<p>Municipal Councils Ordinance No. 29 of 1947 (as amended)</p> <p>Provides for the establishment of Municipal Councils and outlines their powers, duties and responsibilities in relation to the built environment and matters such as waste disposal and sanitation.</p>	Municipal Councils
<p>Urban Councils Ordinance No. 61 of 1936 (as amended)</p> <p>Provides for the establishment of Urban Councils and outlines their powers, duties and responsibilities in relation to the built environment and matters such as waste disposal and sanitation.</p>	Urban Council
<p>Pradeshiya Sabha Act No. 15 of 1987 (as amended)</p> <p>Provides for the establishment of Pradeshiya Sabhas and outlines their powers, duties and responsibilities in relation to the built environment and matters such as waste disposal and sanitation</p>	Pradeshiya Sabha
<p>Urban Development Authority Law No.41 of 1978 (as amended).</p> <p>Empowers the Urban Development Authority (UDA) to regulate and manage the urban environment.</p>	Urban Development Authority
<p>Sri Lanka Land Reclamation and Development Corporation Act No. 15 of 1968 (as amended)</p> <p>Empowers the Sri Lanka Land Reclamation and Development Corporation (SLLR&DC) to reclaim low-lying lands and wetlands.</p>	Sri Lanka Land Reclamation and Development Corporation
<p>Agrarian Development Act No. 46 of 2000 – Part II</p> <p>Provides for the utilisation of agricultural lands in accordance with agricultural policies, having regard to natural resources.</p>	Commissioner General of Agrarian Development
<p>National Aquaculture Development Authority of Sri Lanka Act No. 53 of 1988 (as amended).</p> <p>Establishes the National Aquaculture Development Authority of Sri Lanka and provides for the development of aquatic resources.</p>	National Aquaculture Development Authority
<p>Sri Lanka Sustainable Energy Authority Act No. 35 of 2007</p> <p>Establishes the Sri Lanka Sustainable Energy Authority and provides for the development of renewable energy sources and the implementation of energy efficiency measures and conservation programmes.</p>	Sri Lanka Sustainable Energy Authority
<p>Code of Criminal Procedures Act No. 15 of 1979 (as amended) – Section 98 and Section 261 of the Penal Code (as amended).</p> <p>Provides for the removal or abatement of public nuisances.</p>	Police
<p>Nuisances Ordinance No. 15 of 1862 (as amended)</p> <p>Provides for the preservation of public health and the suppression of various types nuisances.</p>	Urban Council, Municipal Council and Pradeshiya Sabhas Police

Source: De Mel & Sirimanne (2009, pp.28-31)

Appendix II

Policies, strategies and action plans related to the environment and associated institutions

Subject area	Policy, Strategy or Action Plan	Relevant institution
Air	National Air Quality Management Policy (2000) Clean Air 2015 Action Plan for Air Quality Management (2007)	Air Resources Management Centre MENR
Biodiversity	Biodiversity Conservation in Sri Lanka: A Framework of Action (1998) Forestry Sector Master Plan-to translate policy strategies into action (1995-2020) Invasive Plants Action Plan National Biosafety Policy (2005) National Forestry Policy (1995) National Policy on Elephant Conservation and Management (2006) National Wetland Policy and Strategy (2006) National Wildlife Policy (2000)	Department of Wildlife Conservation Forest Department CEA MENR
Cleaner Production	National Policy and Strategy for Cleaner Production (2005)	MENR
Climate change	Climate Change Policy National Climate Change Action Plan National Policy on Clean Development Mechanism National Strategy for Clean Development Mechanism	MENR
Disaster	National Disaster Management Policy (2008) National Disaster Management Action Plan (1999)	Disaster Management Centre Ministry of Disaster Management and Human Rights
Energy	National Energy Policy and Strategies of Sri Lanka (2008)	Ministry of Power and Energy
Environment and sustainable development	Caring for the Environment 2003-2007: Path to-Sustainable Development (NEAP) Natural Environmental policy (2003) Sri Lanka Strategy for Sustainable Development (2008)	MENR
Land	National Land Use Policy	Ministry of Lands

Marine and coastal	Coastal Zone Management Plan (2004) National Fisheries and Aquatic Resources Policy (2006) Ten-year development policy framework of the fisheries and aquatic resources sector 2007-2016 (2007)	Coast Conservation Department Ministry of Fisheries and Aquatic Resources
Minerals	National Mineral Policy (1999) National Policy on Sand as a Resource for the Construction Industry (2006)	Geological Survey and Mines Bureau MENR
Ozone	Sri Lanka National Compliance Action Plan on Phasing-out Ozone Depleting Substances (2003)	MENR
Pollution and waste	National Implementation Plan for the Stockholm Convention on Persistent Organic Pollution (2006) National Industrial Pollution Management Policy National Industrial Pollution Management Strategy National Policy on Solid Waste Management (2002) National Strategy for Solid Waste Management (2002)	MENR Ministry of Science and Technology Ministry of Industries
Resettlement	National Involuntary Resettlement Policy (2001)	CEA MENR Ministry of Lands
Watershed	National Watershed Management Policy (2004)	MENR

Source: De Mel & Sirimanne (2009, pp. 38-39)

Survey Questionnaire

You are kindly requested to complete this questionnaire according to the instructions given and return the completed questionnaire to the postal address or to the e-mail address indicated at the end of the questionnaire.

If you feel that some questions could be better answered by someone else in your company, could you please pass the questionnaire on to him/her to complete.

Instructions: Please respond to all relevant questions in each part of the questionnaire by placing a tick in the brackets against the appropriate answer or by providing the required information, where necessary.

Part One: General Information

1.1 Name and address of your company (optional):

1.2 To which industry sector does your company belong? (As listed on the Colombo Stock Exchange-CSE)

- | | |
|-----------------------------|-----|
| Food, Beverage & Tobacco | () |
| Chemicals & Pharmaceuticals | () |
| Diversified Holdings | () |
| Manufacturing | () |
| Plantation | () |

1.3 For how long have your company been in operation?

- | | |
|----------------------|-----|
| Less than five years | () |
| 5 – 10 years | () |
| 11 – 20 years | () |
| 21 – 25 years | () |
| 26 – 50 years | () |
| Over 50 years | () |

1.4 To which of the scales below, does your company belong?

- | | |
|-----------------------------|-----|
| Large scale | () |
| Medium scale | () |
| Other (please specify)..... | () |

1.5 Does your company structure allow for the positions below relating to Management Accounting (MA) practices and Environmental Management (EM) activities?

(Please tick all relevant positions and place an asterisk (*) in front of your position)

- | | |
|-------------------------------------|-----|
| Financial Manager | () |
| (Chief) Financial Controller | () |
| Chief Financial Accountant | () |
| Financial Accountant | () |
| Management Accountant | () |
| Cost Accountant | () |
| Assistant Accountant/s | () |
| Environmental Management Accountant | () |
| Environmental Manager | () |

Part Two: Management Accounting practices

2.1 Budgeting

I) State the forecasted time period for each component, your company use when preparing budgets.

	Monthly	Quarterly	Semi-annually	Annually	Beyond one year
Budgeted income statement	()	()	()	()	()
Budgeted balance sheet	()	()	()	()	()
Budgeted cash flow statement	()	()	()	()	()
Operating budgets	()	()	()	()	()
Capital expenditure budgets	()	()	()	()	()

II) Which of the following best describes your company's budgeting process?

a) Budgets are prepared annually, illustrating figures as indicated above, and then implemented	
b) Budgets are initially prepared for 12 months and revised quarterly/monthly in accordance with anticipated changes, and then implemented	
c) Other (please specify).....	

III) Activity Based Budgeting (ABB) has recently been suggested as an alternative approach to conventional budgeting. Please indicate which of the following statements is most applicable to your company.

- a) ABB has been introduced ()
- b) It is intended to introduce ABB ()
- c) Some consideration has been given to introduce ABB in future ()
- d) A decision has not been taken to introduce ABB ()
- e) Discussions have not taken place on introduction of ABB ()

IV) To what extent are the following techniques used in forecasting **budgeted sales**?

	<i>Never</i>	<i>Rarely</i>	<i>Sometimes</i>	<i>Often</i>	<i>Always</i>
a) Statistical Forecasting					
b) Market research					
c) Subjective estimates- based on staff experience					

V) When preparing operational budgets you:

(You may tick more than one)

a) Take the previous year's budget as a base and adjust costs and revenues based on possible changes in the relevant year	
b) Reset all budgets to zero and estimate all activities/items independently	
c) Look at different activities performed in the company and then estimate costs/ revenues for each activity	
d) Others <i>(Please specify)</i>	

VI) Please rate the importance of budgeting in each of the following as applicable to your company.

Functions	High	Moderate	Low	Unimportant
a) Planning activities	()	()	()	()
b) Communicating business activities	()	()	()	()
c) Coordinating activities across business units	()	()	()	()
d) Allocating resources for day-to-day operations	()	()	()	()
e) Authorization	()	()	()	()
f) Control	()	()	()	()
g) Performance evaluation	()	()	()	()
h) Motivation	()	()	()	()

2.2 Standard Costing

I) Does your company currently use a standard costing system? Yes () No ()

II) **If yes**, indicate the use of following bases in setting standards:

Item	Past records	Forecast costs & prices	Engineering studies	Other bases <i>(Please specify)</i>
Direct materials				
Direct labour				
Overheads				

III) How frequently are standards or standard costs normally revised?

Weekly () Monthly () Quarterly () Semi-annually ()
 Annually () When required () others *(please specify)*.....

IV) How frequently are variances analysed?

Daily () Weekly () Monthly () Quarterly ()
 Semi-annually () Annually () Others *(please specify)*.....

V) In analysing variances, does your company consider **ex-post variance analysis approach** (i.e. compare actual results with adjusted standards based on changed conditions/ environment in which managers actually operated during the period)? Yes () No ()

VI) Please rate the importance of standard costs and variance analysis information for each of the following as applicable to your company:

	<i>High</i>	<i>Moderate</i>	<i>Low</i>	<i>Unimportant</i>
a) Planning(setting budgets)	()	()	()	()
b) Tracing costs to products (for inventory valuation and profit measurement)	()	()	()	()
c) Controlling costs & day-to-day operations	()	()	()	()
d) Decision Making	()	()	()	()
e) Evaluating (managerial) performance	()	()	()	()
f) Motivating individuals to achieve targets	()	()	()	()

2.3 Product costing.

I) Which of the following method/s does your company use for product costing?

- Traditional costing ()
- Activity based costing ()
- Batch costing ()
- Other (Please specify).....

II) Which of the following best describes the approach your company uses in splitting fixed costs and variable costs?

a) Statistical regression analysis	
b) Classification on a subjective basis based on managerial experience	
c) All overheads are classified as fixed costs and direct costs are classified as variable costs	
d) All overheads and labour costs are classified as fixed costs while material costs are classified as variable costs	
e) Other (Please specify).....	

III) What is the percentage of your company’s indirect cost to your total operational costs in the recent accounting period?%

IV) Which of the following **best** describes your costing system?

a) Only those costs that are directly related to the products are assigned to the products	()
b) Those costs directly related to the products and a proportion of the period/overhead costs are allocated to the products	()
c) All costs of the company are allocated to the products	()
d) Other (Please specify).....	

V) To what extent are the following criteria used in the process of assigning costs (Overheads) to products of your company?

	<i>Never</i>	<i>Rarely</i>	<i>Sometimes</i>	<i>Often</i>	<i>Always</i>
a) Cause and Effect	()	()	()	()	()
b) Benefits Received	()	()	()	()	()
c) Fairness or Equality	()	()	()	()	()
d) Ability to Bear	()	()	()	()	()
e) Other(<i>Please specify</i>)	()	()	()	()	()

VI) Which of the following methods does your company use in allocating service department costs when they provide services to each other (department)?

a) Repeated distribution method	
b) Simultaneous equation/Reciprocal allocation method	
c) Step or sequential/Specific order of closing method	
d) Direct method	
e) Other(<i>Please specify</i>)	

VII) To what extent are the following bases used for allocating overheads to products of your company?

	<i>Never</i>	<i>Rarely</i>	<i>Sometimes</i>	<i>Often</i>	<i>Always</i>
a) Number of machine hours used	()	()	()	()	()
b) Number of direct labour hours used	()	()	()	()	()
c) Cost of labour	()	()	()	()	()
d) Cost of materials	()	()	()	()	()
e) Units of production/sales	()	()	()	()	()
f) The costs of the activities performed to complete the product	()	()	()	()	()

VIII) Which of the following costs are used for the decisions mentioned below?

<i>Cost item</i>	Product costing	Product pricing	Investment Decisions	Make or buy decisions
a) Variable/incremental costs				
b) Fixed/overhead costs				
c) Total Manufacturing cost				
d) Total relevant costs (manufacturing & non-manufacturing)				

2.4 Activity Based Costing System

I) Activity based costing (ABC) has recently been suggested as an alternative approach for tracing overheads to products. Managers have greater confidence in the accuracy of the costs of products and services reported by ABC system as it allows managers to trace many manufacturing overheads to cost objectives (i.e. products) using more appropriate cost drivers.

Please indicate which of the following statements is most applicable to your company.

a) Discussion has not taken place on the introduction of ABC	()
b) A decision has been taken not to introduce ABC	()
c) It is intended to introduce ABC	()
d) Some consideration has being given to introducing ABC	()
e) ABC has been introduced	()

II) If ABC has been introduced, please indicate the number of cost drivers currently used to trace Overhead costs to products

a) 1-5 () b) 6-10 () c) 11-15 () d) 16- 20 () e) over 20 ()

III) If your company **has not yet implemented ABC**, please rank the influence of the following factors using the scale given below.

<i>High (4),</i>	<i>Moderate (3),</i>	<i>Low (2),</i>	<i>Unimportant (1)</i>
------------------	----------------------	-----------------	------------------------

You may use the same number more than once

- a) ABC is more complex and costly than traditional cost system ()
- b) Lack of resources ()
- c) Lack of trained staff ()
- d) Management prefer to apply simple methods ()
- e) Management is satisfied with existing costing system and decision making process ()
- f) Other (*Please specify*)..... ()

2.5 Product pricing

I) Which of the following best describes the pricing method/s of your company?

(You may tick more than one)

a) Estimate the total direct costs that are relevant for the production of one unit of product and then add a mark up	
b) Estimate the total manufacturing costs of one unit of a product and then add a mark up	
c) Estimate the total unit cost of a product and then add percentage mark up to give a reasonable profit	
d) Prices are determined based on the market prices of competitors	
e) Estimate the amount of money the target customers are willing to pay for the product/s prior to designing/ introducing the products	
f) Other (<i>please specify</i>).....	

II) To what extent is **Target costing** used in your company, i.e. an important mechanism for managing the cost of future products by setting target selling price and target profit margin? If the estimated actual cost exceeds the target cost, then efforts are made to reach the target cost by investigating alternative ways of driving down the actual costs to the target cost. E.g.: Modify product designs and/or improve production processes and efficiencies.

Never..... Rarely..... Sometimes..... Often..... Always.....

III) To what extent is **Kaizen costing** used in your company, i.e. a mechanism to be applied during the manufacturing stage of the product life cycle, focusing on production processes for reducing and managing costs? In Kaizen costing, cost reductions are derived primarily through the increased efficiency of the production process. However, potential cost reductions are smaller than that of target costing because the products are already in the manufacturing stage.

Never..... Rarely..... Sometimes..... Often..... Always.....

IV) Rate the importance of the following **pricing policy objectives** as applicable to your company

	<i>High</i>	<i>Moderate</i>	<i>Low</i>	<i>Unimportant</i>
a) Maximize sales	()	()	()	()
b) Maximize profits	()	()	()	()
c) Increase market share	()	()	()	()
d) Offer lowest market price	()	()	()	()
e) Serve a given market segment	()	()	()	()
f) Market penetration	()	()	()	()

2.6 Transfer pricing

I) Do divisions or subsidiaries of your company sell/ buy products (inventories) to/from other divisions or subsidiaries? Yes..... No.....

II) **If yes**, which of the following transfer pricing policy/ policies does your company use?

- a) Use prices that prevail in the market ()
- b) Use the total cost of producing a unit ()
- c) Use the total cost of producing a unit plus a mark up ()
- d) Use the negotiated transfer price ()
- e) Use the marginal/ direct costs of producing a unit ()
- f) Use the marginal/ direct costs of producing a unit plus a mark up ()
- g) Other (*please specify*).....

III) Which of the following purposes does your company intend to achieve by using the above transfer pricing policy/policies?

a) Motivate divisional managers to make sound business decisions	
b) Evaluate managerial & economic (divisional) performance	
c) Move profit between divisions and locations	
d) Ensure divisional autonomy	
e) Other (<i>Please specify</i>).....	

IV) Are divisions/subsidiaries allowed to sell/ buy products from outside the group that can normally be sold/ obtained within the group? Yes..... No.....

V) If the selling/buying division/s or subsidiaries are permitted to sell/ buy from outside the group, indicate whether or not the decision normally has to be approved by the head office.

Yes..... No.....

2.7 Performance evaluation

I) Please indicate the major categories of performance evaluated by your company.

- a) Divisional performance ()
- b) Managerial performance ()
- c) Others (*please specify*)..... ()

II) Which of the following base/s are used to divide your company into divisions?

- a) The nature of the product ()
- b) The geographical area ()
- c) The nature of the market served ()
- d) The function ()
- e) Other (*please specify*).....

III) Please rate the importance of the following measures of performance, your company use in measuring the **managerial performance and/or divisional performance**.

Use the following scale to provide your answers

High (4),	Moderate(3),	Low (2),	Unimportant (1)
------------------	---------------------	-----------------	------------------------

You may use the same number more than once

<i>Performance measures</i>	<i>Managerial performance</i>	<i>Divisional performance</i>
a) Return on investment (ROI)		
b) Return on sales (ROS)		
c) Economic value added		
d) Contribution margin		
e) Divisional net profit before taxes#		
f) Sales volume		

IV) If your company uses contribution margin (CM) to measure divisions or managers performance, please clarify the base/s you use to calculate the contribution.

<u>Bases</u>	<u>Managerial Performance</u>	<u>Divisional Performance</u>
a) Variable short-term CM *
b) Controllable contribution**
c) Divisional contribution ***
d) Other (<i>Please specify</i>).....

Note:
* *Total sales revenue less variable costs*
** *Total sales revenue less (variable costs and controllable fixed costs)*
*** *Total sales revenue less (variable costs, controllable fixed costs and non- controllable avoidable costs)*
Divisional net profit before taxes = Divisional contribution less allocated corporate expenses

(V) To what extent does your company consider **internal transactions** made under the transfer prices in evaluating performance?

	<i>Never</i>	<i>Rarely</i>	<i>Sometimes</i>	<i>Often</i>	<i>Always</i>
Managerial performance	()	()	()	()	()
Economic performance of the divisions	()	()	()	()	()
Other (<i>Please specify</i>).....	()	()	()	()	()

VI) Please indicate how performance is evaluated by your company.

<u>Comparison with,</u>	<i>Managerial Performance</i>	<i>Divisional Performance</i>
a) Budgeted performance
b) Similar companies in the industry
c) Other divisions/managers in the company
d) Other (<i>Please specify</i>).....

VII) Please rate the importance of the purposes of performance evaluation of your company.

	<i>High</i>	<i>Moderate</i>	<i>Low</i>	<i>Unimportant</i>
a) Evaluating managers	()	()	()	()
b) Rewarding managers	()	()	()	()
c) Planning	()	()	()	()
d) Control	()	()	()	()
e) Motivation	()	()	()	()
f) Training/learning	()	()	()	()

2.8 The Balanced Score Card (BSC)

*The BSC has recently been advocated as an approach to evaluate performance under four perspectives (i.e. Financial, Customer, Internal business process, and Learning & growth) integrating both **financial and non-financial measures**. BSC encourages managers to view on the business from these four different perspectives and to articulate major goals for each perspective, and then translate these goals into specific performance measures.*

I) Does your company apply BCS for evaluating performance? Yes () No ()

II) **If yes**, please rate the importance of the following perspectives in measuring and evaluating the performance of your business.

	<i>High</i>	<i>Moderate</i>	<i>Low</i>	<i>Unimportant</i>
a) Financial perspective	()	()	()	()
b) Customer perspective	()	()	()	()
c) Internal business process perspective	()	()	()	()
d) Learning & growth perspective	()	()	()	()

III) Has your company modified or considered modifying the BSC in order to cater for EM issues?

Yes () No ()

2.9 Benchmarking

Benchmarking involves comparing key activities with best practices found within and outside the organization.

- To what extent does your company practice benchmarking?
Please tick as applicable to your company

External benchmarking:

(Identify and study world-class best practices for the activities, aiming at finding out how the activities can be improved and ensuring that the improvements are implemented)

Never..... Rarely..... Sometimes..... Often..... Always.....

Internal benchmarking:

(Compare different business units within the organization that perform the same activities, and the unit that represents best practice becomes the target to achieve)

Never..... Rarely..... Sometimes..... Often..... Always.....

2.10 Just-in-time (JIT) System

Manufacturing firms are adopting JIT system as an inventory management strategy to increase efficiency and decrease/avoid waste or non-value-added activities by receiving materials and components only when they are needed in the production process, thereby reducing inventory costs.

I) Does your company currently use a JIT system? Yes () No ()

II) If your company has **not adopted JIT system**, indicate the reason/s for not adopting it as they apply to your company.

You may tick more than one

- a) It generates substantial risk ()
- b) Nature of manufacturing process ()
- c) Inadequate information ()
- d) Company policy ()
- e) Problems with delivery processes ()
- f) Problems with suppliers ()
- g) Other *(Please specify)*..... ()

Part Three: Management Accounting (MA) Systems and their Responses to Environmental Management (EM) Issues

I) On which system/s does your company mostly rely on, in providing information for decision making particularly relating to routine planning and control activities, and EM activities?

You may tick more than one

- a) MA system ()
- b) Financial Accounting (FA) system ()
- c) Environmental Management Accounting (EMA) system ()
- d) FA system making simple adjustments for EM activities, if any, ()
- e) MA system making simple adjustments for EM activities, if any, ()
- f) FA system making adjustments for EM activities to a considerable extent ()
- g) MA system making adjustments for EM activities to a considerable extent ()
- h) Other *(Please specify)*.....

II) Please indicate the nature of MA systems of your company in terms of information provided for decision making.

- a) On volume and monetary basis, whichever necessary ()
- b) Only on a monetary basis ()
- c) More on monetary basis and less on volume basis ()
- d) Less on monetary basis and more on volume basis ()
- e) Other (*Please specify*)..... ()

III) Does your company review MA/EMA systems to ensure it can better respond to the current needs of the company? Yes () No ()

IV) **If yes**, how frequently do these reviews take place?

- When required () Monthly () Quarterly () Semi-annually ()
 Annually () Other (*please specify*)

V) Has your company taken any initiatives for Corporate Social Responsibility-CSR (Environmental perspectives)? Yes () No ()

If yes, briefly outline them

VI) Rate the influence of the following factors in motivating management to consider EM issues in making decisions relating to the business process.

	<i>High</i>	<i>Moderate</i>	<i>Low</i>	<i>Unimportant</i>
a) Environmental legislations*	()	()	()	()
b) Competitors' actions	()	()	()	()
c) Sustainability of the business	()	()	()	()
d) Create good image for the company	()	()	()	()
e) Company mission & objectives	()	()	()	()
f) Company policies	()	()	()	()
g) Influences from society	()	()	()	()
h) Stakeholders interest	()	()	()	()

- *Please list environmental legislation, if any, adopted/to be adopted by your company and indicate the sources of that legislation.*

Environmental legislation

Sources

.....

VII) Indicate the level of importance of the following stage/s of your business process in relation to environmental impacts, using the scale given below.

High (4), Moderate (3), Low (2), Unimportant (1)

You may use the same number more than once

- a) Capital investment project appraisal ()
- b) Product design ()
- c) Machine set-up ()
- d) Material acquisition, storage & delivery ()
- e) In the production process ()
- f) Storage and delivering of finished goods ()

VIII) Please indicate the **level of importance** that your company attributes to the environment in its decision making process, by ranking the following seven company objectives using the scale given below.

High (4), Moderate (3), Low (2), Unimportant (1)

You may use the same number more than once

- a) Fair business practices ()
- b) Reputation with green business ()
- c) Protection of the environment ()
- d) Profit making ()
- e) Energy conservation/ efficiency ()
- f) Community involvement ()
- g) Product quality ()

IX) Environmental-related cost categories, savings and earnings outlined by International Federation of Accountants- IFAC (2005) are as follows.

Costs:

- a) Material costs of product output** (*purchase costs of natural resources such as water and other materials that are converted into products, by-products and packing*);
- b) Material costs of non- product output** (*costs of energy, water and other materials that become waste and emissions*);
- c) Waste and emission control costs** (*costs for handling, treatment and disposal of waste and emissions; remediation and compensation costs related to environmental damage; and any control-related regulatory compliance costs*);
- d) Prevention and other EM costs** (*costs of preventive EM activities i.e. cleaner production projects, and other EM activities such as environmental planning and systems, environmental measurement, environmental communication and other relevant activities*);
- f) Research and development (R&D) costs** *related to environmental issues.*

Earnings:

Derived from, Sales of scrap or waste (for reuse by another organization); subsidies; sales of excess capacity of waste treatment facilities; Insurance reimbursements for environmental-related claims; higher profit margins due to environmentally benign products etc.

Savings:

From: Decrease of materials use and waste generation (as a result of efficiency improvements by implementing preventive EM activities i.e. on- site recycling, extended producer responsibility, cleaner production, green research and design, green purchasing; and improvements in environmental planning and systems)

- With regard to the MA systems adopted by your company, rate **the ability of management** to respond timorously to EM issues.

Use the following scale to provide answers, as applicable to your company.

High (4), Moderate(3), Low (2,) Irrelevant (0)
--

You may use the same number more than once

<i>Environmental-related cost categories</i>	<i>Identifying relevant cost items</i>	<i>Measuring associated costs/ savings/ earnings</i>	<i>Identifying EM activities</i>	<i>Planning activities with cost/revenue estimates</i>	<i>Taking actions & measuring costs/savings/ earnings</i>
a) Material costs of product outputs					
b) Material costs of non- product outputs					
c) Waste and emission control costs					
d) Prevention and other EM costs					
e) Research and development costs					

- X) Evaluate the **success of your company** in the recent accounting period in managing environmental costs, using the following scales.

High (4), Moderate(3), Low (2,) Irrelevant (1)
--

You may use the same number more than once

<i>EM activities undertaken relating to:</i>	<i>Attainment of planned activity level</i>	<i>Adhered to planned costs</i>	<i>Minimized waste & emissions</i>	<i>Maximized savings/ earnings</i>	<i>Minimized non-value added activities</i>
Purchase of natural resources(Materials)					
Use of materials that become waste & emission					
Waste and emission control					
Preventive EM activities					
Research & development					

XI) Rate the importance of the following MA techniques adopted by your company in making decisions on the business process relating to routine planning and control activities, and EM activities.

Use the following scale to provide your answers.

<i>High (4),</i>	<i>Moderate(3),</i>	<i>Low (2),</i>	<i>Irrelevant (1)</i>
-------------------------	----------------------------	------------------------	------------------------------

You may use the same number more than once

<i>MA Techniques</i>	<i>Routine planning and control activities</i>	<i>EM activities</i>
Budgeting		
Standard costing		
Product costing		
ABC system		
Product pricing		
Transfer pricing		
Performance evaluation		
Balance score card(BSC)		
Benchmarking		
JIT systems		

XII) Rate the influence of the following challenges/ problems with regards to the MA systems, in responding to EM issues and routine planning and control activities, using the following scale.

<i>High (4),</i>	<i>Moderate(3),</i>	<i>Low (2,)</i>	<i>Irrelevant (1)</i>
------------------	---------------------	-----------------	-----------------------

You may use the same number more than once

Challenges/ problems	EM activities	Routine planning and control
a) The existing MA system provides incomplete/ inaccurate cost information <i>(i.e. some cost information including environment-related costs being hidden in overhead accounts, may be due to not adopting ABC system)</i>		
b) There is a communication/knowledge gap between accounting and other staff <i>(i.e. accountants, managers at different levels including environmental managers, technical officers)</i>		
c) Materials use, flow and cost information are often not tracked adequately <i>(i.e. Available information on the above concern is not sufficiently accurate or detailed for environmental, efficiency and other decision making purposes)</i>		
d) Quality /output <i>(Reaching output levels by maintaining the quality with minimum costs and environmental impacts)</i>		
e) Wastes and emissions <i>(Identify and analyse energy, water and other materials that become waste and emissions, and take suitable actions to minimize or avoid them and hence the costs)</i>		
f) Complaints <i>(From internal management on difficulties with available cost information in taking prompt actions to improve efficiency and performance of the business processes)</i>		

XIII) Rate the factors that affect the current MA practices, and the above MA and EM challenges/problems faced by your company, using the following scale.

<i>High (4),</i>	<i>Moderate(3),</i>	<i>Low (2,)</i>	<i>Irrelevant (1)</i>
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You may use the same number more than once

<i>Factors</i>	Current MA Practices	MA and EM Challenges/Problems
<u>Internal Factors</u>	()	()
a) Mission, goals, & objectives of the company	()	()
b) Company policies	()	()
c) EM systems & MA systems	()	()
d) Knowledge, awareness & dedication of staff involved	()	()
<u>External factors</u>		
a) Environmental regulations/ legislations	()	()
b) Social cultural influences	()	()
c) Competitors' actions	()	()
d) Stakeholders interest	()	()

XIV) Indicate the **level of achievement of organizational performance** of your company relating to the following aspects with your current MA practices and EM activities (in the recent accounting period/year).

<i>Achievement (Compared with expected level)</i>	<i>0- 20%</i>	<i>21-40%</i>	<i>41-60%</i>	<i>61-80%</i>	<i>81-100%</i>	<i>Over 100%</i>
a) Increased savings and earnings						
b) Reduction in costs						
c) Improved quality of output						
d) Increase in market share						

.....End.....

Please return the completed questionnaire with any other information to the following address.....Additional information may be provided, on request, by e-mail (.....).

Thank you once again for taking your valuable time and effort to fill out the questionnaire.

Interview Schedule

The Role of Management Accounting in Responding to Environmental Management Issues in Listed Companies: A Survey in the Sri Lankan Context

Thank you for giving me an opportunity to talk with you during your tight work schedule on company obligations. Obtaining your knowledge and experience-based analysis and opinion is immensely beneficial in providing answers to my research questions and reaching solid conclusions to meet the goals of my research study.

Your answers/explanations will be treated in confidence and used only for academic purposes. If you illustrate your experience with examples from your company, I will ensure that nothing can be traced to you. I would like to use a Mini tape recorder, if you give me your consent to do so. It is only for personal use so that I can better understand the answers/explanations you have given in the interview process.

Part One: Structure and Information Systems of the company

- 1) Could you briefly describe the structure of your company and its information systems, particularly accounting information systems (AIS) and environmental management systems (EMS)?
- 2) Could you outline company policies and procedures, and regulations/laws/standards applicable in relation to Management Accounting (MA) practices?
- 3) Could you describe: the decision-making process of your company: information flows; decision making levels and structures; authorization bodies; planning and control?

Part Two: MA Practices and related Issues

- 1) Could you explain the nature of your MA practices (Traditional versus Modern Techniques) and specific situations?
- 2) What are your experience and observations related to reviewing and updating accounting systems to make sure they are more responsive to current needs of the company?
- 3) Could you disclose special features and limitations of your budgeting practices and their implications on decision making processes?
- 4) What would be your views on adopting activity based budgeting (ABB)?
- 5) What are your investigations on target achievement of the company through budgetary planning and control?
- 6) Could you outline the structure of your standard costing system?
- 7) Could you disclose procedures and techniques followed by the company in standard costing, and problems /limitations associated with them?
- 8) What are your observations on current product costing systems of the company and problems/limitations associated with such systems?
- 9) What would be your judgments and suggestions on applying Activity Based Costing (ABC) system to the company?

- 10) What are your views on the company policies and procedures applied for product pricing and transfer pricing?
- 11) What kind of problems/situations have you faced in evaluating performance using performance measures and procedures applied, and cost information available?
- 12) Have you faced any problems in evaluating divisional/managerial performance using performance of inter-transferred goods valued at different prices with different policies?
- 13) Have you adopted modern techniques such as Target costing, Kaizen costing, Balance Score Cards, Benchmarking, JIT systems for your company?
- 14) If yes, what are your observations on adopting those techniques in the present day environment?

If not, what would be the reasons for not adopting those techniques?
- 15) Could you let me know your suggestions for improving MA systems and decision-making process in order to increase efficiency and performance of the company?

Part Three: EM issues and Responses to them in MA systems

- 1) What are the general views of your company on environmental perspectives and EM issues, and responses or actions taken/ to be taken towards them?
- 2) Could you explain the nature of EM issues faced by the company and EM initiatives made to resolve them, and/or actions taken/strategies applied to control the pollution?
- 3) Are you involved in any CSR activities, and if so, what are they and their implications?
- 3) Are there any EM-related laws, rules and regulations, policies and procedures, and standards applicable to your company and, if so, what are they and their implications for the business process?
- 4) What procedures do you follow in conducting business in accordance with those EM legislation and standards?
- 4) Do you have waste management policies, strategies and systems?
- 5) If yes, could you explain them with your environmental action plan?
- 6) Do you think that environmental measures and related costs are included in the accounting systems, and, if so, how do you identify and manage them?

If not, what procedures do you follow, and what are the problems faced by the management in handling such EM costs?
- 7) What are your views on EM issues of your company and the role of MA in responding to them?
- 8) Are there any challenges/problems faced by the company relating to MA practices, and EM activities?
- 9) What are your company initiatives, i.e., training, awareness programs, rewards systems, or any other activities taken/to be taken in order to overcome those challenges/problems and also to increase staff involvement in EM activities?
- 10) What would be the overall performance of the company in view of EM initiatives?
- 11) What are your overall observations and suggestions on MA practices and EM initiatives towards achieving company goals in complying with environmental legislation and standards?