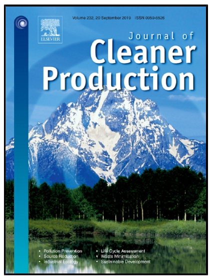
Bhattacharyya, Asit. "Corporate environmental performance evaluation: a cross-country appraisal". *Journal of Cleaner Production* Vol. 237, Issue 10 November 2019, no. 117607 (2019)

Available from: http://dx.doi.org/10.1016/j.jclepro.2019.117607

Accepted Manuscript



Corporate Environmental Performance Evaluation: A Cross-Country Appraisal

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PII:	S0959-6526(19)32427-8
DOI:	10.1016/j.jclepro.2019.117607
Article Number:	117607
Reference:	JCLP 117607
To appear in:	*Journal of Cleaner Production*
Received Date:	22 November 2018
Accepted Date:	09 July 2019

Please cite this article as: Asit Bhattacharyya, Corporate Environmental Performance Evaluation: A Cross-Country Appraisal, *Journal of Cleaner Production* (2019), doi: 10.1016/j.jclepro.2019.117607

Corporate Environmental Performance Evaluation: A Cross-Country Appraisal

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Abstract

This study scrutinises third-party cross-country neutral evaluation of corporate environmental performance (CEP) using a multidimensional CEP model. The study compares Australian and Indian CEP measurement and tests a model to explore whether that model can be effectively implemented in both countries. The model consist of four managerial performance (MP) and two operational performance (OP) indicators. Factor analysis with varimax rotation along with ordinary least square regression were untaken to analyse the relationship and individual contribution of PM and OP to CEP. Two models were confirmed using AMOS Version 18 software. Results indicated that environmental managerial performance and environmental operational performance are two separate constructs of CEP and are mutually dependent and that a single model could not be effectively implement in different cultural locations. The results also inferred that firm environmental management standing would be transformed to decent operational performance. The study found significant differences of performance measurement between Australia and India. Insights into CEP in the cross-country context is the key contribution of the current study. This will aid in developing a more thorough and efficient environmental management system that will assist mid to higher level corporate managers to reduce both cost and risk and thereby increase firm value and competitive advantage. Our findings will be helpful especially to business managers in similar countries to develop an appropriate CEP model to reduce risk and cost.

Keywords: Corporate Environmental Performance; Managerial Performance; Operational Performance; Environmental Performance model; Australia. India.

Corporate Environmental Performance Evaluation: A Cross-Country Appraisal

Abstract

This study scrutinised cross-country neutral evaluation of corporate environmental performance (CEP) using a multidimensional model. We compared Australian and Indian CEP measurement and test whether a particular model can be effectively implemented in both countries. The model consisted of four managerial performance (MP) and two operational performance (OP) indicators. Factor analysis with varimax rotation along with ordinary least square regression were untaken to analyse the relationship and individual contribution of MP and OP to CEP. We confirmed two models using AMOS. Results indicated that environmental managerial performance and environmental operational performance are two separate constructs of CEP and they are mutually dependent. The results also infer that firm environmental management standing will be transformed to decent operational performance but a single model cannot be effectively implemented in different cultural locations. Gathering insights into CEP in the cross-country context is the key contribution of the current study. Our findings will be helpful to business managers to develop an appropriate CEP model to reduce risk and cost. However, whether managers really need environmental management system to reduce both cost and risk could be a valid question.

Keywords: Corporate Environmental Performance; Managerial Performance; Operational Performance; Environmental Performance model; India.

1. Introduction

Environmental protection is generally accepted as the key to achieve sustainable development. For moral and risk management purposes, stakeholders such as shareholders, consumers, regulators and even society at large are concerned about corporate environmental performance. To meet social and environmental obligation, many companies disclose environmental information through various channels, typically annual reports, sustainability reports and company websites (Ilinitch, Soderstrom and Thomas, 1998). However, corporate environmental reporting varies in terms of its content, periphery, flair and complexity (Kokubo, Onish, Higashida and Noda, 2002). Therefore, stakeholders are often puzzled when evaluating the environmental performance of companies based on their reported information and coming to a conclusion about which companies are relatively worse or better than others in respect of environmental protection. Furthermore, "collecting, sorting and comparing environmental information from various channels are all tedious and time-consuming processes (Xie and Hayase, 2007). For these reasons, there is a growing mandate for third-party independent and neutral assessment of CEP (Xie and Hayase, 2007). An organisation's management of its environmental affairs together with its attitudes towards the natural environment, resources consumption and carbon emission determine its environmental performance (Wanger, Van and Wehrmeyer, 2002). Therefore, it is generally agreed that independent and neutral assessment of CEP leads to improved accountability. This paper explored the neutral evaluation of corporate environmental performance (CEP).

Prior research in CEP evaluation is concentrated in the USA, Europe and Japan (Hall and Wagner, 2012). Scant CEP evaluation study in Australia and emerging Asian countries, suggesting the conclusion drawn by Curcovic (2003) that CEP measuring process is still in its embryonic stage is still valid. This condition is, to some extent, due to the complexity of undertaking research activities in various geographical locations and the dearth of available data in this field. To evaluate CEP, organisations adopt a range of measures. Lack of continuity and cohesiveness in these adopted measures impedes the ability of stakeholders to interpret various data and perform meaningful intra-organisational comparisons (Xie and Hayase, 2007). Ilinitch et al. (1998) pointed out that "existing measures have the inherent risk that as measurement and rankings are based partly upon reputation and reputation is based partly upon rankings, this may hinder a stakeholder's ability to interpret such data and make decisive evaluations across companies and cultures (p. 385)". "This can even puzzle the stakeholder and diminish the integrity of these measures and ratings (Xie and Hayase, 2007, p. 149)".

Using a multidimensional CEP model and applying legitimacy theory[1], the current study appraises cross-country neutral evaluation of corporate environmental performance (CEP). The current study compares Australian and Indian CEP measurement to find out whether a single model can be effectively employed to evaluate CEP across both economies. Prior authors comment that developing a uniform measurement model grounded in theory to evaluate performance regularly is essential to provide stakeholders with guiding principles and an uniform appraisal base (Hall and Wanger, 2012). For this reason, the idea of applying legitimacy theory to develop an environmental performance measurement (EPM) model to compare Australian with Indian companies is both novel and innovative. The study also addresses the concern of prior authors (Xie and Hayase, 2007; Ilinitch et al., 1998; Wanger, Van and Wehrmeyer, 2002) about the continuity and cohesiveness of the adopted measures for comparative purposes by testing a single EMP model when comparing Australia with India.

[1] Legitimacy theory postulate that organisational activities and policies should be incongruence with the expectation of stakeholders to legitimise their activities in the society.

Exploring Australian and Indian CEP appraisal processes is crucial and relevant because, first, there is scant literature that offers a comparative analysis of developed and developing accounts that bear some historical, legal and political heritage, such as being associated with the Commonwealth. Both countries have foundations of English common law and share several political similarities that create some commonalities in the macro-institutional environment in both countries. Additionally, Australia, India and China are key economic and political superpowers in the Asia-Pacific region, thus this research in timely. Researchers have undertaken comparative studies of developed countries, but limited attempts have been made to do a comparative study between a developed and an emerging country (Cummings, 2008). Further, Australia is seeking to actively strengthen trade relations with India.

Despite being a developed country, Australia's environmental performance is not on par with other developed countries. Australia is one of the top CO2 emitting (per capita) countries in the world and among the ten largest greenhouse gas emitters in the OECD. Further, India is also one of the major carbon dioxides (CO2) emitting countries in the world and its environmental performance is usually ad-hoc, with limited compliance to rules and India lags far behind than developed countries (Priyadarshini and Gupta, 2003). Both Australia and India have passed mandatory environmental legislation still their CEPs are not up to the stakeholder expectation level. Comparing the two countries on CEP performance would allow for teasing out potential differences and provide an opportunity for India to learn some of Australia's drivers of CEP performance. Further, to establish and operate environmentally responsible and sustainable businesses in India, Australian investors may use Indian CEP measurement results to gauge Indian CEP standards into Australian companies CEP measurement model to launch and run companies sustainably in India. All these factors make India and Australia an important context for study and analysis.

Gathering insights into CEP measurement in cross-country contexts is the paper's key contribution. The paper executes the unique and innovative idea of applying the environmental performance measurement (EPM) concept to compare Australian companies with Indian companies. Comprehension of EMP will enhance the development of further comprehensive management systems, with important organisational implications. An appropriately comprehensive EPM system will assist organisations to formulate strategies to reduce their environmental impact, as it will empower organisations to identify the problematic areas that contribute to high costs. Therefore, the findings will be very helpful to the mid to higher level corporate manager as they will help organizations to reduce both cost and risk. Ensuring a comprehensive EPM system will boost the strategic organisational value, thus enhance competitiveness, profitability and share price.

The paper further contributes to governmental policy formulation, implementation and enforcement. Results of the study will be helpful to law makers to formulate and implement appropriate legislation and enforcement mechanisms as has been done in Australia (Frost and English, 2002) and in India (Bhattacharyya and Agbola, 2018) to encourage their companies to disclose information related to vital operational performance indicators. Our findings will be helpful especially to business managers of similar countries to develop an appropriate CEP model to reduce risk and cost. Our results can also be utilised as a benchmark to measure the impact of the environmental legislation on EPM in the future.

The study extends the work of Xie and Hayase (2007) by testing the constructs' robustness using a larger sample size of 320 companies drawn from three industries sectors (Chemical, Pharmaceutical & Biotech and Industrial Engineering) as compared to 58 companies drawn only from the electrical machinery & instrument manufacturing industry sector.

The rest of the paper is structured as follows. Section 2 provides an overview of the literature and develops hypotheses. Section 3 presents the CEP measurement model. An explanation of the research method is provided in section 4. Section 5 presents the results of factor analyses and regression analyses using AMOS Version 18. Section 6 discusses, compares and contrasts the results with the existing literature. The final section concludes the paper.

2. Literature and hypotheses

Prior scant research that explores the appraisal of CEP may be grouped in two categories. The first group emphasises the development of CEP measurement models to improve internal control and tries to identify suitable Environmental Performance Indicators (EPIs) (Azzone and Noci, 1996; Young and Welford, 1998; Thoresen, 1999). The second group endeavours to develop CEP models suitable for both internal management and third-party evaluation to enable cross-sector or industry comparison (Ilinitch et al., 1998; Jung et al., 2001; Curcovic, 2003; Xie and Hayase, 2007; Sharma, 2009; Hall and Wagner, 2012). Table 1 outlines the CEP models along with their constructs.

[Insert Table 1 here]

The focus of the CEP models developed by group one studies is to assist organisations to identify suitable EPIs of environmental performance for internal management decision making and external commentary. CEP measurement models developed by the group one studies are valued by corporate leaders as they are handy in identifying areas of accomplishment and disappointment and helpful in making informed business decisions (Azzone and Noci, 1996). However, these CEP measurement models and their related EPIs are not suitable for cross-organisational comparisons because there is a lack of consensus about the indicators used and the way they are measured (Young and Welford, 1998). The effort to develop an appropriate measurement model suitable for cross-sector comparisons has been limited until now, despite strong advocacy for the need and importance of development of such measurement models by various authors (Azzone and Noci, 1996; Curcovic, 2003, Metcalf et al., 1995). Some prior studies have considered environmental performance measurement in broader senses, although they failed to identify uniform indicators, ways of measurement and even places of measurement (Kolk and Mauser, 2002). No single measurement model has confirmed theoretically or identified empirically even a few common measurement indicators (Ilinitch et al., 1998).

Based on self-assessment, the European Green Table (1993) was the first attempt in cross-sector comparable CEP model development. That study provided the fundamentals for reliable external stakeholder reporting along with the enhanced internal business decision-making process (Welford, 1996). Later, Ilinitch et al. (1998) established an integrated matrix combining process/outcome and internal/external measurement items. Their matrix included four dimensions: (i) organisational system; (ii) stakeholder relations; (iii) environmental impact; and (iv) regulatory compliance. Subsequently, they recognised a fifth dimension of CEP measurement as they established empirically two dimensions of stakeholder relations. To facilitate third party CEP comparability, Xie and Hayase (2007) suggested using an “environmental intensity change index” as an operation performance indicator. However, it is not feasible to implement this widely because it will be very difficult to collect the necessary information. Required data are neither available nor organisations willing to disclose such sensitive data. Examining the effect of organisational design variables on EPM, Sharma (2009) commented that the organisational design variables, along with others like information and benchmarking, positively affect CEP measurement practices.

Hall and Wagner (2012) reported a positive relationship between the integration of strategic issues and environmental performance. Trumpp et al. (2015) undertook a comprehensive literature review of the ISO 14001 framework and of academic views on the key dimensions of CEP and found that the majority of the studies reviewed did not consider the multidimensional nature of CEP. However, Trumpp et al. (2015) observed that: "CEP has two main pillars: environmental management performance (EMP) and environmental operational performance (EOP), of which the former is mostly qualitative and the latter quantitative. The most relevant sub-dimensions of EMP are environmental policy, objectives, processes, governance, and monitoring. The salient sub-dimensions of EOP extracted from the literature are environmental results, inputs and outputs, the environmental performance of products and services, and regulatory compliance. Other dimensions in addition to EMP and EOP can be identified as customer satisfaction, stakeholder relations, and outcomes, collected by ISO 14001 under the term 'environmental condition' (p 200). More recently, Dragomir (2018), critically reviewing studies on CEP measurement, commented that "extreme diversity of measures have been used for same construct, which raises the question of how we can reach the 'true measurement'."

Authors (Xie and Hayase, 2007; Hall and Wagner, 2012) observe that the differences in the linkage between integration and environmental performance depend on the type of business model employed and innovation pursued. A single model may not be effectively used in different geographical locations, either within a country or globally, due to differences in business models and states of modernisation between companies from various industry sectors and countries. The operative usage of a single model is stalled by differences between organisational styles of operation, locations, and relevant regulations. A performance measurement model is determined by the organisation incorporation of "various indicators and measurement items related to organisational system (environmental auditing, adoption of ISO 1400), stakeholder relations (environmental disclosure, community contribution), and operational countermeasures (countermeasures against global warming, countermeasures against environmental issues in process/product design)" (Xie and Hayase, 2007). Therefore, it may be inferred, differences in organisational culture, attitudes and environmental regulations hamper the efficient implementation of a single model efficiently across different locations and contexts.

It is difficult to select the right measure of evaluation across countries characterised by different social and economic conditions. Differences could also be due to differing degrees of technological development (Xiao et al., 2005). Australia's economic and social development level is higher than India's, leading to differences that may influence stakeholder needs in each country. Stakeholders in Australia perceive economic and environmental issues as being equally important. In contrast, the main concerns of Indian society may be economic issues rather than environmental issues due to the struggle to achieve basic health and welfare needs. This difference, accordingly, affects managerial approaches in an organisation, and subsequently influences corporate environmental performance and the approach to gain and maintain organisational legitimacy.

According to legitimacy theory, to maintain organisational legitimacy, a company must police and restrict its environmental activities to prevent negative signals and undesirable information reaching related stakeholders (Mobus, 2005). Therefore, pro-environmental Australian companies may aim to maintain and improve their legitimacy and reputation by restricting negative environmental activities and communicating positive information to relevant stakeholders to moderate the pressures of a particular group. Although maintaining legitimacy and reducing stakeholder pressure is important, having an efficient environmental management and operational performance measurement system is more critical for an organisation. Companies can save cost via efficient configuration of managerial and operational strategy on the environment. CEP is clearly critical for organisational success.

However, CEP between countries could be different due to cultural backgrounds, differing degrees of pressure from stakeholders, organisational pressure to satisfy only one stakeholder group, or simply a belief that environmental performance should be voluntary. The first explicit Australian environmental reporting requirement is section 299(1)(f) of the Corporations Act, 1998. The section requires Australian companies to disclose environmental information if the entity's operations are subject to any particular and significant environmental regulation under a law of the commonwealth or of a State or Territory (Frost and English, 2002) and expects companies to give details of the entity's performance in relation to environmental regulation (Frost and English, 2002). The act penalises non-compliant directors with a ban from managing companies and /or financial fine up to $220,000. In addition, the Australian Government announced its Environmental protection and Biodiversity Conservation Act 1999 and Biodiversity Strategies 2010-2030 to share responsibility across all levels of government, the community and the private sector, seeking to promote everyone's awareness of the biodiversity crisis and to sustain the rich diversity of life on earth together (Australian Government, 2010). On the other hand, India's environmental disclosure practices have traditionally lagged well behind those in developed economies (Sahay, 2004; Kansal, Joshi and Batra, 2014). Community attitudes towards the environment have changed significantly in India during the past few years; nonetheless, the environmental practices of Indian corporations have not matched these heightened stakeholder aspirations. The Bhopal disaster in December 1984 exposed the environmental scepticism and indifferent environmental behaviour of large corporations and multinationals in India and the same indifferent behaviour still prevails (Sahay, 2004). Moreover, India is now one of the largest carbon dioxide (CO_2) emitting countries in the world.[2] The apparent indifference by the Indian corporate sector towards the environment has led to demands for mandated CSR in India by the various stakeholders. The Indian Government has responded to these demands by introducing mandated CSR regulation through the Companies Act 2013, section 135 of which requires companies to disclose and spend funds on CSR activities as mandated under Schedule VII of the new Act. However, Bhattacharyya (2018) found that the implementation of section 135 has significantly increased social disclosures but environmental disclosure during the operative period (2014-2015) has not increased compared with the pre-operative period (2007-2012). Therefore, based on the foregoing discussion, the study proposes that-

H1: A single model of third party environmental performance measurement cannot be effectively used in Australia and India.

H2: Environmental performance measurement of Australian companies is different from Indian companies.

3. CEP measurement model

The study used legitimacy theory and a hierarchical framework by adapting Xie and Hayase (2007) which identified the fundamental elements that define CEP measurements (Figure 1). The model is a well-defined third party evaluation model and includes all dimensions of CEP measurement following legitimacy theoretical concept. The model consists of two main constructs – Environmental Management Performance (EMP) and Environmental Operational Performance (EOP). Legitimacy theory postulates that organisations have to congruence their

[2] According to a 2012 report of the European Commission and the Netherlands Environmental Assessment Agency, India emits 6% CO_2.

activities with stakeholder expectations. Therefore, four Measurement Performance Indicators (MPIs) (i) organisational system (OS); (ii) operational countermeasures (OC); (iii) stakeholder relations (SR); and (iv) environmental tracking (ET) are employed to measure the EMP. Legitimacy theory also suggests that organisations have to legitimise their operations to operate in a society. Therefore, our model includes inputs and outputs as two operational performance indicators (OPIs) to measure EOP. Theses MPIs and OPIs capture the whole range of activities that are essential to CEP and congruence with the stakeholders' expectations.

[Insert Fig 1 here]

EMP and EOP dimensions are included in all previous CEP models except Ilinitch et al. 1998. These two dimensions are symbiotic facets of CEP and crucial for organisational environmental evaluation. MPIs are key indicators of EMP as, through them, organisations can understand whether proper management systems are in place for comprehending whether the systems that are used deliver the anticipated outcomes (Xie and Hayase, 2007; Wells et al., 1992). The importance of MPIs has been delineated by previous authors (Jung et al., 2001; Tyteca et al., 2002; Ilinitch et al., 1998) giving particular emphasis to stakeholders outside the organisation such as shareholders and consumers. However, Olstoorn et al. (2001) argued that MPIs should be supplemented by OPIs because MPIs are insufficient on their own to provide effective CEP measurement as expected by stakeholders.

4. Methods

4.1 Survey design

A two-part questionnaire was developed and used in the study. The first part contains personal and organisational details about the respondents and second contains MPI and OPI indicators (see Appendix 1). Following Xie and Hayase (2007) MPIs were sub-divided into four clusters:

(1) organisational systems (OS – includes question no. 2, 3, 4, 5, 6); (2) stakeholder relations (SR – includes question no. 7, 8, 9, 10, 11); (3) operational counter-measurements (OCM – includes question no. 12); and (4) environmental tracking (ETi includes question no. 13) OPIs were segmented into two clusters: (1) inputs (includes question no. 14); and (2) outputs (includes question no. 15, 16, 17). MPIs are constituted by 36 measurement items and OPIs consisted of 11 items. All measurement items were selected following the concept of legitimacy theory. The study adapted measurement items for each indicator from the literature (Curcovic, 2003, Nakao, et al., 2007; Xie and Hayase, 2007. The survey requested respondents to evaluate, on a five-point Likert scale, how pre-emptive their companies were in employing the operational countermeasures. The survey asked about the tangible and neutral circumstances of relevant environmental management processes to improve the degree of neutrality of the respondent's responses. However, perceptual questions for the MPI items were not included in the survey. For OPI items, the survey requested respondents to provide the actual quantity of various inputs used and outputs released by their companies during a particular period.

The survey was designed to minimise social desirability bias. We implemented anonymous random model surveys and wordsmith questions carefully. We have adapted well-established survey questions and scales from the CEP literature (Curcovic, 2003, Nakao, et al., 2007; Xie and Hayase, 2007). The adopted CEP measurement indicators were validated, tested and widely used in the literature (Campos, et al., 2015; Dragomir, 2018; Herva and Roca, 2013; Puig et al., 2014; Trumpp et al., 2015).

4.2 Sample and data

A total of 700 (350 to Australian and another 350 to Indian prospective participants) survey questionnaires were initially sent to prospective participants of Australian and Indian companies.3 Out of these 700 questionnaires, 320 completed and useable questionnaires were received back (overall 46% response rate). However, response rate of Australian participants (43%) were marginally less than the response rate of Indian participants (49%). The study used a final sample size of 320, including 150 Australian and 170 Indian participants. To facilitate a reasonable response rate, Market Xcel Data Matrix Pvt Ltd, a professional data collection agency, was engaged to conduct the survey in both countries. Companies were grouped according to environmental sensitivity as prior authors have done (Cambell, 2003; Cho and Pattent, 2007).

Companies operating in the Chemical, Mining, Industrial Engineering, and Pharmaceutical & Biotech industries were nominated because these industries bear a greater risk of being criticised on environmental grounds as their activities involve natural resource extraction or pollution. The electronic database DataStream Advance 5 was used to obtain the industry categorisation and a list of companies for each category. 150 Australian and 170 Indian companies were selected randomly from these lists. The sample companies were all listed on their respective national stock exchanges. Participant middle / senior level managers within the nominated companies were randomly selected by the companies themselves. The completed questionnaires were collected personally from participants in India after one week and Australian participants returned the completed questionnaires by post or over the phone.

[3] Companies that are enlisted in the Australian stock exchange have been termed Australian companies. Similarly, companies listed in the Indian national stock exchange have been termed Indian companies.

4.3 Data analysis

To begin the analysis, we screened the data for outliers and missing data and checked the normality, skewness and/or kurtosis. No significant abnormality, skewness and/or kurtosis was found within the dataset. Following Hair et al. (1998), a skewness and kurtosis value within 1.96 was considered normally distributed. Next, following Armstrong and Overton (1977), we compared constructs' and measures' mean score differences of early versus late response for non-response bias. Following Whitehead et al. (1993), we also compared the mean score differences of partially-completed and fully-completed surveys. No significant mean differences were shown by the two-sample t-test, demonstrating that non-response bias did not impact the study. Following Nunnally (1978) and Fornell and Larcker (1981), we tested the reliability, convergent validity and discriminant validity of the model prior to testing the hypotheses. Cronbach's alpha (≥70 and ≥80) showed internal reliability of the dependent variables of Indian and Australian cases respectively (see Tables 3 and 4). We also undertook factor analysis with varimax rotation and Kaiser Normalisation on measures of EMP and EOP. In the final stage, a correlation and regression were untaken to analyse the relationship between, and individual contribution of, EPM and EOP to CEP. The two models were confirmed using AMOS Version 18 software on both Australian and Indian data. This study used AMOS since it involves the latent variable CEP that is measured through indicators of EMP and EOP.

To avoid common method variance we embraced various approaches. First, we ensure least possible ambiguities in the survey items and respondents' anonymity. Second, we adapted well-established CEP measurement items from the literature (Curcovic, 2003, Nakao, et al., 2007; Xie and Hayase, 2007). The adopted CEP measurement indicators were validated, tested and widely used in the literature (Campos, et al., 2015; Dragomir, 2018; Puig et al., 2014; Trumpp et al., 2015). Third, we used Harman's single-factor test (Podsakoff et al. 2003), adding a common latent factor in the measurement model, and the result indicated unchanged significance of factor loading. Fourth, following Lindell and Whitney (2001), we used a marker variable to observe if there is any shared variance between this variable and the4 variables involved in our model. Results indicated no shared variance, confirming that our model is free from common method variance.

4.4 Developing OPI measures

To measure EOP, the current study used two OPIs, input and output. As indicators of OPIs, input captured various quantifiable units and matrices to measure resources (such as oil, gas, electricity, water, paper) consumed and used by participant's organisation. On the other hand, output data narrate quantifiable units to measure waste (such as CO_2, $SO_{x,}$ NO_x emission, industrial waste disposal) discharged by the participant's organisation. Following Ditz and Ranganathan (1997), the study categorised resources used in two groups, material uses and energy consumption. Waste discharge is also grouped under (i) non-product output and (ii) pollutant release. However, relevant data was not available as no information was provided by the respondents regarding these two indicators. Therefore, the study introduced an estimated value of input and output. It was of the utmost necessity to estimate the two OPI, input and output, to acquit the aim of the study, the examination of a CPE measurement model consisting MPIs and OPIs. To calculate missing value, the imputation method is widely used in the literature (Rubin, 1976; Chi, Marcolin and Newsted, 1996: Royston, 2005). Approximation of the value of "input" and "output was done based on responses received under "operational countermeasures" and "environmental tracking".

5. Results

5.1 Responses to scale items

A wide spread (1.45 to 4.08) of mean score responses from Australian respondents indicated their moderate support for a majority of items, whereas Indian respondents' mean score responses (0.53 to 4.48) indicated either strong or no support (see Table 2). However, standard deviations that were comparatively higher for Australian participants than Indian participant indicated lower accord of their attitudes (Shafer, 2006). Results of the T test (Table 2) indicated that Indian participants supported considerably more items on average than Australian participants did.

[Insert table 2 here]

5.2 Factor analysis

Factor analyses with varimax rotation and Kaiser Normalisation were undertaken on measures of EMP and EOP using Indian and Australian data separately. Input-output data were not a factor we analysed since they were estimates based on other variables of the study. Factor analysis for stakeholder relations (RI1 to RI4) was not carried out because of the low response rate for RI2 and RI3. As a result, using a 5-point Likert scale, only RI1 and RI4 were tangibly measured. Substances representing stakeholder relations were retitled, based on their description, as RI1 – "environmental information" – and RI4 – "volunteer work".

[Insert table 3 here]

For the Indian data, factor analysis on OS resulted in two factors. They explained 64% of the variance collectively (see Table 3). The factor analysis of Australian data indicated that "organisational system" comprised two factors and explained 65% of total variance collectively (Table 4). Three items (SI5, SI1, SI6) with factor loading range from 0.61 to 0.78 made the factor one. Factor one was named as "environmental system" based on the nature and descriptions of the items. "Environmental awareness", the second factor comprises three items (SI3, SI2, SI7) with the load range 0.78 to 0.88.

[Insert table 4 here]

5.3 Interconnections among CEP measures

The study modelled the association of each factor of EMP and OMP with CEP by depicting a latent construct.4 Participants' responses to various items of EMP and OMP measured the latent construct of CEP in this study (Figure 2). Second-order latent constructs, EPM and OPM, are evaluated using their first order latent constructs. The correlation coefficients for factors identified with Indian and Australian data are shown in Table 5 and Table 6. We have included details of interconnections among CEP measures in Appendix 2.

5.4 Testing of hypotheses

Based on the above findings, the CEP latent model, discussed above, on Indian participants was tested in AMOS. Figure 2 shows that first order factors contribute to two second-order factors: environmental operational management (EOM) and EOP. Both these second-order factors collectively explain CEP. Figure 2 indicates that independent variable EMP explains 86% of variance in organisational system ($p \leq 0.001$, critical ratio (cr) 1.39), followed by

[4] Byrne (2009) defined a latent construct as operationalisation "of a construct that is not witnessed directly but inferred on the basis of indicators or survey items measured underlying that construct".

stakeholder relations (ß = 0.71, $p \leq 0.001$) and operational countermeasures (ß =0.52, $p \leq 0.001$, cr 8.01). Although operational countermeasures has a r2 value <.70, Churchill (1979) suggests that items in the range of 0.5 to 0.7 are acceptable. However, the variable environmental tracking explained only 17% variance in EMP as indicated by its low but significant regression value (ß = 0.17, cr 3.14 at $p \leq 0.001$). Therefore, it can be concluded that EMP is more heavily reliant on organisational system and stakeholder relations than environmental tracking and operational countermeasure.

The EOP explains the 36% variance in input data (ß = 0.36, cr 1.39, $p \leq 0.001$) and 17% variance in output data (ß = 0.17, cr1.03, $p \leq 0.001$). This result is important as it indicates that, for Indian participants, environmental operational performance is more dependent on the input of energy and resources than the discharge of industrial gases and pollutants through its operations. Finally, in regressing the dependent variables EMP and EOP on CEP, it appears that corporate environmental performance is more dependent on environmental management performance as indicated by the higher variance percentage (ß = 0.83, cr 2.05, $p \leq 0.001$), compared to environmental operational performance (ß = 0.20, cr = 0.35, $p \leq 0.001$).

[Insert Fig 2 here]

The CEP model for Australia was tested using the same procedure as the Indian data and the results are presented in Figure 3. EMP explains the greater percentage of inconsistency in operational countermeasures (ß=0.99, cr=21.24, $p \leq 0.001$) followed by environmental tracking (ß=0.58, cr=32.36, $p \leq 0.001$) and stakeholder relations (ß=0.57, cr=5.90, $p \leq 0.001$). However, organisational system (ß=0.10, cr=12.41.36, $p \leq 0.001$) explained the lowest percentage (10%) of inconsistency in EMP. Australian results suggest that operational countermeasures (implanted actions and procedures), stakeholder relations and environmental tracking (environmental activities) were more important and significant in defining environmental management performance than adjustments made to organisational system. Furthermore, unlike Indian data where the EOP had a higher percentage of variance in input data, the EOP for Australian managers had an equal percentage of variance in both resource input (ß = 0.41, cr11.23, p ≤0.001) and waste output (ß =0.42, cr 9.65, p ≤0.001). These results indicate that CEP is equally reliant on both the dependent variables EMP and EOP. Hence, in determining CEP, Australian participants gave equal importance to EMP and EOP. This finding indicates the country-effect in determining CEP. Overall, our findings support our H1 and H2.

[Insert Fig 3 here]

6. Discussion

The result indicated that EMP and EOP are interdependent. This findings supports the arguments of Dragomir (2018) that "EMP assessment relies heavily on EOP measurement; thus, these two dimensions are not independent and should not be treated as such". However, this finding contradicts the reported result of Xie and Hayase (2007) that EMP and EOP dimensions were independent from each other. The nature of the OPI values could be the cause of this contradiction. Current study premeditated input and output values from operational countermeasure and environmental tracking, whereas Xie and Hayase (2007) used values provided by the participants.

The results indicated that organisations' operational performance will be positively enhanced by organisations' productiveness towards environmental management. Our findings are in congruence with the findings of Chang (2011) that an organisation's performance in environment administration enhances its operating performance. However, this result contradicts with Xie and Hayase's (2007) finding that organisational actions in environmental management may not essentially enhance operational performance. Possible reasons for this contradiction could be that current study considered data from chemical, Industrial Engineering and Pharma and Biotech industries, whereas, Xie and Hayase (2007) utilised data only from Japanese Electrical machinery manufacturing sector- the most pro-active sector in environmental management with utmost progression rate in Japan. Both industry and country effect may played a role in the observed difference between the studies. Moreover, given the highly rigid and structured nature of Japanese organisations, the participants may have a greater expectancy benchmark regarding "proactivity in implementing operational countermeasures" than Australian and Indian participants.

Our Indian results also suggested that EMP is reliant more on organisational systems and stakeholders relations than operational countermeasure and environmental tracking. This Indian result supports the findings of Joyner (1992) but our Australian result contradicts Joyner's (1992) and Puig et al'.s (2014) findings by showing that EMP is more reliant on its operational countermeasure and environmental tracking than organisational systems and stakeholders relations.

Indian companies consider that CEP is more dependent on EMP than EOP, whereas Australian companies provide equal importance to EMP and EOP to determine CEP. Australian results indicated that in determining CEP, operational countermeasures, environmental tracking, and stakeholder relations are more critical than organisational system, yet the Indian data suggests that EMP is more reliant on its organisational systems and stakeholder relations. The result may potentially be explained in that the objective of the environmentally pro-active organisations is to enhance their environmental reputation and reduce stakeholder pressures rather than decrease their actual environmental impacts (Jung et al., 2001). These concur with the legitimacy theory postulation that maintaining legitimacy involves reducing organisational activities that create negative impressions in stakeholders (Mobus, 2005) and Sahay's (2004) comment that Indian companies were interested in building their public and environment image but reluctant to follow legislative requirements and implement rules and regulations.

On the other hand, Australian companies adopted the dynamic compliance and enforcement system under the Environment Protection and Biodiversity Conservation Act 1999. In addition, the Government announced Australia's Biodiversity Conservation Strategy 2010-2030 to share responsibility across all levels of government, the community and the private sectors, seeking to promote everyone's awareness (Australian Government, 2010). Although maintaining legitimacy and stakeholder relations is important, more significant for Australian organisations is the avoidance of legislative/judicial fines and punishments. Australian organisations also try to minimise cost of inefficient environmental performance. Organisations expect to be more efficient in cost saving through the superior congruence of managerial and operational environmental strategy.

Results indicated multiple rather than single dimension of measures under "organisational system". This implies that due to operational and cultural variations among organisations from different sectors, a single model cannot be applied efficiently in dissimilar geographic locations. This finding is in congruence with the argument of Dragomir (2018) that "CEP is a heterogeneous construct that a unified measure may be irrelevant or impossible to attain". Our results also show that different dimensions of "organisational system" need to be measured in the cases of Australia and India. This reconfirms our H1 and H2. The effective use of one model is thus hindered by the deference in organisational operational location, style and environmental regulations. Organisations incorporate indicators and measurement items interrelated to organisational systems, and operational countermeasures to measure the environmental performance to deliver desired outcomes for stakeholders. Therefore, it may not be possible to utilise similar indicators and measurement items to deliver different outcomes for different stakeholders. It may be inferred from this perspective that differences in organisational attitude and environmental regulation impede the efficient use of one single measurement model across various settings. Alternative evaluation frameworks should be developed and used due to the organisational cultural and environmental regulation differences. To develop an efficient environmental performance framework, irrespective of industry or setting, strategies such as (i) collection and review of main environmental performance data, (ii) organisational participation in environmental information networks and (iii) establishing clear lines of authority, are all critical.

Significant differences (see t-test result in Table 2) in the measurement of Australian and Indian environmental performances are indicated by our results. This further confirms the second hypothesis that Australian companies' environmental performance measurement is different form Indian companies. This difference could be due to the economic development level of the countries, differing degrees of pressure from stakeholders, organisational pressure to satisfy only one stakeholder group, or simply a belief that environmental performance should be voluntary. Other reasons for differences could be attributed to the measurement model used. The model used was unable to measure performance adequately as no single suitable model of environmental performance measurement was available which could be applied in both countries concurrently. It is also difficult to select the right measure of evaluation across countries characterised by different social and economic conditions. Differences could also be due to variances in the socio-economic development level (Xiao et al., 2005) and technological advancement (William and Pei, 1999). Socio-economic development level might influence the need and expectations of the stakeholders. For example, the higher socio-economic development of Australia than India might inspire people in Australia to perceive environmental and economic issues to be equally significant. On the other hand, given the dearth of basic health and welfare facilities in India, people there may prioritise economic issues over environmental issues. This, accordingly, effects attitudes of managers in organisations which impact their environmental performance evaluation. As stakeholders and community legitimise organisations to operate in the society, tactics like communicating environmental activities to escape the development of a publicity emergency is advocated by legitimacy theory. The effective and efficient utilisation of environmental management systems will improve the operational performance in the future.

7. Conclusion

The results show that CEP has two dimensions: EMP and EOP. As EOP is measured by OPIs that were derived from "operational countermeasure" and "environmental tracking", these two dimensions of CEP are mutually dependent. The study's results suggest significant differences between company CEP within Australia and India and indicate that a single CEP measurement model cannot be used efficiently in dissimilar geographic locations. This supports hypothesis 1 and 2. It is very difficult to select same measures of evaluation across locations and countries that are characterised by differential social norms and economic conditions. Different laws and regulations in different states and territories aggravate this difficulty. Dissimilar legal systems of different countries also make it very difficult to use one measurement model efficiently in different countries.

The paper provides practical implications, too, at the institutional and policy level. From the institutional perspective, western companies operating in emerging countries should consider the influence of national systems and stakeholders' expectations in formulating their CEP measurement models. A proper EP measurement system will empower organisations to develop strategies that will allow them to reduce both cost and risk. At the policy level, our paper provides insights for governmental policy formulation, implementation and enforcement. Our results will be helpful to law makers to formulate and implement appropriate legislation and enforcement mechanisms to encourage companies to disclose information related to vital operational performance indicators. However, our results will have limited global implications. The result may not be same if we test the model in a developed country with higher environmental performance and less CO_2 emission. That context can have different interesting results.

In overcoming the critical data unavailability problem, this study showed a constructive approach. We imputed missing values, and also used projected values of input and output measurement items. Hence, the findings need to be interpreted with caution. Nevertheless, the analysis does not violate any theoretical underpinning of the study because it estimated the input and output constructed from the response of the same groups of respondents. Future research may test the model in the context of a developed country with higher environmental performance and less CO_2 emission. Future studies may further explore alternate measures in different locations considering the contemporary nature of environmental performance research.

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List of Tables:

Table 1 Studies Developed EPM Model

Authors (year)	Purpose	Dimensions of EPM model
Group 1		
Azzone and Noci (1996)	Internal decision making	(1) External environmental effectiveness; (2) company's environmental efficiency; (3) company's 'green' image; (4) firm's environmental flexibility.
Young and Welford (1998)	Internal management	(1) Environmental policy; (2) environmental management system; (3) environmental impacts of processes, products/services.
Thoresen (1999)	Internal management	(1) Product lifecycle performance; (2) management system performance; (3) manufacturing operations performance.
Group 2		
European Green Table (1993; in Welford, 1996)	Third-party evaluation	(1) Environmental management EPIs; (2) facility and operation EPIs.
Ilinitch et al. (1998)	Third-party evaluation	(1) Organisational system; (2) stakeholder relations; (3) regulatory compliance; (4) environmental impact.
Jung et al. (2001)	Third-party evaluation	(1) General environmental management; (2) input; (3) process; (4) output; (5) outcome.
Curkovic (2003)	Third-party evaluation	(1) Strategic system; (2) operational system; (3) Information system; (4) results.
Xie and Hayase (2007)	Third-party evaluation	(1) Organisational system, (2) Stakeholder relations, (3) Operational countermeasures; (4) Environmental tracking; (5) Input; (6) Output.
Sharma (2009)	Third-party evaluation	(1)Organization Design, (2) Information and Benchmarking (3) Environmental Impact Reduction.
Wagner (2009)	Third-party evaluation	(1) Stakeholder pressure, (2) Process innovation, (3) Product innovation and (4) Input
Hall and Wagner (2012)	Third-party evaluation	(1)Organisational system, (2) Regulator, (3) Public, (4) Markets (5) Input; (6) Output, (7) Risks, (8) Image.
Puig et al (2014)	Third-party evaluation	(1) Management Performance Indicators, (2) Operational Performance Indicators, (3) Environmental Condition Indicators,
Campos et al. (2015)	Third-party evaluation	(1) Environmental-managerial performance indicators, (2) Managerial environmental performance indicators, (3) Operational environmental performance Indicators, (4)

Nguyen and Hens (2015)	Third-party evaluation	(1) Management performance indicators: the number of env. Audits undertaken, percentage of employees with env. training, number of violations against emission quotas, number of env. friendly suppliers. (2) OPI: dust, SO_2, NO_2 and noise emissions.
Trumpp et al. (2015)	Literature review of third-party evaluation	(1) Env. Management indicators: env. policy, env. objectives, env. processes, organizational structure, env. monitoring. (2) Env. operational performance: energy consumption, water withdrawal, CO_2 emissions, waste and hazardous waste produced.
Escrig-Olmedo et al. (2017)	Third-party evaluation	(1) Strategic intent, (2) governance and management, (3) engagement, (4) operational performance, (5) emissions reduction, (6) product innovation, (7) resource reduction.
Ma-Lin Song, et al. (2018)	Third-party evaluation	Environmental performance evaluation system using big data. Specific evaluation processes involve the improvement and integration of DEA, LCA, and artificial intelligence methods.
Dragomir (2018)	Literature review of third-party evaluation	Authors comments: "the extreme diversity of measures used for the same construct, which raises the question of how we can reach the "true measurement". We cannot answer that question, but we can provide a path to identify those choices which bring more value by introducing quality criteria such as construct validity and measurement reliability".

Source: Adapted from Xie and Hayase (2007)

Table 2

Percentage responses by Indian and Australian managers and their differences

	India						Australia						Diff	
Indicators	**1**	**2**	**3**	**4**	**5**	**Mean (Sd)**	**1**	**2**	**3**	**4**	**5**	**Mean (Sd)**	**t**	**Sig.**
SI_1	0	0	14.4	24.6	61.1	0.53 (.73)	0	0	37.3	30.00	32.7	2.05 (.84)	8.175	.000
SI_2	0	0	21.6	40.7	37.7	0.84 (.76)	0	0	55.3	24.7	20.0	2.05 (.67)	6.547	.000
*SI_3	0	16.2	18	65.9	0	1.50 (.76)	0	0	24.0	8.0	68.0	1.56 (.86)	-2.209	.028
SI_5	0	0	18.0	30.5	51.5	0.66 (.77)	0	0	18.7	20.7	60.7	1.58 (.79)	-.848	.399
SI_6	0	0	16.8	29.9	53.3	0.63 (.76)	0	0	14.7	12.7	72.0	1.45 (.82)	4.992	.000
SI_7	0	0	21.0	39.5	39.5	0.81 (.76)	0	0	30.7	11.3	58.0	1.73 (.90)	4.091	.000
*RI_1	0	0	13.8	35.3	50.3	0.63 (.72)	0	0	13.3	21.3	65.3	1.48 (.72)	.579	.563
RI_4	36.6	24.6	20.1	13.4	5.20	2.26 (1.23)	2.7	13.2	18.7	34.0	31.3	2.22 (1.11)	3.346	.001
CI_1	49.1	10.2	11.4	25.1	4.2	2.25(1.39)	60.7	6.7	17.3	7.3	8.0	1.95 (1.34)	-1.433	.153
CI_2	53.3	4.2	13.8	21.0	7.8	2.26 (1.47)	65.3	7.3	13.3	4.7	9.3	1.85 (1.34)	-2.815	.005
CI_3	9.7	11.5	9.1	32.1	37.6	3.76 (1.33)	47.3	13.3	13.3	10.0	16.0	2.34 (1.53)	-5.482	.000
CI_4	1.8	6.6	6.0	16.2	69.5	4.45 (.99)	20.0	6.7	2.0	22.0	49.3	3.74 (1.59)	-2.691	.008
CI_5	18.2	12.1	6.1	44.8	18.8	3.34 (1.40)	55.3	11.3	6.7	9.3	17.3	2.22 (1.59)	-8.477	.000
CI_6	3.6	5.4	20.4	34.7	35.9	3.94 (1.05)	22.0	10.0	16.7	22.0	29.3	3.27 (1.52)	-3.971	.000
CI_7	9.0	9.6	10.2	44.3	26.9	3.71 (1.22)	44.0	10.7	15.3	14.0	16.0	2.47 (1.54)	-7.726	.000
CI_8	10.8	11.1	9.6	30.7	37.3	3.72 (1.36)	24.0	14.0	14.0	10.0	38.0	3.24 (1.64)	-3.083	.002
CI_9	3.0	9.0	7.8	43.1	37.1	4.02 (1.04)	22.7	9.3	18.7	19.3	30.0	3.25 (1.53)	-4.066	.000
CI_{10}	5.4	9.0	16.3	43.4	25.9	3.75 (1.10)	16.7	7.3	16.7	23.3	36.0	3.55 (1.46)	-2.708	.007
CI_{11}	5.4	6.6	12.0	32.3	43.7	4.02 (1.15)	36.7	17.3	8.7	13.3	24.0	2.71 (1.63)	-8.118	.000
CI_{12}	28.7	11.4	11.4	25.1	23.4	3.03 (1.57)	25.3	12.0	16.0	23.3	23.3	3.07 (1.52)	-1.816	.070
CI_{13}	5.4	8.4	18.7	33.1	34.3	3.83 (1.16)	24.7	13.3	19.3	13.3	29.3	3.09 (1.56)	-2.610	.009
CI_{14}	1.8	4.8	3.0	41.2	49.1	4.31 (.89)	10.0	6.0	9.3	15.3	59.3	4.08 (1.35)	-.445	.656
CI_{15}	7.8	18.0	6.0	38.9	29.3	3.64 (1.29)	22.7	8.7	12.7	18.7	37.3	3.39 (1.59)	-2.975	.003
CI_{16}	0.6	4.8	6.0	23.4	65.3	4.48 (.86)	19.3	12.0	16.0	16.7	36.0	3.38 (1.54)	-5.573	.000

*Note: Responses to SI_4, RI_2 and RI_3 are categorical and hence will be discussed in the paper.

Table 3

Factor analysis of Indian data (N=170)

Organisational system	Factor 1	Factor 2
Environmental Inspection		
SI_7 : Environmental auditing	.84	
SI_6: Environmental accounting	.83	
SI_2: Adoption scope of ISO 14001	.88	
Reliability (Cronbach's alpha)	**.72**	
Environmental control		
SI_1: Environmental target		.86
SI_8: Environmental education		.70
SI_5: Environmental head's position in the company		.62
Reliability (Cronbach's alpha)		**.90**
Operational counter measures		
Operational safeguard		
CI_{13} Reducing the use of chemicals	.73	
$C1_{15}$: Use Env. Disaster Mgmt training programs	.72	
CI_9: Managing and recycling used products	.66	
CI_7: Implementing environment concerned design	.65	
CI_8: Implement the environmental marketing	.61	
Reliability (Cronbach's alpha)	**.70**	
Operational resources		
CI_1: Use of solar power renewable energy		.91
CI_2: Use of wind power renewable energy		.88
CI_4: Use of environmental friendly motor vehicles		.83
CI_{10}: Lengthen the PLC to reduce overall energy consumption		.70
CI_6: Reduce the use of packing or wrapping materials		.68
CI_3: Use energy saving device(s) at the workplace		.65
CI_{11}: Checking suppliers environmental management system		.64
Reliability (Cronbach's alpha)		**.90**

Table 4
Factor analysis of Australian data (N=150)

Organisational system	**Factor 1**	**Factor 2**
Environmental System		
SI_5: Environmental head's position in the company	.78	
SI_1: Environmental Target	.61	
SI_6 Environmental accounting	.61	
Reliability (Cronbach's alpha)	0.82	
Environmental Awareness		
SI_3: Adoption time of ISO 14001		.88
SI_2: Adoption scope of ISO 14001		.86
SI_7: Environmental auditing		.787
Reliability (Cronbach's alpha)		0.90
Operational counter measures		
Operational Usages		
CI_{13}: Reducing the use of chemicals	.75	
CI_5: CI5 Reducing reusing and recycling wastes	.67	
CI_2: Use of wind power renewable energy	.68	
CI_8: Implement the environmental marketing	.65	
CI_4: Use of environmental friendly motor vehicles	.62	
Reliability (Cronbach's alpha)	0.89	
Products		
CI_{12}: Establishing risk management system		.77
CI_9: Managing and recycling used products		.69
CI_7: Implementing environment concerned design		.64
CI_{11}: Checking suppliers environmental management system		.62
Reliability (Cronbach's alpha)		0.71

Table 5
Correlations of EMP and OPI indicators of Indian data

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1.	Env_Inspection	1														
2.	Env_control	.36**														
*3.	Env_Information	.16*	.09													
*4.	Volunteer_Work	.20*	.08	.02												
5.	Op_safeguard	.04	.18*	.05	.13											
6.	Op_Resources	.20	.01	.23**	.11	.37**										
**7	Energy_use	.11	.16*	.20**	-.24**	-.22**	.07									
**8	Resource_use	.13	.26**	-.15	-.08	-.27**	-.19	.75**								
**9	Industrial_waste	.09	.17*	-.09	-.17*	-.27**	.02	.60**	.67**							
**10	Water drainage	.15	.24**	-.13	-.03	-.19*	-.10	.36**	.37**	.46**						
**11	Pollution	.13	.18*	-.10	-.13	-.29**	-.07	.50**	.57**	.58**	.45**					
12.	EEU	.08	.05	.23**	-.20*	.12	.79**	.37**	.20**	.28**	.08	.13				
13.	ERU	.03	-.02	-.02	.08	.44**	.47**	.16	.13	.08	-.04	.08	.09			
14.	EIO	-.06	-.07	-.02	.01	.61**	.37**	-.04	-.04	.08	-.02	-.04	.07	.47**		
15.	EGO	.07	-.07	-.02	.11	.60**	.41**	.08	-.10	-.04	.17	-.07	.18	.36**	.44**	
16.	EPR	.04	-.13	-.14	.23**	.70**	.19*	-.08	-.05	-.20	.04	.08	.02	.38**	.39**	.35**

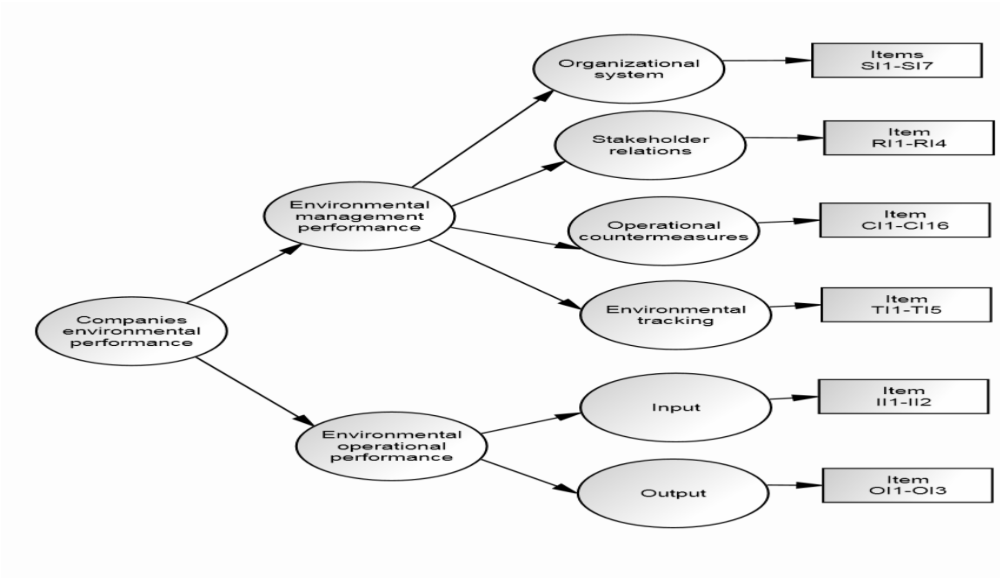
*Represents items RI_1 and RI_4 under stakeholder relationship; ** Factors energy use, resource use, Industrial waste, water drainage and
pollution represent items TI_1 to TI_5 from environmental tracking. 0.01level (2-tailed) significance is represented by (**) and level 0.05(2-tailed) by (*).

Table 6
Correlations of EMP and OPI indicators of Australian data

		1	2	3	4	5	6	7	8	9	10	11	12	13
1.	Env_System	1												
2.	Env_Awareness	.25**												
*3.	Env_Information	.25**	.17*											
*4.	Volunteer_Work	.74	.37	.17										
5.	Operational_Usage	.14	.09	.24	.44**									
6.	Product	.22**	.08	.63*	.36**	.48**								
7.	Hazard_Mgmt	.04	.09	.16	.35**	.42**	.48**							
8.	Water_Pollution	.22**	.28**	.53	.09	.31	.65*	.20*						
9.	Other_Resources	.12	.26**	.18	.58	.22**	.19*	.32**	.26**					
10.	EEU	.15	.21*	.22**	.25*	.38**	.35**	.14	-.12	.14				
11.	ERU	.17*	.52	.02	.55**	.78**	.47**	.64**	-.16*	-.18*	.31**			
12.	EIO	.87	.53	.63	.47**	.56**	.76**	.43**	-.43	-.11	.32**	.47**		
13.	EGO	.85**	.12	.28	.42**	.45**	.81**	.37**	.59	-.12	.26**	.46**	.58**	
14.	EPR	.25*	.19	.23	.65**	.48**	.48**	.56**	.04	-.69*	.58**	.76**	.35**	.39**

*Represents items RI_1 and RI_4 under stakeholder relations; 0.01level (2-tailed) significance is represented by (**) and level 0.05(2-tailed) by (*).

List of Figures:



Source: Adapted from Xie and Hayase (2007)

Figure 1. Conceptual Environmental Performance Measurement Model

3rd Order Factor ← 2nd Order Factor ← 1st Order Factor ← Measurement Indicators

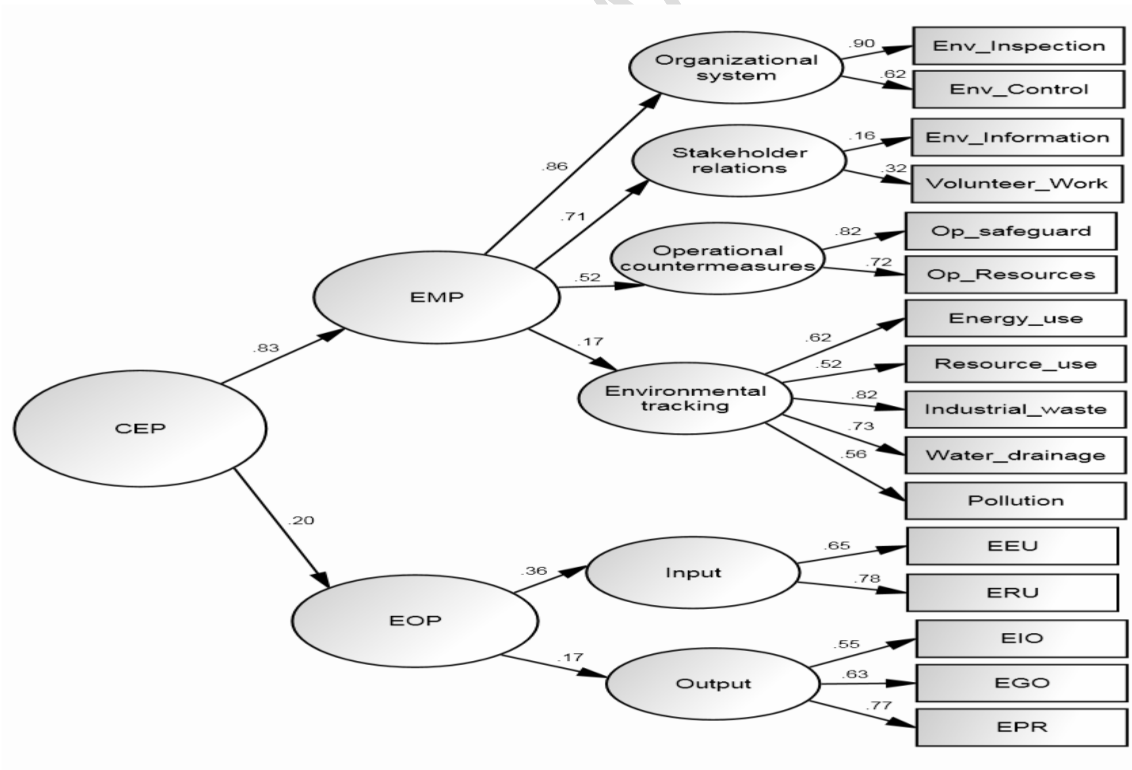


Figure 2. Testing the EPM Model with Indian data

Note: EEU = Estimated Energy Usages, ERU= Estimated Resources Usages, EIO = Estimated Industrial waste Output, EGO = Estimated Gases Output, EPR= Estimated pollutant releases

3rd Order Factor ← 2nd Order Factor ← 1st Order Factor ← Measurement Indicators

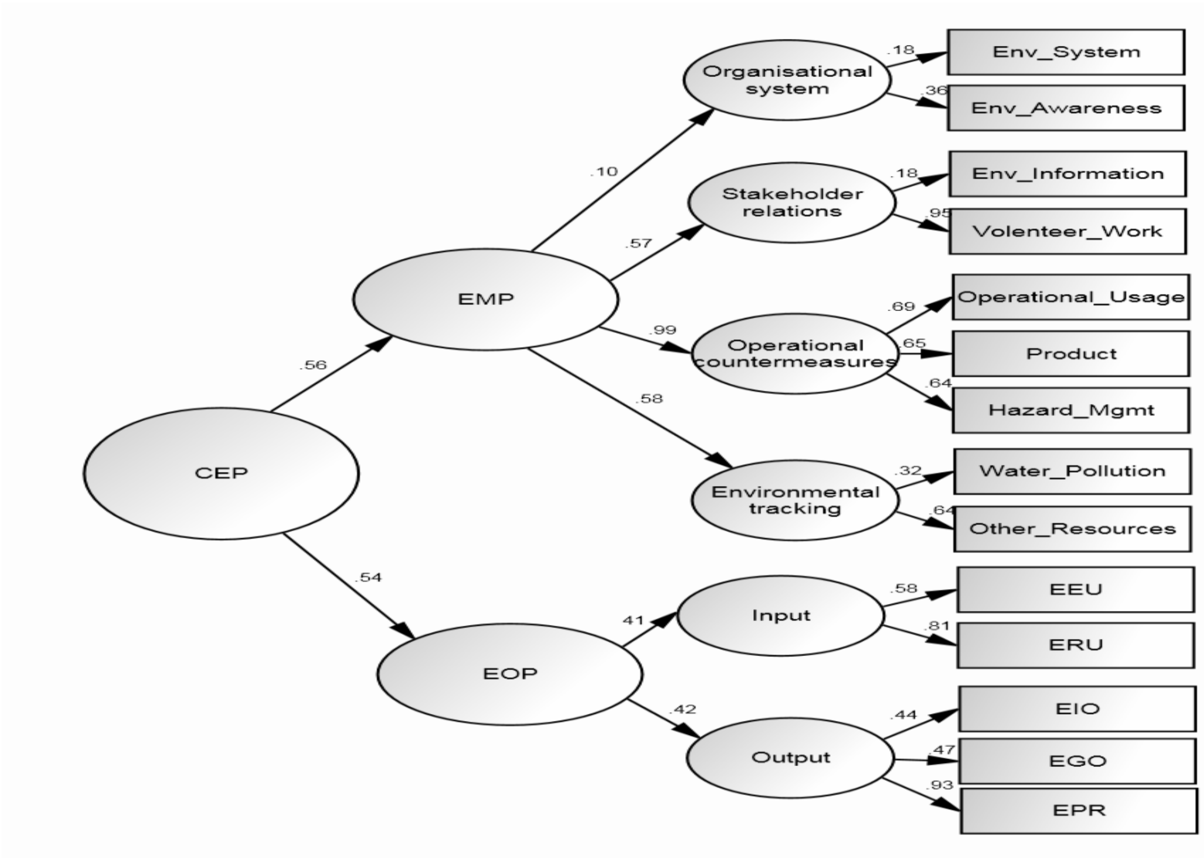


Figure 3. Testing the EPM Model with Australian data

Note: EEU = Estimated Energy Usages, ERU= Estimated Resources Usages, EIO = Estimated Industrial waste Output, EGO = Estimated Gases Output, EPR= Estimated pollutant releases

Appendix1

“**The MPIs, OPIs and corresponding measurement items included in the questionnaire**

Indicators and measurement items	Content outline of the question
Organizational system (Q. 1–6)	
SI_1 Environmental Target	Types of target
SI_2 Adoption scope of ISO 14001	Company’s scope involved in ISO 14001
SI_3 Adoption time of ISO 14001	Time for the first adoption of ISO 14001
SI_4 Environmental organization	Current situation
SI_5 Environmental head’s position in the company	Level of the environmental head’s position in the company
SI_6 Environmental accounting	Company’s scope involved in environmental accounting
SI_7 Environmental auditing	Company’s scope involved in environmental auditing
SI_8 Environmental education	Scope and frequency of environmental education
Stakeholder relations (Q. 7–11)	
RI_1 Environmental disclosure scope	Company’s scope involved in environmental disclosure
RI_2 Environmental disclosure content	Types of environmental information disclosed
RI_3 Environmental disclosure method	Media used to disclose environmental information
RI_4 Contributions to local communities	Types of contribution activity
Operational countermeasures (Q. 12)	
Countermeasures against global warming	How proactively is your company implementing this measure?
CI_1 Using solar power renewable energy	
CI_2 Using wind power renewable energy	
CI_3 Installing energy-saving equipment	
CI_4 Using environmentally friendly cars	
Countermeasures against environmental issues in process/ product design	
CI_5 Reducing reusing and recycling wastes	
CI_6 Reducing the use of package materials	
CI_7 Implementing environment concerned design	
CI_8 Implementing environment marketing	
CI_9 Managing and recycling used products	
CI_{10} Expanding product lifetime	
CI_{11} Checking suppliers’ EMSs	
Countermeasures against environmental risk	
CI_{12} Establishing risk management system	
CI_{13} Reducing the use of chemicals	
CI_{14} Measuring discharge of toxic chemicals	
CI_{15} Training to deal with emergency regularly	
CI_{16} Inspecting toxic-related tanks/pipes regularly	
CI_{17} Specifying explicit responsibilities	
CI_{18} Making out risk management manual	
Environmental tracking (Q. 13)	
TI_1 Tracking scope of energy use	Company’s scope tracking energy use
TI_2 Tracking scope of resource use	Company’s scope tracking resource use
TI_3 Tracking scope of general wastes	Company’s scope tracking general wastes
TI_4 Tracking scope of industrial wastes	Company’s scope tracking industrial wastes
TI_5 Tracking scope air and water pollution	Company’s scope tracing water pollution
TI_6 Tracking scope of greenhouse gases	Company’s scope tracking greenhouse gases
Inputs (Q. 13, 14)	Amount consumed in a particular period
II_1 Oil use (kl)	
II_2 Gas use (m3)	
II_3 Electricity use (kW h)	

II_4 Water use (m3) II_5 Paper use (t)	
Outputs (Q. 15–17) OI_1 Industrial waste disposal (t) OI_2 CO2 emission (t) OI_3 SOx emission (kg) OI_4 NOx emission (kg) OI_5 BOD (kg) OI_6 COD (kg)	 Amount disposed in a particular period Amount emitted in a particular period Same Same Amount in a particular period Same

Source: Xie and Hayase (2007)".

Appendix2

Interconnections among CEP measures

The study modelled the association of each factor of EMP and OMP with CEP by depicting a latent construct.[5] Participants' responses to various items of EMP and OMP measured the latent construct of CEP in this study (Figure 2). Second-order latent constructs, EPM and OPM, are evaluated using their first order latent constructs. Therefore, first order latent factors OS, OR, OCM and ET measured the EMP and input and output measured OPM. Rectangles in Figure 2 represent observed variables that were measured by first order indicators. Hence, the reflective indicators are dependent and latent constructs are independent variable.

[Insert table 5 here]

The correlation coefficients for factors identified with Indian data are shown in Table 5. All correlations among organisational system factors, stakeholder relations and operational countermeasures were acceptable and positively significant at the 0.05 level. The finding is aligned with the reported result of Xie and Hayase (2007). However, five factors of environmental measurement, and factors for input (EEU and ERU) and output data (EIO and EGO) showed insignificant correlations with items OS and OCM. Results suggesting that organisational changes that deal with environmental issues and operational actions cannot track company's environmental performance. This finding contradicts the theoretical underpinning that organisational effort within environmental management influences operational performance.

[Insert Table 6 here]

Table 6 (Correlations of Australian data) indicated that organisational system, operational countermeasure, stakeholder relationship and environmental tracking have significantly positive

[5] Byrne (2009) defined a latent construct as operationalisation "of a construct that is not witnessed directly but inferred on the basis of indicators or survey items measured underlying that construct".

relationships with each other. This relationship compliments the reported results of Xie and Hayase (2007). However, the negative and non-significant relationship of input and output contradicts findings of Xie and Hayase (2007). However, to envisage each factor's contribution to CEP model we retain all factors (irrespective of their association) of the Australian data.