THE USE OF ENVIRONMENTAL MANAGEMENT ACCOUNTING IN CHINA'S MANUFACTURING INDUSTRY

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ABSTRACT

With the increased number of environmental problems in the global scope, the application of environmental management accounting (EMA) in enterprises had attracted constant attention all over the world. Even though EMA has become in the world a new and hot research direction, China's application of EMA research was relatively small. With the strengthening of environmental protection work in China, the Chinese government and enterprises had tried to accept the use of EMA and gradually caught up with the pace of international environment requirements. Previous studies showed the level of adoption and implementation of EMA was still weak, especially in developing countries. A current paper showed results of a pilot research on manufacturing companies conducted in China. Although some studies questioned the extent of the use of EMA, the findings of the research suggested that the use of EMA had potential for further development in China. However, this study is a pilot study, thus the sample size was considered insufficient but a future study had been suggested to produce more accurate results and findings.

Keywords: EMA, use, China, Manufacturing industry

1.0 INTRODUCTION

With the increasing level of environmental problems in the global scope, the application of EMA in companies had attracted frequent attention all over the world. Many companies in developed countries collected, used and distributed information related to the natural environment (Gray et al.,1996, Schaltegger, & Burritt, 2000), this reflected a fundamental change compared to a decade ago However, some companies held that this environmental issue brought no problems or negative effects to their businesses; therefore environmental problems were neglected and dismissed EMA as impractical for the companies (Roziana & Ariffin, 2016). The company's daily activities had a negative impact on the environment, and the increase in environmental impact costs had also evoked great concern among the stakeholders of the company (Burritt, R. L., Hahn, T., & Schaltegger, St. (2002). The calculation method and the environmental cost-benefit list were used as a new management accounting tool for the purpose of evaluating environmental investment (Bouma & Van Der Veen, 2002). In most cases, government agencies and NGOs integrated, edited and adopted these technologies (White et al 1991) and to a certain extent, these technologies had been applied because of the high degree of attention on the business level (Bartolomeo et al., 2000). For Bennett and James, 1998; Van der Veen, 2000 these practices and technologies were called 'EMA'. However, few empirical studies can prove EMA efficiency in transforming a company into a sustainable business (Boons et al., 2013).

Since the United Nations Sustainable Development Program (UN DSD) defined EMA and designed the basic corporate financial model including environmental cost, many countries in the world had conducted extensive research on the application of EMA model in practice. Faced with the pressure of market competition and self-survival brought by environmental management, Chinese enterprises were far from meeting the needs of an ecological market and sustainable development by relying only on traditional competitive means. Therefore, the introduction of the environmental management specific conception and the implementation of EMA were the only way for Chinese companies to face the negative impact of the environment, strengthened their position on the international stage, expanded the company's scale and survived in a competitive market. Despite the fact that EMA had come into the world as a new and hot research direction, China's research in EMA was relatively diminutive. With the strengthening of environmental protection work in China, the Chinese government and enterprises had tried to accept the use of EMA, and gradually accelerated with the pace of international environment (Xiaomei, 2004).

In this paper, the application of the concepts and methods of EMA was the major focus conducted in manufacturing industry of industrial companies China. The following is the structure of the paper. Based on the previous literature, this paper introduced the definition of EMA, the demand for use of EMA in manufacturing companies, EMA in different countries especially in China. This was followed by the result of a pilot study portraying a general scenario on EMA tool in China's manufacturing industry. Finally, this paper concluded with the discussion and finished processes of EMA application, expounded the theoretical and practical enlightenment, and some suggestions for future research.

2.0 LITERATURE REVIEW

2.1 EMA

The definition of EMA in past literature was roughly similar but slightly different to the current ones. According to Schaltegger and Burritt (2000), EMA was a system which enabled a business to trace, collect, collate, and analyze physical and monetary environmental information in order to support decision making and performance management. The UNDSD suggested that EMA was simply doing better management accounting, while wearing an environmental hat that opened the eyes for hidden costs (Albertini, 2013). For Deegan, EMA was the collection, analysis and the use of environmental cost information for the purpose of supporting environmental management systems and environmental reporting to interested parties (Deegan, 2003). Burritt et al. (2002) asserted that the construct of EMA were monetary EMA and physical EMA. Monetary EMA, as part of environmentally differentiated conventional accounting, dealt with the environmental aspects of corporate activities expressed in monetary units and generated information for internal management use (e.g. costs of fines for breaking environmental laws, investment in capital projects that improved environment) while physical EMA was an internal management tool that reduced organizational environmental impacts in physical units (e.g. the flow of energy, water, materials, and wastes) (Burritt et al., 2002).

2.2 The demand for EMA

Rikhardsson (2005) argued that traditional management accounting did not promote sustainable development and was a difficult problem for business management to solve. More companies were now adopting an approach that integrated EMA with traditional management accounting, which promoted the goal of integrating the environment. However, it is worth considering whether the implementation of EMA can affect their own profitability because of the significant infrastructure costs that they incurred (Muhammad & Isa, 2009; Boons et al 2003). In 2000, the European Environmental and Social Accounting Review analyzed the actual and marginal impact of EMA. They found that companies that promoted and implemented EMA had a positive impact on environmental performance (Klassen & McLaughlin, 1996; Giménez Leal et al., 2003; Maliah et al., 2006).

Although companies are currently extremely focused on improving their own green awareness, Gadenne, Kennedy and McKeiver (2008) held that for companies that currently adopt EMA, the implementation was less effective and did not result in benefits to the company. Bartolomeo et al. (2000) on the Economic Project's Interviews with stakeholders revealed that the cost of EMA was much higher than the actual benefits it brought to the company. In addition, although some enterprises had implemented EMA and given full recognition to EMA but they had failed to incorporate EMA into their corporate management activities.

Gadenne et al. (2008) validated the existence of a relationship between the awareness of the environment and the stakeholders of a firm and there was increasing evidence that EMA can be a better stimulus to profitability than traditional management accounting. Therefore, one can assume that adopting a legislative approach can quickly help people to heighten environmental awareness. Therefore, companies need to seek assistance outside of their businesses when they want to translate the concept of environmental awareness into action. In addition, despite the fact that EMA is a universal framework and company had its own special requirements; this meant EMA needed to optimize and improve to these (Sendroiu et al., 2006) Rikhardsson et al. (2005) claimed that whether it was the use of EMA, the effective selection of decision making, the result of pressure from other factors or innovative behaviors; the influence of EMA can be enhanced when companies used EMA as an auxiliary decision-making tool. Schaltegger and Burritt (2000) elaborated on the monetary aspects of EMA in more detail. The United Nations (2002) however paid more attention to environmental costs and economic income flows and proposed to include monetary and non-monetary information in this category (Burritt et al., 2002).

In summary, the fundamental purpose of implementing EMA in a business was to incorporate a number of costs (both monetary and non-monetary aspects) related to the environment into the management of all levels of the business (Mohd Khalid et al., 2012). Bennett and James (1998) offered another definition of EMA and this definition was that EMA encompassed the financial and non-financial information about the environment and the economic benefits of a company was the ultimate goal of implementing sustainable development. In order to control and reduce costs more effectively, Ferreira, Moulang and Hendro (2010) put forward that by incorporating the determined environmental costs into decision-making, such a cost measurement method seemed more accurate. Companies should use the advice about environmental costs generated, know the production and process management and bring new changes to the corporate processes and production methods in order to bring a better approach to achieve profitability.

2.3 EMA in China and abroad

In recent years, environmental pollution had attracted wide attention from all walks of life and led to the intensity of environmental enforcement which had been constantly strengthened. People's awareness of sustainable development had also been constantly improved. Discussions about EMA had been used in environmental considerations and information integration led to a significant increase in the proportion of business making decisions activities (Burritt, 2004; Schaltegger et al., Christ & Burritu.2013). With the increasing use of EMA tools, companies had access to a more detailed information on environmental investment and risk choices (Gale,2006; Deegan,2003) In addition, the development of EMA in European countries ha d increasingly become more sophisticated (Burritt & Saka,2006; Burrit et al.,2009). According to Baxter International's corporate environmental financial report and through the company's related data on measures released, it proved the environmental costs can be effectively controlled by adopting appropriate management measures and quantifying costs. Meanwhile many European projects had made similar findings especially in the Netherlands (Dieleman et al., 1991; Wolters d Bouma, 2000) and the UK (Schwanen et al., 2001). From the perspective of Europe as a whole, it was found that the Netherlands had advanced environmental policies and perfect regulatory measures. At the same time in the United States it was found that the situation was based on a large number of companies and respondents and covered a variety of topics including 'non-environmental' costs, product cost, waste minimization, environmental costs in product development and scrap disposal cost (Bartholomeo, M., Bennett, M., Bouma, J.J., Heydkamp, P., James, P., & Wolters, T., 2000) This was supported by academic and applied research such as a survey of practice (Epstein & Roy, 1998) supported by the US Institute of Management Accountants and the work of Bailey and Soyka (1996). The above behavior served as an important reference for the study of EMA programs in the United Kingdom and other European countries. Moreover, the environmental cost concept of the company was strongly influenced by the National Bureau of Statistics, external accountants, Banks, insurance companies and research institutions. In particular, these parties largely formed the concept of the company management, thus creating an idea of capturing environmental costs and concluded that the role of EMA in the development and adoption of the organization cannot be ignored (Bouma & Van der Veen, 2002).

Burritt et al. (2009) argued that EMA had been shown to be profitable in developed nations, hence more research attempted to explore whether the use of EMA in developing countries had a real impact on gaining profit and examined the applicability of EMA in these countries. In order to comply with the global aspirations for environmental protection, as a developing country, both Chinese government and companies responded actively and contributed to achieving sustainable development (Xiaomei, 2004). However, from the research of Chinese companies on EMA, the companies investigated were found to have no evidence of using EMA. The study of 40 companies recorded in two provinces in China showed that EMA was still in the basic developmental stage in China (Liu et al., 2016). Ma et al. (2016) pointed out that through the field investigation related to EMA, Chinese companies had certain research on the theoretical framework of EMA, but they lacked behavioral consideration. Therefore, the use of EMA in China needed to be developed. Lin et al. (2015) proposed that Chinese companies need to establish new codes of conduct and legislation if they want to implement EMA. Since EMA had just received attention in China, the major obstacle of its implementation was the lack of environmental cost measurement methods and systems. In addition, China's economy had been very rapid which had led to more environmental problems. China's manufacturing industry had received tremendous development; for example, China had become a world leader in wind power technology and

solar power technology becoming the largest clean energy country in the world (Ivanova, 2010). In some studies, Burritt and Saka (2006); Qin et al. (2011) found that the Chinese government had increased its efforts in environmental protection and had launched new environmental protection policies. These methods and policies also provided great help to companies in implementing EMA but also created a lot of pressure. In terms of policies and systems, the Ministry of Finance of China had established a working group to discuss some new accounting standards related to EMA. Therefore, Chinese companies may be more likely to accept the use of environmental management accounting (Hubacek et al., 2009).

3.0 RESEARCH METHODOLOGY

3.1 Sample

A conducted research within the manufacturing companies that were listed in Certification and Accreditation Administration of China (CAAC) as the sample. Data was collected using online questionnaire sent to manufacturing companies. Forty - three (43) was the total number of questionnaires which were randomly distributed to manufacturing companies and thirty-five (35) of these questionnaires were returned but five (5) of the companies were not certificated ISO 14001. Therefore, only thirty (30) samples were considered valid and applied to data analysis. From the results, local companies accounted for the vast majority of 83.3% and most of the participants had been in operation for five to fifteen years. In the past three years of annual sales, companies with RMB5-50 million accounted for 63.3%, accounting for the largest proportion, companies with less than RMB 5 million accounted for 26.7% and companies with more than RMB 50 million accounted for the least, only accounting for 10%.

Table 1 showed the specific sample profile. All respondents were environmentally relevant personnel in Chinese manufacturing companies. These people worked in the related environment, hence they were assumed to know the most about the company's monitoring of the environment and the surrounding environment.

Table 1: Sample Profile

Demographic Profile	Categories	Frequency	%
Type of company	local-based company	25	83.3
	multi-national corporation	5	16.7
Average annual sales	Less than RMB 5 mil	8	26.7
	RMB 5 mil – RMB50 mil	19	63.3
	RMB 50 mil and above	3	10.0
In operation	Less than five years	2	6.7
	5 to 15 years	20	66.7
	More than 15 years	8	26.7
Certified ISO 14001 Environmental Management System	Yes	30	85.7
	no	5	14.3

3.2 Variable Measurements

EMA construct was adapted from the measurement constructs proposed by Ferreria et al (2010) to reflect the EMA activities in both monetary and physical aspects. Also, the constructs were operationalized using s on a five-point Likert scales ranging from '1 (strongly disagree) to 5 (strongly agree)' (Hair, 2017). As it mentioned, the application of EMA in the current research has 12 items with two dimensions – physical EMA (6 Items) and monetary EMA (6 Items). Table 2 showed the reliability statistics for each measurement. According to the instrument measurement concept and the stability and consistency of the evaluation measurement, the coefficient of Cronbach alpha should be greater than 0.6, and both two dimensions of the measurement meet the requirements (Uma Sekaran & Bougie, 2016).

Table 2: Reliability Statistics (n=30)

EMA use	Cronbach's Alpha	N of Items
PEMA	.845	6
MEMA	.888	6

3.3 Results and findings

The findings of this article reflected a number of different answers that can provide different insights into the use of EMA information by organizations especially in developing countries. Previous studies examined that most firms have their specific budgets for environmental activities and for the most part only PEMA (Jamil et al., 2015). In addition, the adoption of both MEMA and PEMA in manufacturing companies was considered moderate and low (Jalaludin et al., 2010). However, according to the results in the current research, it had quite the interesting progress which was different from the use of EMA in monetary and physical aspects.

Table 3: Descriptive statistics (n = 30)

	Minimum	Maximum	Mean	Std. Deviation
EMA1	2	5	3.83	.747
EMA2	2	5	3.77	.774
EMA3	2	5	3.87	.776
EMA4	2	5	3.80	.805
EMA5	2	5	4.03	.765
EMA6	2	5	3.83	.913
EMA7	2	5	3.83	.834
EMA8	2	5	3.87	.860
EMA9	3	5	3.93	.691
EMA10	2	5	3.90	.885
EMA11	3	5	3.77	.679
EMA12	2	5	3.83	.834

Table 3 provided the descriptive statistic of EMA items used in the current research. A mean score of less than 2 was rated as low and more than 4 considered high. According to the descriptive statistics, the level of the use of EMA was almost high, ranging from 3.80 to 4.03. All the companies had certificated ISO 14001 which most likely answered the

reason for the high score. The companies which had the certification of ISO14001 willing to use EMA (Mohd Khalid et al., 2012). The result of the research was quite different from the previous research which firms were not able to access full use of EMA due to the lack of awareness (Frost & Wilmshurst, 2000). As a result, the use of EMA was useful and meaningful for the organizations.

4.0 DISCUSSION AND CONCLUSION

In China, neither the current environmental management accounting system nor the environmental management system implemented by enterprises can voluntarily leave the information support of environmental management accounting. On the one hand, for construction projects, an environmental impact assessment system must be implemented. When preparing an economic feasibility report, it was necessary to reflect both qualitatively and quantitatively the environmental gains and losses, so as to incorporate environmental factors into the investment decision analysis, which required the use of environmental management accounting information. On the other hand, during the implementation of the ISO14001 environmental management system, the company must formulate environmental goals and carry out initial environmental reviews to identify environmental factors. In this process, the life cycle analysis of the company's activities and processes must be carried out, considering the past and present and possible environmental impacts in the future. Next, it must test the environmental factors to ensure important environmental factors. However, many companies in China had not consciously used EMA. So far, the vast majority of companies were oriented towards compliance with laws and regulations in order to avoid administrative penalties or not being included in the list of major polluters. In terms of environmental costs and benefits, investment decisions and performance evaluation, environmental impacts were not considered. Therefore, the extensive application of environmental management accounting information was meaningful and especially necessary in China.

Since the research is still in its infancy, the result of the study may be affected. The first was due to the small sample size (n = 30). Future research should expand the sample size. Larger sample size may result in relatively more accurate changes, revealed smart analysis and unique insights. In addition, the current research was an exploratory research, and its main purpose was to find the degree of use of EMA among organizations. Future research should consider designing a research framework from a theoretical standpoint that may be able to understand the premise and results of the use of EMA information in the organization. This can provide a better understanding of EMA-related issues.

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