Factors hindering the application of Environmental Management Accounting among Manufacturing Companies in Kenya

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Declaration

I declare that this work has not been previously submitted and approved for the award of a degree by this or any other University. To the best of my knowledge and belief, the thesis contains no material previously published or written by another person except where due reference is made in the thesis itself.

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Abstract

The need for businesses to be accountable to the impact they have on the environmenta has nessesitated the adoption of environmetal management accounting (EMA). EMA adoption has not only proved to respond to environemental challenges of businesses but also imrove their financial performance. However, research on manuafcturng companies in Kenya ahs shown low adoption of EMA. The aim of this study was to establish the challenges to adoption of EMA and their association with level of adoption. The study adopted a questionnaire to collect data on adoption level and challenges to adoption. The data was analyzed using descriptive statistics and narrative analysis. The relationship between EMA and challenges was analyzed by use of multiple regression analysis. The results of this study show that the adoption level of EMA among manufacturing is still low with an industry average of 40% similar to previous studies. There is varied levels of adoption among companies, with some adopting all EMA techniques while others adopting only the necessary practices. The challenges associated with EMA application were found to be; lack of guidance on EMA, absence of expertise on EMA, low awareness of environmental issues, lack of communication across departments and failure of existing regulatory approaches. In Kenya listed companies (who are more exposed to the society) have no pressure to adopt EMA. This could be linked to key challenges observed in this study of failing regulatory approaches. The Capital Markets Authority, the National Environmental Management Authority, Kenya National Cleaner Production Centre and other regulators are not doing enough to influence EMA adoption or ensure that companies are responsible for their environmental impact. There is need to have clear non-fragmented guidelines and regulations that would require environmental accountability for manufacturing companies. These regulatory bodies should therefore work together with UNDSD and UNEP to develop such regulations and guidelines for the manufacturing companies. Low levels of awareness and lack of expertise on EMA have been presented as key challenges to EMA adoption. The members of the public, shareholders and employees of companies need to be educated on the importance of EMA and Environmental accountability. The government, with the aim of attaining a green economy by 2030, should be in the forefront with this sensitization. The 2030 goal is national and yet many Kenyans are still not aware of it, yet they are required to be on-board in this journey to a green economy.

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List of Abbreviations

ABC	Activity Based Costing
AMS	Advanced Manufacturing Systems
AMT	Advanced Manufacturing Techniques
EMA	Environmental Management Accounting
EMCA	Environmental Management and Coordination Act
ERB	Environmentally Responsible Behavior
FCA	Lifecycle Assessment
GASCO	Global Association of Corporate Sustainability Officers
GOK	Government of Kenya
GHGs	Greenhouse Gases
IFAC	International Federation of Accountants
KAM	Kenya Association of Manufacturers
LCA	Lifecycle Assessment
KGBS	Kenya Green Building Society
KICC	Kenyatta International Convention Centre
KNBS	Kenya National Bureau of Statistics
KNCPC	Kenya National Cleaner Production Center
MEMA	Monetary Environmental Management Accounting
MFA	Materials Flow Accounting
NACOSTI	National Commission for Science, Technology and Innovation
NEMA	National Environmental Management Authority
NSE	Nairobi Securities Exchange

PEMA	Physical Environmental Management Authority
SEM	Standard Error of Mean
TCA	Total Cost Accounting
UNDP	United Nations Development Program
UNDSD	United Nations Division of Sustainable Development
UNEP	United Nations Environmental Program
VIF	Value Inflation Factor

Chapter One

Introduction

1.1 Background of Study

The Brundtland Commission of 1987 introduced the need to integrate economic development, environmental protection and social justice in development agenda to achieve sustainable development (Brundtland, 1987). This concept has ever since been embraced and advocated by economies, institutions and researchers (Atkinson, 2000; Delgado & Montiel, 2014; Dyllick & Hockerts, 2002; European Union, 2006; GACSO, 2011; Kariuki, 2015; United Kingdom, 2005). Environmental problems such as pollution, acid rain, depletion of natural resources and global warming have, which cause economic slowdown, unemployment, market volatility and pose a threat to human health have been linked to business activities (Kariuki, 2015; UNDSD, 2001; United Nations, 1987; White, 1998). Picking from previous projects undertaken by national governments, the United Nations and the World Bank: Kenya, Libya, Nigeria and Venezuela are some of the countries whose capital accumulation has been offset by the depletion of raw materials and fertile land (White, 1998). People have become wealthier through an industrialization process that blighted the landscape and poisoned the water, the air, and the ground (Labatt & White, 2002). Businesses operating in highly sensitive industries such as manufacturing have been identified to be the largest emitters of greenhouse gases (Khalid & Dixon, 2012; UNDSD, 2001). Kenya is one of the countries whose agricultural, manufacturing and transportation sectors are the leading emitters of GHG (GOK, 2010; GOK, 2016).

Businesses have seen the need to adapt their operations to meet the global environmental challenges such as global warming with increasing urgency (Burritt, 2004; GACSO, 2011). One tool that has been implemented to meet this agenda is Environmental Management Accounting (EMA) (Seetharaman, Ismail, & Saravanan, 2010). This is a tool that provides data essential for corporate environmental management in order for their business to be sustainable (Setthasakko, 2010). Researchers and Practitioners have used different words to describe Environmental Management Accounting. The underlying definition that seem to be coming out of most of them is that 'an internal process concerned with capturing, allocation and analysis of financial and non-financial data, and provision of information necessary for corporate environmental management' (ACCA, 2015; Bartolomeo et al., 2000; Burritt, Schaltegger, Kokubu, & Wagner, 2003; Harangzó et al., 2010; IFAC, 2004; Setthasakko, 2010; UNDSD,

2001). This definition expands the management accounting from the traditional conventional management accounting which had a narrow focus on monetary measurements by introducing corporate environmental management which provides both Physical Environmental Accounting and Monetary Environmental Accounting including tools for costing decisions, investment and planning decisions and, performance evaluation decisions (Bennett, Wolters, & Bouma, 2002; Burritt, 2005; Lanfield, Thorne, & Hilton, 2009; UNDSD, 2003).

EMA adoption is vital for corporations to apply cleaner and more productive procedures such as reduction of carbon emissions and efficient use of physical resources such as water and raw materials (UNDSD, 2001). Implementation of EMA plays a double role by not only reducing negative environmental impacts of a manufacturing firm but also lowering operational costs associated with environmental protection (Ferreira, Moulang, & Hendro, 2010; Schaltegger & Burritt, 2010). Previous studies have also found a positive relationship between EMA implementation and financial performance (Mbuthia, 2016; Wachira, 2014; Onyango, 2014). Despite having numerous advantages associated with EMA adoption results of previous studies show low adoption levels. Some organizations are still not practicing at all and most are practicing only the minimal (Chang, 2013; Mbuthia, 2016; Onyango, 2014).

There is no standard method of measuring EMA adoption level. Some researchers have used environmental information incorporated into management systems (Gale, 2006; Masanet, 2006) while others have used checklists (Jalaludin, Suleiman & Ahmad, 2011; Wachira, 2014). Each of these methods of measurement present some weakness. Using information input in systems assume that all environmental information can be captured. It also does not consider businesses that may be implementing EMA practices in their processes but do not include environmental information in the system. Using a checklist has the risk of leaving out some practices in its development. This weakness, however, can be minimized by using a comprehensive list and giving allowance to the respondents of study to include any EMA practices they implement that is not captured in the checklist. Previous studies in Kenya have used this method (Mbuthia, 2016; Wachira, 2014; Onyango, 2014) and found that the level of adoption is low.

Organizations in different industries of different countries adopt different EMA practices (UNDSD; 2000; Bennett, Wolters, & Bouma, 2002; Rikhardson et al., 2005; Qian, Burritt, & Chen, 2015; Jumoke & Olalekan, 2017), the guidelines provided should therefore be specific (Rikhardson et al., 2005; Keit, 2011). Due to their managerial nature, EMA practices have not been standardized by the International Accounting Standards (Chang & Deegan, 2010) and

therefore there is no generally accepted framework for EMA. Developed countries like Germany, Japan and Australia perceive environment concerns to be of very high priority (Burritt et al., 2003). Culture in developed countries influence business values about the importance of issues such as environmental concerns (Ariffin, 2016).

Even though the EMA practices are unique among countries and industries, some specific practices are common. The EMA tools and techniques available (ACCA, 2017; Baumgartner & Ebner, 2010; Burritt, 2004; Burritt et al., 2003; UNDSD, 2001; Ferreira et al., 2010; GRI, 2017; UNDSD, 2003; Zhou, Ou, & Li, 2016) provide a large number of practices, some of which are shared across industries. For example, organizations in industries that have direct impact to the environment as energy, farming, manufacturing and mining are highly likely to be under pressure with respect to implementing environmental accounting and may choose practices that tend to show environmental impact accountability (Bennett et al., 2002). Some factors influencing adoption of EMA have also been found to be similar across industries and countries (Mbuthia, 2016; Keit, 2011; Rikhardson et al., 2005; Smit & Dikgwatlhe, 2015).

EMA adoption is determined by factors that hinder its application (described as challenges of implementation through this study) faced by organizations. Studies have shown that an organization could experience one or more challenges at the same time. Generally these challenges can either be internal or external. Internal challenges are hindering factors such as lack of expertise and low level of awareness of environmental issues. External challenges are factors such as perverse economic incentives and failure of existing regulatory approaches. The results of challenges to EMA adoption experienced by organization has been inconsistent from one country and industry to the other (Bennett et al., 2002; Chang, 2013; Olalekan & Jumoke, 2017; Smit & Dikgwatlhe, 2015). It is therefore necessary to understand an industry's specific challenges of a country in order to overcome them.

In Kenya, the adoption of EMA is not a legal requirement. In July 2000, the Kenyan Government and United Nations Development Program (UNDP) developed the Kenya National Cleaner Productions Center (KNCPC) whose mission is to build national capacity for Resource Efficient and Cleaner Production application in enterprises through awareness creation, training, project implementation and policy advice for increased enterprise productivity and sound environmental management. The only framework laws associated with Environmental Management and Conservation are: the 'Environmental Management and Coordination Act (EMCA) - 2015', which is enforced by the 'National Environmental Management Authority (NEMA) (EMCA, 2015), and requirement for directors to regard the impact of companies

operations on the community and environment (Companies Act, 2015). The guidelines and requirements under this Acts are not sufficient to influence EMA adoption among companies. Very few manufacturing firms account for their carbon emissions (UNEP, 2014). Given that United Nations Environment Program (UNEP) Africa Office is located in Nairobi, it would have been expected that the government would have put laws that are more stringent on corporate accountability regarding environmental impact that would necessitate EMA adoption, however, that is not the case. This means that it is upon companies own initiatives and motives to decide whether to implement EMA.

The number of manufacturers in the country has grown over the years and manufacturing output grew by 69% since 2010 from KES 1.3 trillion to KES 2.1 trillion in 2016. According to KNBS 2017, the manufacturing sector recorded employment growth rate of 1.8%, rate expected to improve because manufacturing is one of the four sectors that President Uhuru Kenyatta has put as priority in the Big4 Agenda. The other three agenda are healthcare, affordable housing and food security. In his inaugural speech on 28th November 2017, the president vowed to grow and sustain the manufacturing sector and raise its share of the 'national cake' from 9 to 15 percent. He promised to set-up industries for cotton, leather, tea, dairy, meat, fish, crop and electronics assembly (KAM, 2018)

1.2 Problem Statement

EMA and Conventional Management Accounting play the same role of satisfying the information needs of internal management (IFAC, 2004). The conventional management accounting however has not been sufficient in addressing environmental risks, costs and problems that business bear (ACCA 2015; Bennett, Wolters, & Bouma, 2002; Burritt, 2005; IFAC, 2005). The change in weather patterns also known as climate change has been linked to business activities (UNDSD, 2001). Climate change affects eco systems, water resources, agriculture, health, human growth, coastal zones and industrial activities. This directly affect economic growth in Kenya since key drivers of the economy are agriculture, tourism, livestock, forestry and fisheries (NEMA, 2018). EMA adoption has not only proved to reduce environmental impact but also improve financial performance and shareholders value (Labatt & White, 2002; Mbuthia, 2016; Wachira, 2014; Onyango, 2014a).

Despite having both short term and long term benefits, and being something of interest in the modern business environment (Kariuki, 2015), EMA adoption is still low (Chang, 2013; Mbuthia, 2016; Onyango, 2014). This has been associated with different challenges companies

face (Baumgartner & Ebner, 2010; Chang & Deegan, 2010; Olalekan & Jumoke, 2017; Setthasakko, 2010). Research has provided a number of challenges to explain level of adoption. The challenges presented by research can be categorized into internal and external. The challenges faced by management significantly determine the level of EMA adoption of a given company (Chang, 2013).

According to UNEP (2014) report, the Kenya manufacturing industry is burdened by hurdles such as high-energy costs, unreliable supply of electricity, poor infrastructure, resource scarcity, weak and fragmented policy coordination among relevant government agencies and low levels of technology and product innovation. Given the benefits derived from EMA, its adoption will be key in addressing the hurdles faced by manufacturing companies (Wachira & Wangombe, 2018). This will also be instrumental in enabling manufacturing companies to contribute to the national goal of transitioning Kenya to a green economy by 2030, especially with the intention to significantly expand the manufacturing industry in Kenya's big 4 Agenda. The true picture of challenges to EMA adoption in Kenya is still not clear. Challenges faced by manufacturing companies in Kenya and recommendations to overcoming them need to be determined for higher levels of EMA adoption.

The aim of this research was to investigate the challenges to adoption of EMA in Kenya. To measure the level of adoption, some researchers have used environmental information incorporated into management systems (Gale, 2006; Masanet, 2006) while others have used checklists (Jalaludin, Suleiman & Ahmad, 2011; Wachira, 2014). Each of these methods of measurement present some weakness. Using information input in systems assume that all environmental information can be captured. It also does not consider businesses that may be implementing EMA practices in their processes but do not include environmental information in the system. Using a checklist has the risk of leaving out practices in its development. This weakness, however, can be minimized by using a comprehensive list and giving allowance to the respondents of study to include any EMA practices they implement that is not captured in the checklist. This study used a comprehensive checklist of EMA techniques to question the existing practices then tested all possible challenges among a pool of manufacturing companies. The study employed both primary qualitative and quantitative data to draw conclusions.

1.3 Research Objectives

1.3.1 General objective

1. To establish the challenges to adoption of EMA and their association with level of adoption.

1.3.2 Specific Objectives

1. To determine the level of EMA adoption among manufacturing companies in Kenya
2. To determine the challenges to adoption of EMA among manufacturing companies in Kenya.
3. To establish the relationship between level of EMA adoption and challenges to adoption.

1.4 Research Questions

1. What is the level of EMA adoption among manufacturing companies in Kenya?
2. What are the challenges to adoption of EMA among manufacturing companies in Kenya?
3. What is the relationship between EMA adoption and challenges experienced?

1.5 Justification of Study

1.5.1 Policy makers

Policies and regulations tend to determine practices of organizations. Studies specifically in EMA have found failure of existing regulatory approaches as a challenge to adoption (Gunningham & Sinclair, 1997; Olalekan & Jumoke, 2017). Therefore, the lack of or inappropriate regulatory framework is a challenge to implementation of EMA in Kenya. The study confirmed this. The policy makers should strengthen and coordinate policies among relevant government agencies in regards to environmental management by corporates.

1.5.2 Company finance managers

This research is of most significant to finance managers and consultants. Finance managers in the Manufacturing businesses, especially those with low level of EMA application, will better understand the challenges they face in their application of EMA and recommendation to overcoming them.

1.5.3 Academics

Jalaludin et al., (2011) noted that there is insufficient knowledge on EMA practices in developing countries, that was six years ago. A number of research has been done in developing countries. This however, does not change the fact that EMA practices are country and industry

specific. This study introduced a different contextual perspective by providing academia with literature specifically from Kenya.

1.6 Scope and Limitations of study

This study was conducted in Kenya. It surveyed manufacturing firms that are members of Kenya Association of Manufacturers (KAM). Due to the nature of EMA practices, the results cannot be generalized to other industries in Kenya or any other country; they only be describing the reality of the studied companies and the manufacturing industry in Kenya. There are 564 KAM member companies which are of different sectors as follows; Building, Mining & Construction (20), Chemical & Allied (70), Energy, Electrical & Electronics (34), Food & Beverages (71), Fresh Food (3), Leather & Footwear (7), Metal & Allied (66), Motor Vehicle Assemblers & Accessories (27), Paper & Board (63), Pharmaceutical & Medical Equipment (21), Plastics & Rubber (68), Services & Consultancy (62), Textiles & Apparel (35) and Timber, Wood & Furniture (17).

Chapter Two

Literature Review

2.1 Introduction

Environmental Management Accounting has been identified as a way for businesses to meet Sustainable Development Agenda (Seetharaman et al., 2010). Its adoption depends on the number of managerial accounting techniques or methods used to account for environmental activities related to the organization (Chang, 2013).

EMA is managerial in nature and therefore the practices are not standardized by the International Accounting Standards (Chang & Deegan, 2010). Previous studies have shown that due to difference in culture (Ariffin, 2016) and environmental impact of operations (Bennett et al., 2002), adoption of EMA practices is country and industry specific (Qian, Burritt, & Chen, 2015). Research nevertheless, has provided a range of tools, procedures, principles and techniques that management can adopt in their practice of EMA (ACCA, 2017; Baumgartner & Ebner, 2010; Burritt, 2004; Burritt et al., 2003; UNDSD, 2001; Ferreira et al., 2010; GRI, 2017; UNDSD, 2003; Zhou, Ou, & Li, 2016) . There are influencing factors and challenges that determine the level of adoption of EMA among companies. These will be discussed in this chapter. The chapter is organized as follows; 2.2 we discuss the theories used to explain the level of adoption and determinants, 2.3 the meaning and concepts of EMA, 2.4 Drivers for EMA, 2.5 Challenges to adoption of EMA and finally 2.6 The conceptual framework.

2.2. Theoretical Framework

There is no generally accepted theory for EMA (IFAC 2005, UNDSD 2001). Previous studies on EMA adoption and determinants to adoption have used a number of deep theories to explain management behavior. Some of these theories are explained below.

2.2.1 Legitimacy Theory

The legitimacy theory is based on the notion that in order to continue operating successfully, a company would voluntarily engage in activities that management believe to be within the boundaries of what society identifies as socially acceptable behavior (Deegan, 2002; O'Donovan, 2002; Reynolds, 2018). A study by O'Donovan (2002) confirmed the use of specific micro-legitimation tactics employed by organizations in response to legitimacy threatening environmental events and practices. An organization that ignores societal norms

and act outside the expectations of the society may have difficulties in obtaining support from the community in continuing its operations (Qian & Burritt, 2008).

Therefore, an organization would employ EMA as a tool to make it look environmentally responsive and accountable to the society. This theory, however, has no regard for organizations that practice in order to meet other objectives that are not related to legitimation for example good acts of non-profit organizations and social entrepreneurs. It also ignores organizations that put deliberate efforts to respond to environmental problems caused by business without considering influence of the society.

2.2.2 Shareholder Theory

The shareholders proposes that firms are owned and should be operated purely for the benefit of their shareholders. This theory was first introduced by Milton Friedman (1970) who said that 'there is one and only one social responsibility of business - to use its resources and engage in activities designed to increase its profits so long as it engages in open and free competition without deception or fraud.' This theory therefore suggest than the adoption of EMA only makes sense if the value of the firm appreciates as a result of its adoption. Notably, this theory focuses majorly on long-term returns. Therefore, if adoption is costly in the present and expected to have long-term benefits, then it still holds. Some researchers following this theory have found positive relationship between EMA adoption and firm value (Ferreira et al., 2010; Mbuthia, 2016; Wachira, 2014; Onyango, 2014). However other researchers have found no significant relationship (Murray, Sinclair, Power, & Gray, 2005; Naila, 2011) and others have a negative relationship (Burritt et al., 2003). Proponents of this theory carry the risk of rendering EMA undesirable if results of their studies show no financial benefits derived from its adoption. Nevertheless, this theory the arguments of this theory are significant in describing EMA adoption behavior of managers. In Kenya, particularly, this theory has been found to be significant in studying drivers of EMA adoption (Onyango, 2014).

2.2.3 Theory of environmentally responsible behavior (ERB)

Hines, Hungerford and Tomera (1986) proposed the ERB theory. The model argues that possessing an intention of acting is a major factor influencing ERB. The Model of Responsible Environmental Behavior indicates that the following variables; intention to act, locus of control (an internalized sense of personal control over the events in one's own life), attitudes, sense of personal responsibility, and knowledge suggested whether a person would adopt a behavior or not. According to the model, the internal control center has a very considerable impact on the intention of acting, which determines an individual's ERB substantially. The theory

concentrates more on existing interactions between parameters that influence a person's behavior than on the singular impact of a single variable.

The theories discussed are significant in explaining EMA adoption behavior of managers. However, using one either one of them in explaining management adoption behavior will not provide an adequate comprehensive explanation. It is therefore prudent to have a multi-theoretical approach in studying EMA adoption behavior of management. The different aspects of the various theories make it necessary to consider each of them in analyzing corporate environmental behavior but their similarity invites one to consider them jointly (Wangombe, 2013). This study employed a multi-theoretical approach to draw conclusions

2.3 The concept of Environmental Management Accounting

In 1987, the Brundtland Commission met and released a report which was called 'our common future'. This report defined Sustainable Development by introducing the need to integrate economic development, environmental protection and social justice in development agenda (United Nations, 1987). Ever since the three dimensions of sustainable development have been known to be Social, Economic and Environmental/ecological (Atkinson, 2000; Baumgartner & Ebner, 2010; Dyllick & Hockerts, 2002; Hahn & Scheermesser, 2006; Kletner et al., 2013; Marcel, 2003). Businesses needed a way to adapt their operations to meet the environmental impacts caused by their day-to-day affairs in order to meet the goal of sustainability (GACSO, 2011; Hahn & Scheermesser, 2006). These environmental impacts are a result of use of resources, emissions into the air, into the ground or into the water as well as hazardous waste (Baumgartner & Ebner, 2010; Kariuki, 2015). Environmental Management Accounting is a tool that provides businesses with the essential data to enable them to meet the object of environmental management (Setthasakko, 2010).

There have been diverse description of EMA by different practitioners and researchers. EMA is the generation, analysis and use of financial and related non-financial information, in order to support management within a company or business, in integrating corporate environmental and economic policies and building sustainable business (Bartolomeo et al., 2000). EMA is the practice of utilizing a broad voluntary toolset to improve the environmental performance of companies, help them achieve regulatory compliance and increase competitive advantage (Harangzó, Harangozó, Kerekes, & Zsóka, 2010). It has simply been described EMA as 'the generation and analysis of both financial and non-financial information in order to support internal environmental management processes' (ACCA, 2015).

The definitions delimits EMA to conventional management accounting which according to (ACCA, 2015; Bennett et al., 2002; IFAC, 2004; UNDSD, 2001) focused on monetary measurements and generally accepted concepts. EMA is therefore seen as comprehensive by focusing on material and energy flow information, environmental costs, and other related costs and physical information (Smith et al., 2009). Even though both EMA and Conventional Management accounting play the same role of satisfying the information needs of internal management (IFAC, 2004), EMA is a better tool since it provides a more comprehensive focus (Frost & Wilmhurst, 2010). This explains why it has been defined as an improvement of the traditional conventional management accounting (ACCA, 2015; Frost & Wilmhurst, 2010; Labatt & White, 2002; UNDSD, 2003) and also as a branch of accounting that deals with environmental issues (Schaltegger & Burritt, 2010).

EMA provides both Physical Environmental Management Accounting and Monetary Environmental Management Accounting (Bennett, Wolters, & Bouma, 2002; Burritt, 2005; UNDSD, 2003). The internalization of environmental costs is significant in integration of economic profits and environmental costs (Wang & Li, 2005). UNDSD (2003) categorizes Environmental costs into two major classes; costs incurred to protect the environment and costs of inefficiencies in the production process (wasted material, capital and labor). These costs have further been categorized broadly as shown in the table below:

Table 2.1 Environmental Costs

1	**Environmental prevention costs**: the costs of activities undertaken to prevent the production of waste.
2	**Environmental detection costs**: costs incurred to ensure that the organization complies with regulations and voluntary standards.
3	**Environmental internal failure costs**: costs incurred from performing activities that have produced contaminants and waste that have not been discharged into the environment.
4	**Environmental external failure costs**: costs incurred on activities performed after discharging waste into the environment.
5	**Conventional costs**: raw material and energy costs having environmental relevance
6	**Potentially hidden costs**: costs captured by accounting systems but then losing their identity in 'general overheads'
7	**Contingent costs**: costs to be incurred at a future date – for example, clean-up costs
8	**Image and relationship costs**: costs that, by their nature, are intangible, for example, the costs of preparing environmental reports.

(ACCA, 2017; Baumgartner & Ebner, 2010; IFAC, 2005; Burritt, 2005; Lanfield, Thorne, & Hilton, 2009)

The conventional Management accounting techniques could misrepresent environmental issues, leading to managers making decisions that are bad for businesses and environment (ACCA, 2015). By failing to reform management accounting practices to incorporate environmental concerns, organizations fail to identify cost reduction and other improvement opportunities, employ incorrect product/service pricing, mix and development decisions (Frost and Wilmhurst, 2000). This leads to a failure to enhance customer value, while increasing the risk profile of investments and other decisions with long-term consequences. EMA is not only past oriented but also future oriented with a short term and a long-term focus on both (Schaltegger & Burritt, 2010). Past oriented EMA involves environmental cost accounting, ex-post assessment of costing decisions, environmentally induced capital expenditure, life cycle costing, material and energy flow accounting, environmental capital impact accounting and post assessment of physical environmental investment appraisal. Future oriented EMA focuses on environmental operational budgeting, physical and financial planning, physical and lifecycle budgeting, environmental costing and project investment appraisal. Appendices 1 and 2 show a summary of both past and future oriented EMA tools and techniques.

Since EMA is meant to provide satisfying information for internal management, it has a challenge of not being regulated by law or international standards as financial accounting and as a result the practices are unique to different countries, industries and organizations (Chang & Deegan, 2010; IFAC, 2004; Rikhardson et al., 2005; UNDSD, 2001).

2.4 Drivers of EMA adoption

Even though EMA is necessary for provision of information required for environmental management, studies have shown that the adoption level of EMA is low (Chang, 2013; Labatt & White, 2002; Mbuthia, 2016; Olalekan & Jumoke, 2017; Onyango, 2014; Ustad, 2010). It is therefore important to understand the factors that influence organizations to adopt EMA. A good number of studies have been done before to find the factors driving adoption of EMA within organizations. These factors are summarized below.

i. Industry of the company

The Industry in which a company operates plays an important role in determining whether an organization will adopt EMA practices and to what extent (Ferreira et.al, 2010). This is because the different business are exposed to different environmental risks to different levels. For

example organizations in the manufacturing, energy and mining sector have a relatively higher adoption rate due to the impact of their activities on the ecosystem (Bennett et al., 2002; Wachira, 2014). Chang & Deegan (2010) did a study on higher education institutes to find their adoption level of EMA practices, which they found to be low. A similar repeat of the study by Chang, (2013) yielded similar results revealing that, due to low environmental risks universities are not committed to EMA.

ii. Shareholders Influence

Shareholders being owners of the organization are expected to have some influence on its operations. A study by Jalaludin et al. (2011) showed that shareholders put pressure on manufacturing companies in Malaysia to adopt EMA. Wangombe, (2013) found that the government, shareholders, customers and environmental lobby groups as significant stakeholders in influencing corporate environmental reporting behavior. Ariffin (2016) also observed that cultural differences might influence business values about the importance of issues such as environmental concerns. This explains why developed countries like Germany, Japan and Australia perceive environment concerns to be of very high priority (Burritt et al., 2003). These findings show the significance of shareholders' pressure on influencing adoption of EMA practices.

iii. Financial Performance

Environmental costs are becoming huge for companies significantly that they need to be managed in order to improve financial performance. Management of such costs through employment of EMA has proved to be beneficial to organizations. EMA adoption has been associated with process innovation leading to economic benefits, while simultaneously enhancing environmental performance (Ferreira & Mounlang, 2008). A study by Gunarathne and Lee (2015) observed that organizations would incorporate environmental management and EMA practices in an urgent, cost-saving bid when faced with a financial crisis. Having realized their cost-saving potential and strategic benefits, management would develop these selective practices over time into comprehensive practices that are integrated into the daily management process supported by all stakeholders. Wachira (2014) also found a positive relationship between financial performance and EMA adoption. However, most of the participants in her study were neutral on the influence of this factor.

iv. Size of the Company

It is expected that as companies become bigger they would require more advanced accounting techniques and systems to facilitate comprehensive financial data collection, interpretation and use. Chang (2013) found that the bigger firms have influenced management to employ a range of managerial accounting methods. This is because management need to have a better grasp of costs incurred in the different cost centers for them to make more informed decisions (Wachira, 2014); therefore, larger companies are likely to use more specialized management accounting practices. A recent study by Nartey (2018) to find determinants of carbon management accounting adoption in Ghanaian firms concluded that bigger firms are more likely to employ EMA practices than smaller ones. Wachira (2014), however, found no significant relationship between firm size and EMA adoption. It should be noted that in her study she used turnover as the parameter to measure firm size. The weakness with turnover is that it does not really tell the extent of cost centers, which ideally are the ones expected to influence EMA adoption. In this study departments and staff number was used to measure firm size as a factor. A large firm was considered as one with over 200 employees and at least 8 departments. A medium-size firm was one with between 50 and 200 employees, and at least 6 departments. A small firm is one with less than 50 employees and not more than 6 departments.

2.5 Challenges to EMA adoption

The results of research related to challenges to adoption of Environmental Management Accounting has been inconsistent. Managers in different various industries of various countries have presented challenges they encounter to explain why their adoption level of EMA is low. For example, a study done in South Africa and Nigeria by Olalekan and Jumoke (2017) using 25 similar companies in each country produced different results. Challenges in South Africa were found to be high implementation costs of implementing EMA and a focus on short-term financial performance by management. On the hand, challenges in Nigeria were found to be failure of existing regulatory approaches, lack of Stakeholder and shareholder Power, underrating the Environment in firm policy, lack of management support and inability to collect and allocate environmental costs. Gunningham and Sinclair (1997) did a comprehensive research on challenges to the development of cleaner productions that drew results from international literature, 20 industries' representatives and other stakeholders. The study separated challenges into internal and external. Other studies that have followed have shown

that challenges experienced relate to these findings in a unique industry and country specific way. The table below shows findings of various industries in different countries.

Table 2.2 Summary of past studies

Study Title	**Location**	**Methodology**	**Findings**
Barriers and Motivators to the adoption of Cleaner Production practices by Gunningham and Sinclair (1997)	Australia	Exploratory Results drawn from international literature, 20 industries' representatives and other relevant stakeholders	<u>Internal Barriers/Challenges</u> 1. Lack of guidance 2. Absence of expertise on EMA 3. A low awareness of environmental issues 4. Focus on short term financial performance 5. Underrating the Environment in firm policy 6. High resistance to change 7. Accounting systems which fail to capture environmental costs and benefits 8. Inability of management to process information perfectly 9. High implementation cost 10. Lack of communication across departments in firms 11. Middle management inertia (bureaucracy) 12. Lack of personnel in charge of management, control and implementation 13. Reluctance to engage necessary restructuring 14. Difficulty in implementing cleaner technology <u>External Barriers/Challenges</u> 1. Failure of existing regulatory approaches 2. Difficulty in accessing cleaner technology o 3. Complexity of new technology 4. Difficulty in accessing external funds 5. Perverse economic incentives 6. Absence of markets for recycled goods 7. Economic cycles (Booms and Recessions)
Barriers to Development of EMA by Setthasakko (2010)	Thailand	Case study 3 Manufacturing Companies; Interview, Data display matrix.	1. Lack of Building organizational culture 2. A narrow focus on financial performance 3. Lack of guidance on EMA
The adoption and Implementation of EM systems in New Zealand Hotels (Ustad, 2010)	New Zealand	Descriptive, Questionnaire. Tables, charts and graphs. Calculation of Frequencies and Percentages.	1. High implementation cost 2. Difficulty in accessing Technology
Factors influencing adoption of EMA among Manufacturing	Kenya	Descriptive, Questionnaire Mean and Mode	1. Absence of Guidance on EMA 2. Absence of expertise on EMA

companies in Kenya (Wachira, 2014)		Narrative Analysis	
Assessing the awareness of EMA in the mining industry in South Africa by Smit & Dikgwatlhe (2015)	South Africa	Descriptive, Questionnaire Calculation of Frequencies and Percentages	1. Lack of Communication across departments 2. Inability to acquire and process information 3. Hidden costs such as water, energy and consumables
Identifying barriers to environmental management accounting practices: a comparative study of Nigeria and South Africa by Olalekan and Jumoke (2017)	Nigeria and South Africa	Exploratory, Questionnaire Across 7 industries 50 companies 25 in each country. Analyses descriptive statistics - tables and mean	Nigeria 1. Failure of existing regulatory approaches 2. Lack of Stakeholder and shareholder Power 3. Underrating the Environment in firm policy 4. Lack of management support 5. Inability to collect and allocating environmental costs South Africa 1. High implementation costs 2. Focus on short term financial performance

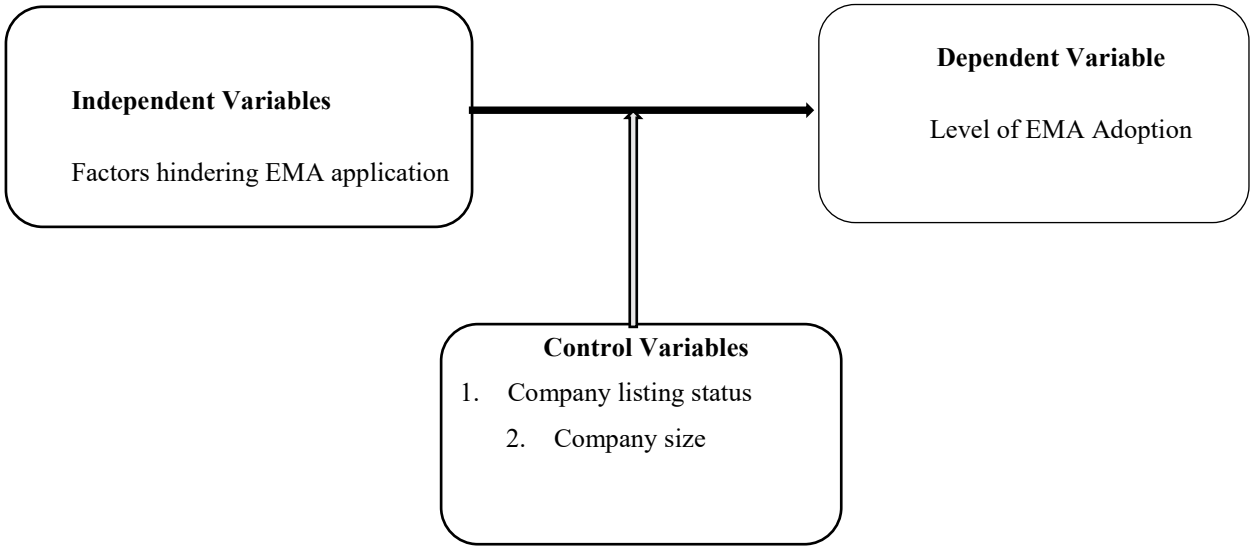
From these findings, it is evident that the challenges associated with application of EMA are specific to countries and industries. Take for example, same study by Olalekan & Jumoke (2017) yielded results in South Africa that are different from Nigeria. Another study in South Africa by Smit & Dikgwatlhe (2015) yielded different results since the focus was on the industry of mining. Noteworthy, the barriers experienced by the different countries all fit in the findings by Gunningham and Sinclair (1997). This is because the study drew its results from international literature, 20 industries' representatives and other relevant stakeholders. This study will employ the barriers identified by Gunningham and Sinclair (1997) since it provides a basis for generating a more comprehensive checklist.

2.5 Conceptual Framework

The conceptual framework represents the actual ideas and beliefs that you hold about the phenomena studied in either written or as a visual form (Maxwell, 2013). The factors identified to influence EMA adoption moderate how these challenges affect each individual company. For example, large companies need to have a better grasp of costs incurred in the different cost centers for them to make more informed decisions (Wachira, 2014), as a result challenges like management inertia, focus on short term financial performance and reluctance to engage in necessary restructuring may not affect term same way as a small company. Large companies also have a huge capital base therefore can be able to raise funds for adopting new systems and getting the best expertise, therefore financial and staff challenges may not affect them the same way as small companies. Another factor to consider is stakeholders influence. Companies that have high stakeholder influence are likely to tackle challenges like underrating the environment

in firm policy and middle management inertia. Listed companies in Kenya tend to face highest influence by stakeholders such as the Capital Markets Authority and Shareholders. As a result, these challenges may not affect listed companies the same way they affect non-listed companies. Factor like industry however were insignificant in this study because the population of the study composed of companies in the manufacturing industry and hence affect the companies in the same way. Therefore, for this study company listing status and size were considered as control variables. A control variable is another factor in an experiment that must be held constant.

Figure 2.1 Conceptual Framework



Chapter Three

Research Methodology

3.1 Introduction

This chapter is composed of the methods the researcher adopted to meet the objectives of the study and to answer the research questions. It emphasizes on research design, population and sample of the study, data collection methods, data presentation and analysis methods.

3.2 Research Philosophy

A research philosophy is a belief about the way in which data about a phenomenon should be gathered, analyzed and used. The purpose of a scientific research is to transform things believed into things known. For this study, the philosophy borrowed was Positivism. Positivists believe that reality is stable and can be observed and described from an objective viewpoint (Levin, 1991) without interfering with the phenomena being studied. They contend that phenomena should be isolated and that observations should be repeatable. This often involves manipulation of reality with variations in only a single independent variable to identify regularities in, and to form relationships between, some of the constituent elements of the social world. This philosophy was useful in determining the reality of the level of EMA application and the factors hindering the application of EMA practices among manufacturing companies in Kenya.

3.3 Research Design

Descriptive survey design was used in this study to explain the variables, selecting sample, designing the method of collecting data, analyzing information and reporting the findings. This was useful in describing in-depth the challenges to adoption and solutions to those challenges. A descriptive survey involves acquiring information about one or more groups of people about their characteristics, attitudes, opinions or experiences by asking them questions and tabulating their answers (Leedy & Ormrod, 2005). Given that a meaning had to be derived from the collected data, especially in explaining relationship between challenges and EMA adoption, the study design was also be partly explanatory. The data collection was done in one point in time (cross sectional basis) due to time constraint the research was subject to.

3.4 Target population and Sampling

The population of this study was composed of manufacturing companies in Kenya that are members of the Kenya Association of Manufactures (KAM). KAM members are categorized into 14 sectors, 12 of which are in processing and value addition while the other two offer

essential services to enhance formal industry. The type of raw materials companies import or the products they manufacture defines sub-sectors (KAM, 2017). The following sectors represent the members of KAM; Building, Mining & Construction, Chemical & Allied, Energy, Electrical & Electronics, Food & Beverages, Leather & Footwear, Metal & Allied, Motor Vehicle Assemblers & Accessories, Paper & Board, Pharmaceutical & Medical Equipment, Plastics & Rubber, Services & Consultancy, Textiles & Apparel, Timber, Wood & Furniture and Motor Vehicle Assemblers & Accessories. There are a total of 564 members from around Kenya as follows; Eastern (18), Central Kenya (31), Coast (73), Rift valley (32) and Nairobi (400).

Due to time constraint, the research aimed to study 60 companies. The sample of 60 was reached by the use of sampling formula $\mathbf{n} = \frac{\mathbf{c2Np(1-p)}}{\mathbf{(A2N)+(c2p(1-p))}}$. n-is the sample size required. N-is the whole target population in question (564 KAM members). p-is the average proportion of records expected to meet the various criteria (1-p) is the average proportion of records not expected to meet the criteria. The study used a p of 50% based on previous studies. A-is the margin of error deemed to be acceptable (calculated as a proportion). The margin of error of 10% was acceptable in this study. c-is a mathematical constant defined by the Confidence Interval chosen i.e. (how sure we need to be of the result). The study adopted a 95% confidence interval.

From the total population of 564 KAM members, sample companies in the different 14 sub-sectors were selected randomly depending on the number (weight) of companies in each sub-sector. This method is known as stratified random sampling. Stratified random sampling is a method of sampling that involves the division of a population into smaller groups known as strata based on members' shared attributes or characteristics. The table below shows a summary of how the sampling was done.

Table 3.1 Research Sample

Sector	**Total Companies**	**Weight**	**Sample**
Food & Beverages	71	12.59%	8
Chemical & Allied	70	12.41%	7
Plastics & Rubber	68	12.06%	7
Metal & Allied	66	11.70%	7
Paper & Board	63	11.17%	7
Services & Consultancy	62	10.99%	7
Textiles & Apparel	35	6.21%	4
Energy, Electrical & Electronics	34	6.03%	4

Motor Vehicle Assemblers & Accessories	27	4.79%	3
Pharmaceutical & Medical Equipment	21	3.72%	2
Building, Mining & Construction	20	3.55%	2
Timber, Wood & Furniture	17	3.01%	2
Leather & Footwear	7	1.24%	1
Fresh Food	3	0.53%	0
	564	**100%**	**60**

3.5 Data collection and methods

This study used primary data by use of questionnaires. A single online questionnaire was created using google documents. Google documents are easy to administrate, fill and can reach people remotely creating a better chance for response. To find the adoption level of the companies, as used in previous studies (Wachira, 2014; Olalekan & Jumoke, 2017), a checklist was provided for a score of 1 if a technique is being used and 0 if it's not. A checklist is a list of behavior or practices a researcher is investigating to check whether or not the items are observed, present or true (Leedy & Ormrod, 2005). For a comprehensive picture of organizational EMA practices, the checklist was developed from a variety of techniques provided by previous studies (ACCA, 2015; ACCA, 2017; Baumgartner & Ebner, 2010; Burritt, 2004; Burritt et al., 2003; Ferreira et al., 2010; GRI, 2017; UNDSD, 2001; UNDSD, 2003; Zhou, Ou, & Li, 2016). See Appendix 3

The same data collection technique was used to investigate challenges to EMA adoption faced by companies. A checklist where respondents scored 1 to 5 symbolizing strongly agree (5), agree (4), neutral (3), disagree (2) and strongly disagree (1). The checklist contained both internal and external challenges to EMA. Separating the challenges into internal and external bore the risk that respondent could be biased in selecting only external challenges. To reduce this risk, all challenges were listed together. The separation was done during analysis. *See* Appendix 2. Provisions were made for respondents to indicate any other EMA techniques and challenges that were not covered in the checklist

3.6 Data Analysis

The data was both quantitative and qualitative. Quantitative data is represented through numbers and analyzed using statistics (O'leary, 2009). To answer the first objective, the number of techniques adopted by a company was divided by the total number of techniques. This established the percentage ((frequency of technique mentioning/ total response) of techniques adopted out of the total available to determine the level of EMA adoption (Burritt et al., 2003; Wachira, 2014; Olalekan & Jumoke, 2017).

For the second objective, the responses to challenges were grouped into two, one group containing internal challenges and the other containing external challenges. The grouping of challenges was based on 'mode and mean' of all responses to each challenges mentioned. This was useful to show what challenges are most common to the managers. This has been the analysis used in the past by researchers (Olalekan & Jumoke, 2017; Setthasakko, 2010; Smit & Dikgwatlhe, 2015; Ustad, 2010). The findings were then be presented in a tabular form showing the mean and mode for each single challenges. This was followed by narrative analysis of each challenges.

For the third objective, multiple regression and coefficient analysis were done to establish how the variables together influence adoption and which are significant in the influence. The regression model was as follows; $Y=\beta_o+ \beta1X1+ \beta2X2+ \beta3X3+ \beta4X4+ \beta5X5+e$

The model described how dependent variable Y (EMA adoption) is related to anyone of the independent variables (challenges to adoption) X1…Xn (regressors) provided all others remain constants. A factor analysis of the challenges was done to reduce the regressors to only those that are not correlated and those that are significant enough for the regression model. The X values (regressors) that were considered for this model were those factors (challenges) that had an eigenvalue of ≥1. A factor loading was then done to identify those specific variables.

β_o is the coefficient of regression. It predicts the relationship between EMA adoption and respective challenges. Y (EMA adoption) is the percentage level of the adoption of the EMA techniques practices.

β1, β2, β3, β4, β5– Each represented the change in marginal effect that follows change in unit change in the respective corresponding variable (X1, X2, X3, X4, X5) holding other variables constant.

e = Error term

T-statistics was computed using standard error that account for non-independence (association) of the data collected. 95% confidence level of estimate was used. The adjusted R squared was computed to test the significance of the regression model in explaining the relationship between EMA adoption and challenges to adoption. The Value Inflation Factor (VIF) for each variable was computed to test the multicollinearity of the independent variables.

3.7 Ethical Consideration

This research conducted under the guidelines of Strathmore University's code of ethics. Ethical Clearance was obtained from the Strathmore University Institutional Ethics Review Committee. Research permit was sought from the National Commission for Science, Technology and Innovation (NACOSTI). Permission to collect data was obtained from the university. A letter from Strathmore Business School was sort and used to interact with the respondents. The confidentiality, anonymity and privacy of the respondents was maintained. Respondents' participation in the study was voluntary. Respondents were informed of all the details of the study. Data gathered and analysed in this research, was regarded with high privacy and used purely on research.

Chapter Four

Presentation and Analysis of Findings

4.1 Introduction

This chapter presents analysis and interpretation of data collected in this research. Section 4.2 provides summary profiles of the respondents. Section 4.3 presents the adoption level among manufacturing companies in Kenya and the most used EMA tools. Section 4.4 of this chapter discusses the challenges to adoption and their levels of significance. Section 4.5 presents relationship between adoption level and challenges to adoption by use of the multiple-regression model. Section 4.6 provides gives a summary of means used by respondents to overcome challenges to EMA adoption.

4.2 Profiles of respondents

The study received a total response rate of 30 companies out of the sample of 60, a response rate of 50% and a 5.3% representative of the total 564 KAM members. Out of the 30 respondents, 26 thought that EMA is necessary for their companies while only 4 thought otherwise. However, from their description of EMA, only 11 had a good understanding of what EMA is.

To measure the influence of listing on EMA adoption, respondents were asked to state whether they are listed on the Nairobi Securities Exchange (NSE). From the total 30 respondents, 5 companies are listed on the NSE.

The most represented sub-sectors are Building, Mining & Construction, Chemical & Allied, Food & Beverages and Timber, Wood & Furniture. The Sub-sectors that have not been represented at all include Leather & Footwear and Fresh Food, which have the least KAM membership. The table below shows a summary.

Table 4.1 Respondents' Profiles

Sub-Sector	No. of companies	Target	Variance
Building, Mining & Construction	3	3	0
Chemical & Allied	4	7	3
Energy, Electrical & Electronics	3	4	1
Food & Beverages	4	8	4
Metal & Allied	3	7	4
Motor Vehicle Assemblers & Accessories	2	3	1
Paper & Board	3	7	4
Pharmaceutical & Medical Equipment	1	2	1
Plastics & Rubber	3	7	4
Textiles & Apparel	2	4	2
Timber, Wood & Furniture	2	2	0
Services & Consultancy	0	7	7
Leather & Footwear	0	0	0
Fresh Food	0	0	0
TOTAL	**30**	**60**	**30**

The companies were divided into different years of existence. Most respondents (36%) have been in existence for less than 10 years i.e. 11 out of the total 30. Older companies of above 50 years were least represented by 5 out of the total 30. The table below shows age summaries of the respondents.

Table 4.2 Number of companies by age

Company Age	No. of Companies
Less than 10 years	11
Between 10-25 years	5
Between 25-50 years	9
Over 50 years	5
Total	**30**

The respondents were asked about their number of departments and employees so that they could be grouped according to their sizes for the researcher to test the significance of size as a control variable. There were three categories of size namely large, medium and small each represented by 11, 16 and 3 companies respectfully. The table below gives a summary of company sizes.

Table 4.3 Number of companies by size

Company Size	No. of companies
Large Companies	11
Medium Sized Companies	16
Small Companies	3
Total	**30**

4.3 EMA Adoption level

The first objective of the study was to find the current adoption of level of EMA among manufacturing companies in Kenya. By finding the aggregate of the practices adopted for each or the three tools, (costing, investing and performance evaluation) the level of adoption was obtained for all the three tools for each respondent. An average adoption level was then derived from the total practices according to the weight held in each tool. Only 12 out of the total 30 respondents had adoption levels of more than 50%. The average adoption level stood at 40% depicting a low level of adoption.

Four (4) companies portrayed no EMA adoption representing 13% of zero (0) adoption. Further investigation of the companies' responses revealed the following. Two were responded to by accountants, 1 by a financial manager and 1 by an internal auditor. All the four respondents had no proper understanding of what EMA. Only two of the four thought EMA adoption is necessary, the other two thought otherwise. Three companies showed the highest adoption level of 100%, 92% and 89%. The three companies' respondents were accountant, finance manager and director. Two of them were Food & Beverages companies and one was in Energy, Electrical & Electronics sub-sector. The respondents had good understanding of what EMA is. One of the companies, with 92% adoption level was a listed company.

Most adopted EMA techniques and practices are in planning and investing decisions. Companies in the manufacturing consider the environment in their planning and investing decisions. There are eight (8) planning and investing techniques, their average adoption level was 51%. The least adopted EMA tool is performance evaluation which had an average adoption of 30%. Manufacturing companies in Kenya are yet to adopt EMA in evaluation employees and company performance.

The table below shows a summary of adoption levels for all EMA tools of each respondent.

Table 4.4 Adoption levels

Respondents	Costing Decisions (23)	Investing Decisions (8)	Performance Evaluation (7)	Total Adoption (38)
1	0%	0%	0%	0%
2	35%	63%	43%	42%
3	0%	0%	0%	0%
4	48%	38%	14%	39%
5	43%	100%	57%	58%
6	0%	0%	0%	0%
7	13%	50%	0%	18%
8	87%	100%	100%	92%
9	65%	63%	71%	66%
10	13%	38%	0%	16%
11	39%	50%	14%	37%
12	57%	75%	71%	63%
13	57%	63%	43%	55%
14	17%	0%	0%	11%
15	48%	75%	86%	61%
16	74%	50%	57%	66%
17	22%	25%	0%	18%
18	78%	100%	29%	74%
19	87%	88%	100%	89%
20	57%	100%	57%	66%
21	35%	75%	14%	39%
22	0%	0%	0%	0%
23	9%	50%	0%	16%
24	25%	33%	0%	22%
25	26%	13%	0%	18%
26	100%	100%	100%	100%
27	4%	25%	0%	8%
28	35%	50%	14%	34%
29	52%	63%	43%	53%
30	39%	50%	0%	34%
Average	**39%**	**51%**	**30%**	**40%**

In the Costing decision techniques, only eight out of the 23 had application of above 50%. Assessment of toxicity of emissions and quantification of volume of waste had the least application of 14%. Inventory analysis had the highest level of application at 69%, followed by life cycle goal setting and, assessment of prevention and other environment management costs, with application levels of 66% and 55% respectively. Assessment of toxicity of emission/waste treated, quantification of volume of waste and energy streams and emissions (e.g. CO2, CH4, NO2) and relative costs of treating different kinds of emissions had the least application of 14% each. Issues of company emissions seems to not been given focus; could be due to complexity of the measuring volumes and their impact or negligence since there is no

legal requirement for companies to be accountable. The table below summarizes application of costing decisions per practice.

Table 4.5 Costing decisions

Costing Decisions	Score	Total	% of Application
Assessment of Materials Cost of product outputs	18	29	62%
Assessment of Materials Cost of Non-Product outputs	7	29	24%
Assessment of Waste and emissions control costs	13	29	45%
Assessment of Prevention and other environment management costs	16	29	55%
Assessment of Research and development costs	15	29	52%
Assessment of Less tangible costs (Cost savings and Increased revenue)	15	29	52%
Life cycle Goal setting	19	29	66%
Inventory analysis	20	29	69%
Environmental Impact Assessment	15	29	52%
Improvement Assessment	16	29	55%
Environmental Target Costing	9	29	31%
Assessment of Volume of emissions/waste	10	29	34%
Assessment of Toxicity of emission/waste treated	4	29	14%
Assessment of Environmental impact added (Volume*input per unit of volume)	8	29	28%
Relative costs of treating different kinds of emissions	4	29	14%
Market price method for environmental costing	12	29	41%
Hedonic pricing method (Assessment of internal and External Factors affecting Price)	11	29	38%
Travel cost method (Economic value of Environmental goods)	9	29	31%
Contingent valuation method (Survey based Economic value of Environmental goods)	5	29	17%
Preliminary estimation of wastage costs	8	29	28%
Quantification of volume of waste and energy streams and emissions (e.g. CO2 , CH4, NO2)	4	29	14%
Evaluation of cleaner production processes	14	29	48%
Post assessment of environmental costing decisions	10	29	34%

In the investing and planning decisions, the least application was on environmental budgeting and lifecycle budgeting at 34% while identification of costs and benefits of capital investment had the highest application 76%. Half of the practices have an application level of more than 50%. Allocation of costs to a specific product has a high application are of 72%. Notably, this practice has been thoroughly applied in the conventional activity based costing. The table below shows the summary of application for investing and planning decisions.

Table 4.6 investing and planning decisions

Investment and planning Decisions	Score	Total	% of Application
Identify costs and benefits of a proposed capital investment	22	29	76%
Allocation of costs to a specific product	21	29	72%
Apply costs across a specified time frame	17	29	59%
Financial indicators (N.P.V, IRR)	16	29	55%
Environmental long term financial planning	12	29	41%
Environmental budgeting	10	29	34%
Physical and Financial environmental planning	13	29	45%
Physical and Lifecycle budgeting	10	29	34%

In performance evaluation decisions, the environmental multiplier had the least application of 17% while the environmental assessment programs had the highest adoption pf 45%. This is the least applied EMA tool with all practices having application levels of <50%. See the table below for the summary.

Table 4.7 Performance evaluation decisions

Performance Evaluation Decisions	Score	Total	% of Application
Environmental Multiplier (Tying Employees Environmental Performance to their bonus pay)	5	29	17%
Ex-post assessment of costing decisions	10	29	34%
Impact accounting and post assessment of physical environmental investment appraisal	8	29	28%
Environmental balanced scorecard	10	29	34%
Environmental assessment programs (Impact assessments)	13	29	45%
Environmental costing and project investment appraisal	10	29	34%
Establishing employees' individual environmental goals	9	29	31%

4.4 Challenges associated with EMA adoption

The second objective was to establish the challenges among manufacturing companies in Kenya. Twenty-nine (29) out of the 30 respondents responded to the challenges. The mode and the mean for each challenges was then calculated to help tell the significance of the challenges. The challenges were scored on a Likert scale of five levels as follows: strongly disagree (1), disagree (2), neutral (3), agree (4) and strongly agree (5). For this analysis, challenges with mode and mean of above 3 (neutral) were considered as significant. Internal challenges tend to be more significant than the external challenges. Accounting systems that fail to capture environmental costs and benefits is the most significant challenge with a mode of 5 and mean of 4. Other significant internal challenges are; Lack of guidance on EMA, Absence of expertise on EMA, A low awareness of environmental issues, Companies' underrating the Environment in firm policy, Inability of management to process information perfectly, Lack of communication across departments in firms and Difficulty in implementing cleaner technology.

The only significant external challenges was found to be failure of existing regulatory approaches. The table below provides a summary of the challenges their mean and mode.

Table 4.8 List of Challenges

List of challenges	N	Mode	Mean	Standard Deviation	SEM
Internal Challenges					
1. Lack of guidance on EMA	29	5	3.59	1.30	0.24
2. Absence of expertise on EMA	29	5	3.69	1.14	0.21
3. A low awareness of environmental issues	29	5	3.62	1.35	0.25
4. Focus on short term financial performance	29	3	3.28	1.24	0.23
5. Underrating the Environment in firm policy	29	5	3.48	1.24	0.23
6. High resistance to change	29	3	3.66	1.08	0.20
7. Accounting systems which fail to capture environmental costs and benefits	29	5	4.00	1.07	0.20
8. Inability of management to process information perfectly	29	4	3.55	1.11	0.21
9. High implementation cost	29	3	3.55	1.21	0.23
10. Lack of communication across departments in firms	29	4	3.62	0.98	0.18
11. Middle management inertia (bureaucracy)	29	3	3.31	1.20	0.22
12. Lack of personnel in charge of management, control and implementation	29	3	3.45	1.06	0.20
13. Reluctance to engage necessary restructuring	29	3	3.52	0.99	0.18
14. Difficulty in implementing cleaner technology	29	4	3.59	1.16	0.21
External Challenges					
1. Failure of existing regulatory approaches	29	4	3.83	0.92	0.17
2. Difficulty in accessing cleaner technology	29	4	3.4	1.05	0.19
3. Complexity of new technology	29	3	3.4	0.98	0.18
4. Difficulty in accessing external funds	29	4	3.63	1.21	0.22
5. Perverse economic incentives	29	4	3.43	1.21	0.22
6. Absence of markets for recycled goods	29	3	3.17	1.20	0.22
7. Economic cycles (Booms and Recessions)	29	3	3.6	1.08	0.20

4.5 Relationship between challenges to EMA adoption and the level of adoption.

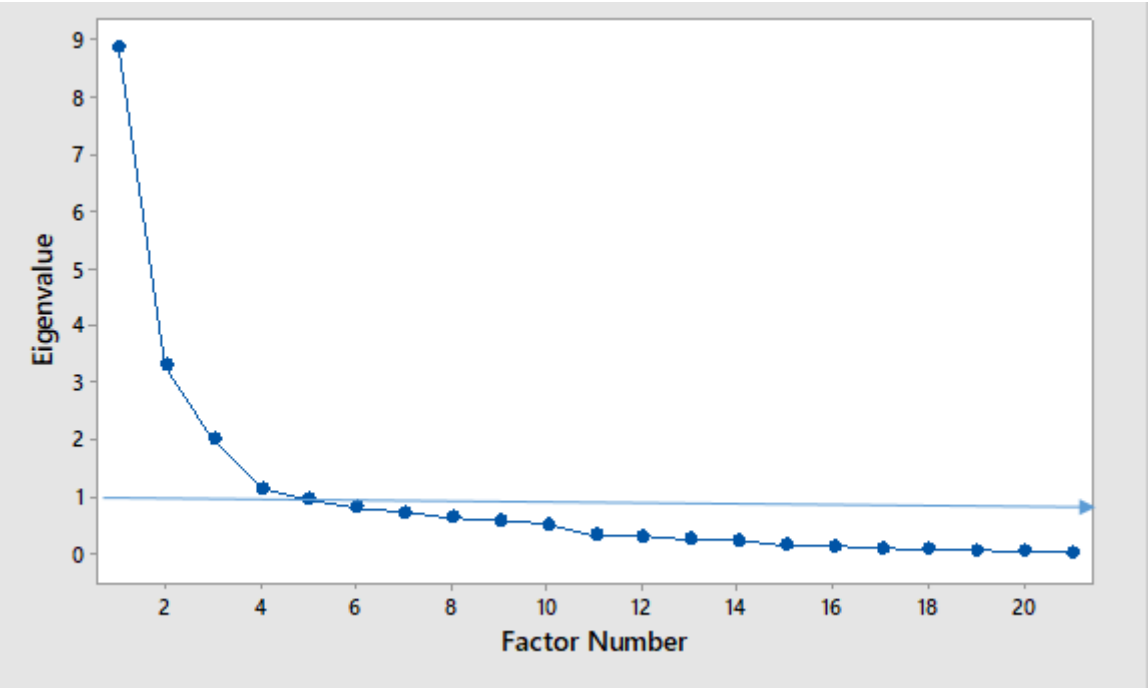
The third objective of the study was to establish the relationship between EMA adoption and challenges to adoption. This was done in two steps. The first step was a factor analysis to reduce the number of interrelated or non-significant factors. The second step was a multiple regression to find the correlation between the significant challenges (independent variable) and adoption level (dependent variable.).

4.5.1 Factor Analysis

In factor analysis, there are the same number of factors as there are variables. Each factor captures a certain amount of the overall variance in the observed variables, and the factors are always listed in order of how much variation they explain.

The eigenvalue is a measure of how much of the variance of the observed variables a factor explains. Any factor with an eigenvalue ≥1 explains more variance than a single observed variable. The figure below shows the eigenvalues for the 21 challenges to adoption.

Figure 4.1 cree Plot for Eigenvalue against Factor Number



From the Scree plot, we can see that only five factors have an eigenvalues that are ≥1. Therefore, out of 21 variables, five factors can significantly be used to explain more variance than the other single observed variables. In other words the 21 variables are inter-related and can be reduced to the five variables.

Factor loadings were done for five factors. The factors were identified to be; lack of guidance on EMA, low awareness of environmental issues, accounting systems which fail to capture environmetal costs and benefits, underrating the environment in firm policy and inability of management to process infoormation perfectly. At the points where the values are highest lies the variables with the strongest association to the factor. In the figure below these values are marked in bold.

Figure 4.2 Factor analysis model for 5 factors

Variable	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Communality
Lack of guidance on EMA (C1)	-0.054	**0.906**	-0.229	0.028	-0.062	0.84
Absence of expertise on EMA (C2)	0.119	-0.873	-0.187	0.123	-0.074	0.91
A low awareness of environmental issues (C3)	**0.928**	-0.336	-0.895	-0.033	-0.042	0.76
Focus on short term financial performance (C4)	-0.086	-0.246	-0.157	0.103	-0.064	0.78
Underrating the Environment in firm policy (C5)	0.207	-0.419	-0.468	**0.878**	-0.226	0.63
High resistance to change (C6)	0.26	-0.096	0.014	0.074	-0.109	0.87
Accounting systems which fail to capture environmental costs and benefits (C7)	0.267	-0.393	**0.346**	0.11	-0.189	0.68
Inability of management to process information perfectly (C8)	0.098	-0.116	-0.103	0.199	**-0.007**	0.66
High implementation cost (C9)	0.381	-0.114	-0.163	0.591	-0.307	0.88
Lack of communication across departments in firms (C10)	0.057	-0.15	-0.007	0.226	-0.16	0.74
Middle management inertia (bureaucracy) (C11)	0.475	-0.072	-0.069	0.232	-0.046	0.68
Lack of personnel in charge of management, control and implementation (C12)	0.636	-0.216	-0.265	0.118	-0.243	0.82
Reluctance to engage necessary restructuring (C13)	0.294	-0.248	-0.567	0.293	-0.268	0.72
Difficulty in implementing cleaner technology (C14)	0.291	-0.15	-0.128	0.204	-0.807	0.86
Failure of existing regulatory approaches (C15)	-0.019	-0.234	0.049	0.039	-0.076	0.78
Difficulty in accessing cleaner technology (C16)	0.442	-0.037	-0.08	0.218	-0.316	0.68
Complexity of new technology (C17)	0.704	0.03	-0.146	0.186	-0.086	0.82
Difficulty in accessing external funds (C18)	0.762	-0.03	-0.069	0.166	-0.106	0.56
Perverse economic incentives (C19)	0.865	-0.057	0.066	0.125	-0.081	0.71
Absence of markets for recycled goods (C20)	0.787	0.002	-0.283	0.095	-0.012	0.88
Economic cycles (Booms and Recessions) (C21)	0.75	-0.051	-0.068	0.124	-0.27	0.76
Variance	4.6474	2.3434	1.7676	1.6032	1.2278	16.02
% Var	**0.221**	**0.112**	**0.094**	**0.086**	**0.078**	**59.1%**

However, a further analysis of the total variances explained by the five factors revealed that they only explain 59.1%. See the figure below. As a result, the researcher tested for the adequacy of the model by adding a factor after that. After testing with 6, 7 and 8 factors, the optimum number of factors to be used for further analysis increased to 8, improving the variance explained by the variables to 74.3%. The factor loading for the 8 factors was done to find the variables to be used for multiple regression analysis. See the figure below.

Figure 4.3 Factor analysis model for 10 factors

Rotated Factor Loadings and Communalities									
Varimax Rotation									
Variable	**Factor1**	**Factor2**	**Factor3**	**Factor4**	**Factor5**	**Factor6**	**Factor7**	**Factor8**	**Communality**
C1	-0.054	**0.906**	-0.229	0.028	-0.062	-0.14	0.121	0.074	0.84
C2	0.119	-0.873	-0.187	0.123	-0.074	**0.123**	0.177	0.099	0.91
C3	**0.928**	-0.336	-0.895	-0.033	-0.042	-0.101	-0.013	0.001	0.76
C4	-0.086	-0.246	-0.157	0.103	-0.064	-0.113	0.161	0.147	0.78
C5	0.207	-0.419	-0.468	**0.878**	-0.226	0.021	0.022	0.008	0.63
C6	0.26	-0.096	0.014	0.074	-0.109	-0.182	-0.008	0.226	0.87
C7	0.267	-0.393	**0.346**	0.11	-0.189	-0.218	0.086	0.208	0.68
C8	0.098	-0.116	-0.103	0.199	**-0.007**	-0.904	0.179	0.13	0.66
C9	0.381	-0.114	-0.163	0.591	-0.307	-0.174	0.251	0.065	0.88
C10	0.057	-0.15	-0.007	0.226	-0.16	-0.142	0.212	**0.876**	0.74
C11	0.475	-0.072	-0.069	0.232	-0.046	-0.24	0.071	0.081	0.68
C12	0.636	-0.216	-0.265	0.118	-0.243	-0.165	-0.041	-0.106	0.82
C13	0.294	-0.248	-0.567	0.293	-0.268	-0.091	-0.167	0.059	0.72
C14	0.291	-0.15	-0.128	0.204	-0.807	-0.102	0.115	0.208	0.86
C15	-0.019	-0.234	0.049	0.039	-0.076	-0.167	**0.918**	0.182	0.78
C16	0.442	-0.037	-0.08	0.218	-0.316	0.117	0.078	0.21	0.68
C17	0.704	0.03	-0.146	0.186	-0.086	-0.058	0.03	0.092	0.82
C18	0.762	-0.03	-0.069	0.166	-0.106	-0.048	0.099	0.04	0.56
C19	0.865	-0.057	0.066	0.125	-0.081	-0.059	-0.106	0.016	0.71
C20	0.787	0.002	-0.283	0.095	-0.012	0.101	-0.015	-0.012	0.88
C21	0.75	-0.051	-0.068	0.124	-0.27	-0.177	-0.035	0.144	0.76
Variance	4.6474	2.3434	1.7676	1.6032	1.2278	1.1873	1.141	1.0932	16.02
% Var	**0.221**	**0.112**	**0.094**	**0.086**	**0.078**	**0.067**	**0.054**	**0.052**	**74.3%**

Factor 5 had a loading of -0.007 which is weak compared to others and was also removed as a variable by the researcher hence reducing the variables to nine. Therefore, the eight variables that were used for regression were; lack of guidance on EMA, absence of expertise on EMA, low awareness of environmental issues, underrating the environment in firm policy, lack of communication across departments in firms, difficulty in implementing cleaner technology and failure of existing regulatory approaches.

4.5.2 Regression Analysis

After the factor analysis was done, a multiple regression was done on the nine independent variables obtained against levels of EMA adoption to find out whether the variables can be used to explain adoption behaviour of manufacturing companies. The model is summarized below.

Figure 4.4 Regression model for Challenges to EMA adoption and Level of EMA adoption

Model Summary

S	R	R-sq.	R-sq. (adj)
2.291	94%	88%	72.80%

Coefficients					
Term	Coef	SE Coef	T-Value	P-Value	VIF
Regression	**7**			**0.0423**	
Constant	0.271	0.32	2.72	0.014	
Lack of guidance on EMA	-0.019	0.0966	-0.02	0.0185	5.19
Absence of expertise on EMA	-0.118	0.127	-0.93	0.0365	6.87
A low awareness of environmental issues	-0.1	0.0678	-1.48	0.0157	2.76
Underrating the Environment in firm policy	0.978	0.0766	1.28	**0.2108**	2.99
Accounting systems which fail to capture environmental	0.78	0.101	0.77	**0.4530**	3.88
Lack of communication across departments	-0.852	0.0768	-1.11	0.0282	1.88
Failure of existing regulatory approaches	-0.831	0.0783	-1.06	0.0303	1.70

The result from the regression show that the model has a P-value of 0.042, which is slightly lower than 0.05. This tells that the regression model is significant in explaining the relationship between the dependent and independent variables. The adjusted R of 72.8% indicate that changes in the independent variables can explain variance in levels of adoption by the same percentage. The Standard Error (S) of 2.291 validates that the observed values fall approximately close to the regression line.

The Value Inflation Factor (VIF) is used to quantify the degree to which the independent variables are correlated (multicollinearity). The variables 'Lack of guidance on EMA' and 'Absence of expertise on EMA' have VIFs of 5.19 and 6.87 respectively presenting moderate multicollinearity, while the other variables have VIFs of less than 5 hence showing small multicollinearity.

From the individual independent variables, the P values of the variables 'Underrating the Environment in firm policy', 'Accounting systems which fail to capture environmental', and 'Inability of management to process information perfectly' are 0.2108 and 0.4530 respectively. These values are above 0.05 and hence the variables are regarded insignificant and therefore not considered in the regression.

The constant has a coefficient of 0.271 representing an adoption level of 27% when all the independent variables are held constant. For the first variable the coefficient shows that when lack of guidance on EMA increases by 1% adoption level reduces by 0.019%. A negative

relationship also exists for the second challenge where a unit increase in absence of expertise on EMA reduces adoption by 0.118%. For the third variable, a unit increase in low awareness of environmental issues reduces EMA adoption by 0.1%. The coefficient of the variable lack of communication across departments is 0.852 indicating that its unit increase reduces adoption level by 0.852%. For the fifth variable, a unit increase in failure of existing regulatory approaches reduces EMA adoption by 0.831.

4.5.3 Impact of the control variables size and listing status

There were three small companies' among the 30 respondents. Their adoption level were 34% for 2 and 0% for 1 making an average of 23%. The 16 medium sized companies had an average of 30% adoption with only 4 out of 16 having adoption levels of above 50%. The 11 large companies had an average adoption of 58% with 8 out the 11 having adoption levels of more than 50%. From this we can conclude that bigger companies tend to adopt have a higher adoption than smaller ones.

There were five listed companies out of the total 30 respondents. Three out of five listed companies had adoption levels of above 50%. One had an adoption of 92% and another had an adoption of 7%. This shows that there is no huge influence of listing on adoption of EMA in Kenya.

4.6 Overcoming Challenges to EMA adoption

The respondents were asked to state how they overcome the challenges that they have encountered in implementing EMA. Thirteen companies responded to this question. The responses were then sorted into similar concepts and ideas then grouped together. This grouping enabled formation of six unique ways of overcoming EMA adoption challenges.

The most common practice adopted to overcome challenges to EMA adoption has been creating awareness among stakeholders. Two companies ensured that the board, shareholders and employees were educated on the importance of EMA so that everyone understood the concept and its importance, as a result making them support its adoption. Three companies focused on building organisational learning programs that equipped staff with requisite knowledge and skills on environmental issues and their impacts on the society.

Improving communication within the company. Two companies improved their communication channels and frequencies hence enabling effective sharing of information across departments. Some companies overcome challenges by implementing one practice at a

time. One company affirmed that its high adoption was a step at a time approach, where we they tackled each problem as it occurred and eventually more practices were adopted.

EMA challenges have also been overcome by collaborating and learning from other companies. One company stated that partnerships with organizations that have effectively adopted EMA gave it the proficiency to implement practices that seemed challenging. Another company has been working with Kenya Green Building Society (KGBS) to promote the adoption of green building strategies amongst the local developers.

Policy formulation and value creation have also been practices used to overcome challenges to EMA adoption. Two companies asserted that their formulation of internal policies and procedures enabled the monitoring and controlling of the impact of their operations on the environment. One company created a market for their recycled goods enabling it to generate value out of EMA practices hence overcoming challenge of implementation costs.

Chapter Five

Discussion and Conclusion

5.1 Introduction

This chapter discusses the findings of the study and summarizes the conclusions of derived from the analysis of the collected data. Section 5.2 will give a summary of the results of analysis and answer the three research questions. Section 5.3 will highlight the limitations of the study and provide recommendations for further studies.

5.2 Summary of the findings

5.2.1 EMA adoption level among manufacturing

There are two commonly methods to measure adoption level, the analysis of environmental information incorporated into management and a checklist of EMA techniques being adopted. This study adopted latter by use of a comprehensive checklist of the tool used in EMA and their correspondent techniques. The average adoption level of EMA among the respondents is 40%. This is an indicator that the level of EMA adoption is low. The findings of this study concur with previous studies in Kenya that found low level of EMA adoption (Mbuthia, 2016; Wachira, 2014; Onyango, 2014).

The finding on level of EMA adoption also revealed the most and least adopted EMA tools and techniques. The most commonly adopted techniques are in planning and investing decisions. Companies in the manufacturing consider the environment in their planning and investing decisions. This could be because this tool has practices that are vital for the financial performance of an organisation such as identification of costs and benefits of a proposed capital investment, allocation of costs to a specific product, environmental long term financial planning and environmental budgeting. A company's management can barely ignore these practices. The average adoption level for planning and investing decisions was 51%.

The least adopted EMA tool is performance evaluation. This tool had an average adoption of 30%. Manufacturing companies in Kenya tend to evaluate employees and company performance without considering the environmental performance. This tool however comprise of very complicated and advanced practices such tying employees environmental performance to their bonus pay, post assessment of physical environmental investment appraisal, environmental balanced scorecard, environmental costing and project investment appraisal and establishing employees' individual environmental goals.

5.2.2 Challenges associated with EMA adoption

An analysis of the challenges revealed that the twenty-one (21) challenges seemed to be explaining the variances in EMA adoption level among factors. Not all challenges are significant to all the companies; they affect the companies at different levels. The mode and the mean for each challenges was calculated to rank the challenges according to their significance. The challenges were scored on a Likert scale of five levels.

The challenges were separated between the internal and external ones. The challenges that were most common among the companies were; accounting systems that fail to capture environmental costs and benefits, lack of guidance on EMA, absence of expertise on EMA, a low awareness of environmental issues, companies' underrating the Environment in firm policy, inability of management to process information perfectly, lack of communication across departments in firms, difficulty in implementing cleaner technology and failure of existing regulatory approaches. From the above nine mentioned challenges, the only external one is failure of existing regulatory approaches. This affirms that challenges to EMA adoption faced manufacturing companies in Kenya are within their control. A previous study done by Wachira (2016) found that lack of guidance on EMA and absence of expertise of expertise on EMA were the main challenges associated with EMA adoption among manufacturing companies in Kenya. Her study, however, was more focused on factors influencing EMA adoption as opposed to challenges to EMA adoption which in the focus of this study. The findings of this study, nevertheless, have confirmed that those two as part of the significant challenges to EMA adoption.

The results of this study are similar to most of the previous studies in other countries on challenges to EMA have found internal challenges as the most significant (Setthasakko, 2010; Smit & Dikgwatlhe, 2015; Ustad, 2010). A similar study in Nigeria and South Africa by (Olalekan & Jumoke, 2017) also found failure of existing regulatory approaches as the only external challenges to EMA adoption. This is consistent with UNEP (2014) report that identified weak and fragmented policy coordination among relevant government agencies.

5.2.3 Relationship between challenges to EMA adoption and the level of adoption

To find the relationship between challenges and level of EMA adoption the researcher fist reduced the 21 factors to only a representative number of the total. This was done by use of factor analysis. The 21 factors were reduced to the following nine variables; lack of guidance on EMA, absence of expertise on EMA, low awareness of environmental issues, focus on short

term financial performance, underrating the Environment in firm policy, accounting systems which fail to capture environmental costs and benefits, lack of communication across departments in firms, difficulty in implementing cleaner technology and failure of existing regulatory approaches.

A multiple regression analysis was then done matching each respondent's level of adoption to their scoring on the nine challenges identified as variables. The regression model was tested and found to significant. It was also established from the adjusted R squared that changes in the independent variables can explain variance in levels of adoption by the same percentage.

The results of the regression model revealed that only five out of the nine tested challenges were related to the level of adoption. The relationship between these challenges and the level of adoption was negative showing that level of adoption reduced as these challenges increased. The challenges were; lack of guidance on EMA, absence of expertise on EMA, low awareness of environmental issues, lack of communication across departments and failure of existing regulatory approaches. This means that manufacturing companies can attain higher levels of adoption once these challenges are overcome. Some respondents have provided guidelines to overcome the key challenges within management's control. These are discussed in the section 5.2.4. Given that there are 21 challenges to EMA adoption, with a mean adoption level of 40% EMA among manufacturing companies, the challenges related to adoption should ideally be more than five. However, we can conclude that adoption is not only explained by challenges but also some motivators. Wachira (2014), found these influencers among manufacturing companies as age, size, financial performance, level of sophistication of manufacturing technologies and level of environmental strategies. This study also found that age and size of a company explain variability in adoption.

Size of the company was identified to be influencing the level of EMA adoption. The study revealed that large companies have a higher adoption compared to small companies. Eight out the eleven large companies in this study have high adoption levels of above 50%. This finding is similar to one in Ghana by Nartey (2018) who found bigger firms to be in the frontline to implementing carbon management accounting as opposed to smaller ones. Bigger companies influence management to employ a range of managerial accounting methods (Chang, 2013).

Listing status of the company has no influence on the level of EMA application. The EMA adoption levels of listed companies in this study ranged widely from 92% to 7% showing no relationship between adoption levels and listing status.

5.2.4 Overcoming Challenges to adoption

The study also sought to find the ways management overcome challenges to EMA adoption. Creation of awareness among employees and other is the most used way to improve acceptance and implementation of EMA. This makes sense because one of the main challenges to adoption is low awareness on environmental issues. Developing learning programs within organizations will not only enhance EMA acceptance but also create room for exchange of ideas on ways to work together and boost adoption within organizations.

Improving communication within the company and EMA policy formulation are other common ways used to overcome EMA adoption challenges. Underrating the Environment in firm policy and lack of communication across departments are significant challenges to adoption of EMA. Improving communication across departments enables gathering of information from cost centres and, integration milestones achieves and challenges experiences within the companies. Considering the environment on firm policy creates a roadmap to be observed by the company for environmental management.

Other ways used by some companies to overcome challenges to EMA adoption are; implementing one practice at a time, partnering and learning from other companies and value creation. Implementing one practice at a time manages the cost incurred in implementation and facilitates maximization of an EMA technique before another one is embodied. Partnering and learning from other companies held overcome the challenges of lack of expertise and guidance on EMA. Companies that have not yet adopted or have lower adoption levels can collaborate with leaders in the industry whose adoption level is higher than most. Creation of value for EMA practices is key to realize financial benefits of adoption. Example, a respondent generates value by creating a market for their recycled goods. This enables the company to cover the lifecycle of its products, reduce production costs, increase revenue and reduce waste associated costs.

5.3 Limitations of the Study

The biggest limitation of this study is attaining only 30 companies' respondents out of over a thousand manufacturing companies in Kenya. This is because the study was cross sectional due to time constraints. Furthermore, the research did not receive responses from three sub-sectors; services & consultancy, leather & footwear and fresh food.

5.4 Conclusion and Recommendations

Kenya is one of the countries in the forefront of building global agreement around best approaches to promote sustainable development. The country aims at Recently, the Government of Kenya host a High-Level Global Conference on Sustainable Blue Economy from 26th – 28th November 2018 at the Kenyatta International Convention Centre (KICC) in Nairobi. The conference was grounded on Job Creation, Poverty Alleviation, Climate Change, Waste Management and Controlling Pollution. The manufacturing industry is one of the key industries associated with job creation and as well as production of hazardous waste. The country's big 4 agenda gives manufacturing a priory with the aim to expand create jobs and increase revenues through exportation.

EMA adoption has proved to enable sustainability of manufacturing companies and at the same time reduce environmental impact hence contributing to national goal of attaining a green economy by 2030. The results of this study, however, show that the adoption level of EMA among manufacturing is still low with an industry average of 40%. There is varied levels of adoption among companies, with some adopting all EMA techniques while others adopting only the necessary practices. Previous studies and theories have presented a number of motivations for adoption. Legitimacy theory explains that companies behave within the boundaries of what society identifies as socially acceptable behaviour (Deegan, 2002; Reynolds, 2018). This could not be the case in Kenya where listed companies (who are more exposed to the society) have no pressure to adopt EMA. According to findings of this study, listing status of a company is not an influencing factor to EMA adoption. This could be linked to key challenges observed in this study of failing regulatory approaches. The Capital Markets Authority, the National Environmental Management Authority, Kenya National Cleaner Production Centre and other regulators are not doing enough to influence EMA adoption or ensure that companies are responsible for their environmental impact. There is need to have clear non-fragmented guidelines and regulations that would require environmental accountability for manufacturing companies. These regulatory bodies should therefore work together with UNDSD and UNEP to develop such regulations and guidelines for the manufacturing companies.

Low levels of awareness and lack of expertise on EMA have been presented as key challenges to EMA adoption. Given that the companies face similar challenges yet have varied adoption levels, knowledge could be used to explain this variance. The planned behaviour model by Azjen (1991) that connects knowledge, attitude, behavioural intention and actual behaviour

could be applied in this context. Companies that have more knowledge have better control of their attitude and behaviour and hence are expected to adopt more.

The members of the public, shareholders and employees of companies need to be educated on the importance of EMA and Environmental accountability. The government, with the aim of attaining a green economy by 2030, should be in the forefront with this sensitization. The 2030 goal is national and yet many Kenyans are still not aware of it, yet they are required to be on-board in this journey to a green economy.

Future studies should attempt to be longitudinal and target a bigger sample. Future studies should also use additional data collection methods like interviews and focused group discussions with different managers of different companies. This would help to have direct open discussions with respondents and obtain more information on challenges and ways of overcoming them. Furthermore, the study could be extended to other industries like transport, agriculture and mining which are equally highly sensitive to the environment.

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APPENDICES

Appendix 1

Techniques for EMA

Tools	Techniques
1. Costing Decisions	**A.) Identification of environmental costs** i. Assessment of Materials Cost of product outputs ii. Assessment of Materials Cost of Non-Product outputs iii. Assessment of Waste and emissions control costs iv. Assessment of Prevention and other environment management costs v. Assessment of Research and development costs vi. Assessment of Less tangible costs (Cost savings and Increased revenue) **B.) Life Cycle Assessment (LCA)** i. Goal setting ii. Inventory analysis iii. Impact Assessment iv. Improvement Assessment **C.) Environmental Target Costing** **D.) Activity Based Costing (ABC)** i. Assessment of Volume of emissions/waste ii. Assessment of Toxicity of emission/waste treated iii. Assessment of Environmental impact added (Volume*input per unit of volume) iv. Relative costs of treating different kinds of emissions **E.) Full Environmental Cost Accounting:** i. Market price method, ii. Hedonic pricing method (Assessment of internal and External Factors affecting Price) iii. Travel cost method (Economic value of Environmental goods) iv. Contingent valuation method (Survey based Economic value of Environmental goods) **F.) Materials Flow Accounting** i. Preliminary estimation of wastage costs ii. Quantification of volume of waste and energy streams and emissions (e.g. CO2 , CH4, NO2) iii. Evaluation of cleaner production processes **G.) Post assessment of environmental costing decisions**
2. Investment and planning Decisions	**A.) Total Cost Assessment (TCA)** i. Identify costs and benefits of a proposed capital investment ii. Allocation of costs to a specific product iii. Apply costs across a specified time frame iv. Financial indicators (N.P.V, IRR)

	B.) Environmental risk and uncertainty analysis i. Environmental long term financial planning ii. Environmental budgeting iii. Physical and Financial environmental planning iv. Physical and Lifecycle budgeting **C.) Multi-Criteria Assessment (Evaluation to consider and trade off all relevant criteria in Decision Making)**
3. Performance Evaluation Decisions	i. Environmental Multiplier (Tying Employees Environmental Performance to their bonus pay) ii. Ex-post assessment of costing decisions iii. Impact accounting and post assessment of physical environmental investment appraisal iv. Environmental balanced scorecard v. Environmental assessment programs (Impact assessments) vi. Environmental costing and project investment appraisal vii. Establishing employees' individual environmental goals

(ACCA, 2015; Development, Accounting & Verkehr, 2001; Institute of Management Accountants, 1996)

Appendix 2

Techniques for Identifying and Allocating environmental costs

	Technique	Description
1	Input/Outflow Analysis	This technique records material inflows and balances this with outflows on the basis that, what comes in, must go out. By accounting for outputs in this way, both in terms of physical quantities and, at the end of the process, in monetary terms too, businesses are forced to focus on environmental costs. For example, if 800kg of materials have been bought and only 500kg of materials have been produced, then the 300kg difference must be accounted for.
2	Flow Cost Accounting	This technique makes material flows transparent by looking at the physical quantities involved, their costs and their value. It divides the material flows into three categories: material, system & delivery and disposal. The values and costs of each of these three flows are then calculated. The aim of flow cost accounting is to reduce the quantity of materials as well as having a positive effect on the environment, should have a positive effect on a business' total costs in the long-run.
		ABC allocates internal costs to cost centres and cost drivers based on the activities that give rise to the costs. In an environmental accounting context, it distinguishes between environment-related costs, which can be attributed to joint cost centres, and environment driven costs, which tend to be hidden on general overheads.
3	Activity-Based Costing	
4	Lifecycle Costing	Within the context of environmental accounting, lifecycle costing is a technique that requires the full environmental consequences, and, therefore, costs, arising from production of a product to be taken account across its whole lifecycle.

(ACCA, 2017;; UNDSD, 2001; UNDSD, 2003)

Appendix 3

EMA Tools and Their Corresponding Techniques

EMA Tools and Their Corresponding Techniques	**SCORE**	
Costing Decisions	**0**	**1**
Assessment of Materials Cost of product outputs		
Assessment of Materials Cost of Non-Product outputs		
Assessment of Waste and emissions control costs		
Assessment of Prevention and other environment management costs		
Assessment of Research and development costs		
Assessment of Less tangible costs (Cost savings and Increased revenue)		
Life cycle Goal setting		
Inventory analysis		
Environmental Impact Assessment		
Improvement Assessment		
Environmental Target Costing		
Assessment of Volume of emissions/waste		
Assessment of Toxicity of emission/waste treated		
Assessment of Environmental impact added (Volume*input per unit of volume)		
Relative costs of treating different kinds of emissions		
Market price method for environmental costing		
Hedonic pricing method (Assessment of internal and External Factors affecting Price)		
Travel cost method (Economic value of Environmental goods)		
Contingent valuation method (Survey based Economic value of Environmental goods)		
Preliminary estimation of wastage costs		
Quantification of volume of waste and energy streams and emissions (e.g. CO2 , CH4, NO2)		
Evaluation of cleaner production processes		
Post assessment of environmental costing decisions		
Investment and planning Decisions		
Identify costs and benefits of a proposed capital investment		
Allocation of costs to a specific product		
Apply costs across a specified time frame		
Financial indicators (N.P.V, IRR)		
Environmental long term financial planning		
Environmental budgeting		
Physical and Financial environmental planning		
Physical and Lifecycle budgeting		
Performance Evaluation Decisions		
Environmental Multiplier (Tying Employees Environmental Performance to their bonus pay)		

Ex-post assessment of costing decisions		
Impact accounting and post assessment of physical environmental investment appraisal		
Environmental balanced scorecard		
Environmental assessment programs (Impact assessments)		
Environmental costing and project investment appraisal		
Establishing employees' individual environmental goals		
Please add any other technique(s) you use in the spaces provided below:		

Appendix 4

The following are challenges you experience to your adoption of EMA

Please tick where appropriate. Add any other challenge(s) not mentioned in the space provided.					
Challenges	Strongly Disagree **(1)**	Disagree **(2)**	Neutral **(3)**	Agree **(4)**	Strongly Agree **(5)**
1. Lack of guidance					
2. Absence of expertise on EMA					
3. A low awareness of environmental issues					
4. Focus on short term financial performance					
5. Underrating the Environment in firm policy					
6. High resistance to change					
7. Accounting systems which fail to capture environmental costs and benefits					
8. Inability of management to process information perfectly					
9. High implementation cost					
10. Lack of communication across departments in firms					
11. Middle management inertia (bureaucracy)					
12. Lack of personnel in charge of management, control and implementation					
13. Reluctance to engage necessary restructuring					
14. Difficulty in implementing cleaner technology					
15. Failure of existing regulatory approaches					
16. Difficulty in accessing cleaner technology					
17. Complexity of new technology					
18. Difficulty in accessing external funds					
19. Perverse economic incentives					
20. Absence of markets for recycled goods					
21. Economic cycles (Booms and Recessions)					
Please add any other challenge(s) you face in the spaces provided below:					

Appendix 5

Questionnaire