# The association between ethical leadership and environmental activity management: The mediating role of employee environmental empowerment

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ABSTRACT

This study examines the association between ethical leadership and environmental activity management (EAM) [environmental activity analysis (EAA), environmental activity cost analysis (EACA) and environmental activity-based costing (EABC)] and the mediating role of employee environmental empowerment in such an association. Data was collected using an online survey questionnaire from 400 middle and lower-level Australian managers. The results reveal that the relationship between ethical leadership and EAM transpires indirectly, with ethical leadership found to be positively associated with employee environmental empowerment which in turn, exhibits a positive association with the use of all three levels of EAM (EAA, EACA and EABC). Such findings highlight the importance of ethical leadership as a means of enhancing employee environmental empowerment, and subsequently increasing the extent of use of EAM. Accordingly, organisations should endeavour to encourage ethical leadership through leadership training programs and/or the recruitment of appropriate 'ethical' leaders. In addition, as employee environmental empowerment fully mediates the association between ethical leadership and the extent of use of EAM, organisations should look to enhance employee environmental empowerment through providing employees with greater opportunities: to discuss and be involved with the development of new environmental management practices; to be actively involved in the development, management and evaluation of environmental management practices; and/or to be involved in strategic decision making regarding environmental management practices.

## 1. Introduction

This study focuses on the use of a relatively new environmental initiative which has drawn increasing attention in recent literature (Baird, Su, & Tung, 2022; Baird, Tung, & Su, 2018; Nuhu, Baird, & Su, 2021; Phan, Baird, & Su, 2018; Su, Tung, & Baird, 2017), namely environmental activity management (EAM). EAM applies Gosselin's (1997) principle of activity management in an environmental context and consists of three levels: environmental activity analysis (EAA), environmental activity cost analysis (EACA) and environmental activity-based costing (EABC). EAA focuses on identifying, monitoring and evaluating the environment-related activities that transpire within an organisation while EACA goes one step further to concentrate on the costs of these activities and the drivers of such costs (Gosselin, 1997). The third and most complex level of EAM, EABC, subsumes the other two levels. Specifically, it goes beyond identifying and monitoring the

environment-related activities (i.e. EAA) to determine the costs and cost drivers of such activities (i.e. EACA) for the purpose of allocating the costs of environmental-related activities to products and services (Gosselin, 1997, p.107). Hence, the three levels are not mutually exclusive, with EACA subsuming the characteristics of EAA, and EABC subsuming the characteristics of EAA and EACA.

EAM is pertinent amidst growing community concerns regarding the environmental impact of business activities (Testa, Grappio, Gusmerotti, Iraldo, & Frey, 2016; Testa, Miroshnychenko, Barontini, & Frey, 2018). In particular, EAM enables organisations to account for their environmental activities and their costs more accurately (Virtanen, Tuomaala, & Pentti, 2013) and hence, contributes to the Environmental Management Accounting literature (e.g. Burritt, Hahn, & Schaltegger, 2002; Burritt, Schaltegger, & Zvezdov, 2011) through introducing a new environment-related accounting system to manage environmental and economic performance (IFAC, 2005). Tsai, Kuo, Lin, Kuo, and Shen (2010) here

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highlights the importance of such practices in addressing the understatement of environmental costs and allocating such costs to products and processes.

Previous studies have highlighted the benefits of EAM with Phan et al. (2018) highlighting the positive impact of EAM on environmental performance, Baird, Su, and Tung (2022) providing evidence of its' effect on both environmental and financial performance, and Nuhu et al. (2021) highlighting its' effect on triple bottom line performance. Evidence of the usefulness of EAM practices has led to contingency-based research which examines the factors influencing the extent of use of EAM within organisations. For instance, Su et al. (2017) examined the role of employees, specifically the impact of employee environmental commitment, on the extent of use of EAM, and Baird et al. (2018) examined the role of organisational culture in influencing the extent of use of EAM. This study aims to extend this contingency-based literature by examining the influence of two employee related factors, ethical leadership and employee environmental empowerment, on the extent of use of EAM.

Ethical leadership here involves exhibiting and promoting appropriate ethical conduct throughout the organisation (Brown, Treviño, & Harrison, 2005). We focus on the influence of ethical leadership as while there has been extensive literature examining the effect of ethical leadership in promoting employee attitudinal and behavioural outcomes (e.g., Avey, Palanski, & Walumbwa, 2011; Brown et al., 2005; Brown & Treviño, 2006; Mayer, Aquino, Greenbaum, & Kuenzi, 2012; Piccolo, Greenbaum, Den Hartog, & Folger, 2010; Resick, Hargis, Shao, & Dust, 2013), its impact on organisational environmental policies and practices (such as EAM) has been overlooked (Pasricha, Singh, & Verma, 2018). Accordingly, we aim to provide an empirical insight into the influence of ethical leadership on the use of a specific environmental practice, EAM. There is general conjecture here that ethical leaders will promote environmental practices within their organisation (Ahmad, Islam, Sadiq, & Kaleem, 2021). In particular, as ethical leaders are more likely to be cognisant of their responsibility to their stakeholders, including the wider community (Ren, Tang, & Jackson, 2021), it is expected that they will be more likely to engage in environmentally friendly behaviour in order to maintain a "healthy natural environment" (Ren et al., 2021, p.7). Accordingly, we expect that ethical leaders will be more likely to use EAM.

In addition, in response to calls to consider "the mechanisms (or mediating effects) that underlie ethical leadership's influence on the followers' work behaviour" (Ahmad et al., 2021, p.534), the study also aims to provide an insight into the mechanism through which ethical leadership influences the extent of use of EAM. Specifically, grounded in Dedahanov, Bozorov, and Sung's (2019) proposition that the association between leadership styles and organisational innovation behaviour can transpire through the Human Resource Management (HRM) factor employee empowerment,[1] the study aims to examine the role of employee environmental empowerment, a Green HRM (GHRM) factor (Ren et al., 2021), in mediating the association between ethical leadership and the extent of use of EAM.

While previous studies define employee environmental empowerment as the extent of employees' participation and influence in environmental planning and decision making (Carlini & Grace, 2021), given our focus on the extent of use of EAM, we define employee environmental empowerment in respect to the extent of employees' awareness and understanding of, involvement in decisions relating to, and participation in the development of new environmental management

practice.[2] Our focus on employee environmental empowerment is pertinent as it is envisaged that ethical leaders will be more likely to give employees the opportunity to participate in and influence the development of new environmental management practices i.e. higher employee environmental empowerment, with such empowerment promoting the use of EAM as empowered employees are more aware of, better understand, and accept and promote new environmental management initiatives.

Data was collected using an online survey questionnaire distributed to Australian middle and lower level managers. Structural Equation Modelling (SEM) was used to test the hypothesised relationships with the results revealing a significant indirect positive relationship between ethical leadership and the extent of use of all three levels of EAM, mediated by employee environmental empowerment. The findings highlight the importance of both ethical leadership and employee environmental empowerment in enhancing the extent of use of EAM practices.

The remainder of the paper is organised as follows. First, the next section discusses the main constructs of the study, and the plausible relationships between the constructs. The following section then outlines the research method adopted in the study, followed by the results section. The final section discusses and presents the implications of the findings, the limitations and directions for future research.

## 2. Literature review and hypotheses development

### 2.1. Ethical leadership

Ethical leadership has gained increasing attention in today's business environment with the term 'ethical leader' commonly associated with being a 'moral person' and a 'moral manager' (Khan, Du, Ali, Saleem, & Usman, 2019; Pasricha et al., 2018). A moral person is defined as following "the demonstration of normatively appropriate conduct through personal actions and interpersonal relationships" (Brown et al., 2005, p.120). While the term 'normatively appropriate conduct' here is deliberately vague and may differ based on the work context and culture, it generally implies that leaders are honest, fair, trustworthy and caring, and act in line with ethical principles and take responsibilities for their own actions (Byun, Karau, Dai, & Lee, 2018; Den Hartog, 2015; Moore et al., 2019). A moral manager promotes normatively appropriate conduct to "followers through two-way communication, reinforcement, and decision-making" (Brown et al., 2005, p.120).

Moral managers provide their subordinates a voice and offer them a high level of autonomy and influence in their work (Brown et al., 2005; De Hoogh & Den Hartog, 2008). Moral managers also "make ethics an explicit part of their leadership agenda by communicating an ethics and values message, by visibly and intentionally role modelling ethical behaviour" (Brown & Treviño, 2006, p.597). Further, moral managers consider ethical consequences in making decisions and implement ethical standards amongst employees through employing appropriate reward and punishment systems (Brown et al., 2005; Byun et al., 2018; Zhang & Tu, 2018). Prior literature suggests that ethical leaders have a long-term focus in respect to their organisations' success and are concerned about the environment and value sustainability development (De Hoogh & Den Hartog, 2008; Ferdig, 2007; Kalshoven, Den Hartog, & De Hoogh, 2011). Accordingly, a potential positive association is expected between ethical leadership and the environmental initiative EAM which has been empirically proven to enhance both environmental and social performance (Baird et al., 2018; Nuhu et al., 2021; Phan et al., 2018).

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[1] Employee empowerment is defined as "the delegation of power and responsibility from higher levels in the organisational hierarchy to lower-level employees, especially the power to make decisions" (Baird & Wang, 2010, p. 577).

[2] This definition is adapted from Carlini and Grace (2021) which was in the context of CSR.

## 2.2. Environmental activity management

In response to the problems associated with the traditional costing system (e.g., assuming all costs are volume-driven and failing to assign non-manufacturing costs to products), Gosselin (1997) developed an alternative costing system called activity management which aimed to more accurately identify and assign all of the costs associated with production to related products. Activity management consists of three levels including activity analysis which focuses on the activities associated with providing goods and/or services, activity cost analysis which goes one step further by identifying the costs of each activity and the factors causing them to incur, and activity-based costing which includes tracing the costs of each activity to products, thereby enabling an estimation of product/service costs.

As environmental costs are often hidden in overhead accounts and are not identified and recorded in traditional costing systems due to their less tangible and difficult to quantify nature (Pember & Lemon, 2012), there are calls in the literature to extend Gosselin's (1997) activity management principles to an environmental accounting context with Emblemsvåg and Bras (2001) first extending activity management into the environmental domain. Similarly, as part of the introduction of principles and procedures for environmental management accounting, the United Nations Division for Sustainable Development (UNDSD, 2001) suggests that environmental costs should be directly allocated to the activities that cause the costs. In response to such calls to apply activity management as a means of accurately identifying, managing and allocating environment-related costs, Phan et al. (2018)[3] introduced the concept Environmental Activity Management (EAM), which consists of three levels, namely Environmental Activity Analysis (EAA), Environmental Activity Cost Analysis (EACA) and Environmental Activity-Based Costing (EABC). EAA serves to identify those activities that have potential environmental impacts, EACA progresses EAA by estimating the environmental costs associated with each activity and identifying the factors that cause the costs to be incurred (i.e., cost drivers), while EABC goes one step further by tracing the environmental costs of each activity to products/services, thereby enabling organisations to estimate their product/service costs more accurately (Phan et al., 2018). The three levels are not mutually exclusive, with EACA subsuming EAA, and EABC subsuming the characteristics of EAA and EACA. Hence, the distinction between the three levels of EAM is based on the depth of the analysis and the extent to which the information obtained is used for decision making purposes with the complexity of the EAM system increasing as organisations move from using EAA through to EACA and EABC to a greater extent.

The following two sections develop hypotheses in relation to the direct association between ethical leadership and EAM (Section 2.3) and the mediating role of employee environmental empowerment in such an association (Section 2.4).

## 2.3. The association between ethical leadership and environmental activity management

As a moral person acting in line with ethical principles, ethical leaders are more likely to consider protecting the natural environment and proactively engage with pro-environmental behaviour (Wu, Kwan, Yim, Chiu, & He, 2015). In particular, in line with Ren et al. (2021), the protection of the natural environment, for the benefit of the wider community, is an inherent responsibility of ethical leaders and consequently it is expected that "ethical leaders will promote environmentally friendly policies and practices within their organisation." (Ahmad & Umrani, 2019, p.543). Further, grounded in the upper echelons theory

which suggests that leaders' characteristics and values have a significant impact on strategic choices and decisions (Finkelstein, Hambrick, & Canella, 2009), it is expected that ethical leaders will be more likely to promote the use of environment-related initiatives (Pasricha et al., 2018) such as EAM. Finally, Brown and Treviño (2006) posit that leaders have the most influence over ethics-related initiatives while Khan et al. (2019) suggest that due to the focus on pursuing ethical values and behaviour, ethical leadership will exhibit a strong positive influence on the use of organisational environmental initiatives, such as EAM. Accordingly, it is expected that ethical leadership will be positively associated with the extent of use of EAM.

This positive association is expected in relation to all three levels of EAM (i.e., EAA, EACA, and EABC) with the extent of use of each level of EAM expected to increase as there is stronger ethical leadership. However, given the three levels of EAM are not mutually exclusive, we acknowledge that the extent to which each is used is dependent upon the unique objectives of organisations and cost-benefit analysis, i.e., a comparison of the increasing complexity and costs involved as organisations move from EAA to EACA to EABC with the additional benefits of EABC compared to EACA compared to EAA. Specifically, organisations whose primary objectives are process improvements in respect to environmental activities may be content using EAA, while those who wish to analyse the costs of such activities and their drivers will progress to use EACA, and those who wish to allocate environmental activity costs to products for the purpose of enabling a more accurate determination of product costs will proceed to use EABC to a greater extent.

Irrespective of the level of EAM used by organisations we expect a positive association between ethical leadership and the extent of use of these practices. First, ethical leaders are expected to use EAA to a greater extent as it can provide them with detailed information regarding the activities that have an environmental impact in their organisation (Gosselin, 1997). EAA enables managers to be more aware of the activities involved in their organisation's operations with a view to managing the environmental impact of such activities. Specifically, as EAA can assist organisations in eliminating or modifying activities that require excessive resources or generate too much waste and pollution (Pember & Lemon, 2012), ethical leaders are likely to promote the use of EAA for the purpose of reducing the negative impact of their organisations' activities on the environment. This is supported by Khan et al.'s (2019) proposition that since sustainability is an ethical issue, ethical leaders will promote environmental policies and procedures and environmental practices that can help to reduce the negative impact of their organisations' activities on the environment.

Secondly, ethical leaders are expected to use EACA to a greater extent as through calculating the costs of activities with potential environmental impacts, and the drivers of such costs, organisations will be able to reduce their environment-related costs and eliminate non-value-added activities, thereby improving the efficiency of activities, promoting better product and process design (Ittner, Lanen, & Larcker, 2002) and improving environmental performance. Hence, as ethical leaders carry out decision making in adherence to ethical principles and focus on their organisations' long-term success (Pasricha et al., 2018), they will promote the use of EACA as it enables their organisations to uncover hidden environmental costs and their drivers and subsequently make more environmentally accountable decisions (Su et al., 2017). In addition, Zhu, Sun, and Leung (2014) argue that ethical leaders will utilise EACA as it facilitates better decisions in relation to the impact of organisational activities on the natural environment, thereby enabling them to better demonstrate their concern and commitment to environmental objectives.

Finally, ethical leaders are expected to use EABC to a greater extent as through tracing the hidden costs of environmental activities to products and services (Phan et al., 2018) it will enable managers to determine product and service costs more accurately. Such analysis will facilitate better control of environmental-related costs (Emblemsvåg & Bras, 2001) and facilitate improved product pricing and product mix

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[3] While Su et al. (2017) was published prior to Phan et al. (2018) they acknowledge the concept of EAM was introduced by a working paper (i.e. Phan, 2017) which was later published as Phan et al. (2018).

decisions. Hence, ethical leaders are likely to use EABC to a greater extent as accurate costing and pricing can contribute to an organisations' long-term success (Langfield-Smith, Smith, Andon, Hilton, & Thorne, 2018).

Accordingly, it is expected that there will be a positive association between ethical leadership and the extent of use of EAA, EACA and EABC.

**H1**. There will be a positive association between ethical leadership and the extent of use of: (a) EAA; (b) EACA; and (c)EABC.

*2.4. The mediating role of employee environmental empowerment in the association between ethical leadership and environmental activity management*

The literature refers to the important role of both leadership and GHRM practices (i.e., employee environmental empowerment) in influencing employees' green behaviour (Ahmad et al., 2021; Ren et al., 2021). Furthermore, the importance of empowerment in the context of environmental management is emphasised in the literature (Daily, Bishop, & Massoud, 2012; Daily, Bishop, & Steiner, 2007) with Matthews, Diaz, and Cole (2003) and Ali and Ahmad (2009) indicating that for an organisation to pursue environmental initiatives, their employees must be empowered and environmentally conscious.

Adhiati and Ratnawati (2021) found that employee environmental empowerment mediated the association between eco-leaders' characteristics and organisational pro-environmental behaviour. Similarly, Tariq, Jan, and Ahmad (2016) suggest that employee environmental empowerment could serve as a potential mediator of the association between human resource aspects of environmental management (e.g., ethical leadership) and organisations' green initiatives (i.e., EAM in our study). Accordingly, we consider employee environmental empowerment as a mediator of the relationship between ethical leadership and the extent of use of EAM practices. This is pertinent due to the role of employee environmental empowerment as a behavioural mechanism through which organisations encourage flexibility and responsiveness (Baird & Wang, 2010) to new environmental management practices. In particular, the emphasis of ethical leaders on pro-environmental behaviour is expected to result in enhanced employee environmental empowerment, which in turn will facilitate greater use of the three levels of EAM (i.e. EAA, EACA and EABC) through delegating the decision-making authority to employ such environmental management practices to employees. In addition, in line with Tariq et al. (2016), environmentally empowered employees will be more motivated and enthusiastic to commit to an organisations' new environmental initiatives.

Menon (2001) posits that leadership affects empowerment while Ramus (2001) suggests that leaders that support sustainability inspire employees with the same vision via empowerment. Hence, consistent with Adhiati and Ratnawati (2021) who found that the leaders who frequently communicated with their employees in regard to environmental sustainability had a positive effect on employee environmental empowerment, we expect a positive association between ethical leadership and employee environmental empowerment.

Subsequently, Dutta (2012) emphasised the role of employee environmental empowerment in assisting organisations in pursuing environmental goals, while Tariq et al. (2016) suggest that environmentally empowered employees are more motivated and committed to engage in environmental activities and practices. Further, in line with social learning theory (Bandura, 1986), which suggests that employees learn by emulating the attitudes, values and behaviours of their leaders, we expect that employees who are led by ethical leaders, will be more likely to actively participate in the discussion and development of new environmental management initiatives. Therefore, we argue that ethical leaders will enhance the extent of use of EAM practices through empowering employees i.e. making them aware of and involving them

in environmental-related decisions including those relating to the use of EAM practices. Hence, employee environmental empowerment is expected to serve as a mechanism that facilitates the association between ethical leadership and the use of each of the three levels of EAM (i.e., EAA, EACA and EABC).

First, in respect to EAA, it is anticipated that the enhanced focus of ethical leaders on their environmental responsibilities will result in higher employee environmental empowerment, and in turn a greater emphasis on analysing environmental activities (i.e. EAA). In particular, as ethical leaders empower employees by providing them with a 'voice', i.e. enabling them to put forward their opinions and ideas (Brown et al., 2005; De Hoogh & Den Hartog, 2008; Piccolo et al., 2010) and participate in environmental decision making processes, there will be a greater emphasis placed on identifying and analysing the environmental activities within an organisation (i.e. EAA). Similarly, as ethical leaders are more aware of their responsibility, not just to their own organisation but to the wider community, including the natural environment (Ahmad & Umrani, 2019, Ren et al., 2020), they are more likely to encourage employees to actively express their concerns and suggestions regarding environmental issues within their organisation (Zhang & Tu, 2018) and hence, there is more likely to be a greater emphasis placed on EAA. Further, through communicating the pro-environmental agenda of their organisation to employees, ethical leaders will enhance employees' awareness and understanding of their organisations' environment-related activities (Rangarajan & Rahm, 2011), thereby facilitating the use of EAA.

Similarly, as the environmental empowerment of employees is enhanced, employees will be more likely to have the authority to monitor and evaluate the costs associated with conducting environmental activities and analysing the factors that cause such costs to vary (Phan et al., 2018). Hence, higher employee environmental empowerment will lead to a higher extent of use of EACA to enable employees to monitor and manage the efficiency with which environmental activities are performed. In particular, ethical leaders who are concerned with reducing the costs associated with environmental activities and/or enhancing their environmental performance, will empower employees to adopt this second level of EAM (i.e. EACA) to a greater extent. Further, as empowered employees have a greater sense of ownership of their environmental responsibilities, they will be more likely to engage in EACA as it enables them to manage their environmental resources more efficiently and effectively, and in way which minimises their environmental impact.

Finally, in respect to EABC, as employees are more empowered in respect to their awareness of and involvement in decisions relating to environmental management practices, they are more likely to use the third level of EAM (i.e. EABC) to a greater extent. In particular, more empowered employees will have the motivation and authority to implement the most complex level of EAM, EABC, which will enable them to allocate environmental costs to the products and/or processes that incur the environmental costs (Phan et al., 2018). Further, as empowered employees are more likely to be engaged in strategic decisions concerning product mix, the price of goods and services and decisions relating to future investments and/or product design and development (Tsai, Lai, Tseng, & Chou, 2008), they are more likely to engage in EABC as it enables them to more accurately ascertain the environmental costs associated with producing goods and services and hence, better evaluate and manage their sustainability efforts (Phan et al., 2018).

Hence, while the extent to which each level of EABM is used may differ depending on the specific objectives of organisations and cost-benefit analysis, we argue that environmentally empowered employees will facilitate the implementation of each of the three levels of EAM. In particular, empowered employees will demonstrate less employee resistance to change which is vital given that such resistance is one of the biggest challenges faced by organisations when introducing management accounting practices (e.g., EAM) (Akenbor & Okoye,

2012). Further, empowered employees will evoke a greater sense of employee ownership of environmental management initiatives and exhibit a high level of commitment (Kirkman & Rosen, 1999) toward such practices which is essential for the successful implementation of any organisational system/practice (Langfield-Smith et al., 2018). For instance, Su et al. (2017) found that organisations with more environmentally committed employees are more likely to analyse the various environmental activities involved in producing goods and services (i.e., EAA), identify the costs of each environmental activity and the factors that cause them to incur (i.e., EACA) and measure the environmental costs associated with each product more accurately (i.e., EABC).

Therefore, in the context of environmental management, we posit that environmentally empowered employees will be more likely to promote the use of new environmental initiatives such as EAA, EACA and EABC that can help organisations to eliminate the unnecessary excessive consumption of resources and better understand, trace and estimate their environmental costs. Accordingly, given the role of ethical leaders in facilitating employee environmental empowerment and in turn, the likely effect of employee environmental empowerment on the extent of use of the three levels of EAM, we hypothesise that employee environmental empowerment mediates the association between ethical leadership and the extent of use of EAA, EACA and EABC respectively.

**H2.** Employee environmental empowerment will positively mediate the association between ethical leadership and the extent of use of: (a) EAA; (b) EACA; and (c) EABC.

## 3. Method

An Australian-based data collection company, Online Research Unit (ORU), was appointed to recruit potential participants and collect data for the study.[4] An online survey questionnaire, which was designed to ask potential participants to assess their direct supervisor's leadership style (i.e., ethical leadership), the extent to which they are empowered by their leaders in respect to environmental management practices, and the extent of use of EAM within their organisations, was sent out to middle and lower-level managers[5] in Australian business organisations. Middle and lower-level managers were considered to be the most appropriate respondents as they are in positions that hold a certain level of responsibility/accountability for their own work, while they are still subject to the leadership of top-level management. Hence, they were deemed to possess the required knowledge of the study's variables. Further, to ensure that potential participants possessed a good understanding of their organisation's use of EAM, only those middle and lower-level managers who had worked for their organisation for more than two years were eligible to participate in the survey.

The ORU sent the questionnaire to 1395 eligible middle and lower-level managers, with two reminders sent to those who had not completed the questionnaire. A total of 439 complete surveys questionnaires were received, achieving a response rate of 31.5%. To enhance the quality of the data collected, speeder and attention checks were implemented to identify respondents who finished the questionnaire too fast[6] or who provided low-effort responses.[7] As a result, 39 respondents were removed from the study, leaving 400 complete questionnaires to be used for the data analysis. Amongst these 400 respondents, 100 were lower-level managers and 300 were middle-level managers. The respondents spent between 11.6 and 22.5 min completing the questionnaire with a mean completion time of 13.8 min.

Table 1 reveals the demographic information for the final 400 participants. The majority of the respondents (66.1%) held an undergraduate or postgraduate degree, while the majority (58.5%) had worked in their current organisation between 2 and 10 years. In regard to organisational size, 35.5% of the participants worked in organisations with >300 employees while 33% of the participants worked in organisations with <50 employees (see Table 1 for more details).

### 3.1. Common method bias

Both methodological and statistical strategies were implemented to reduce the problem of common method bias. First, based on Jordan and Troth's (2020) recommendation, an information coversheet was provided to respondents outlining the purpose of the study. Clear instructions were also provided in respect to each section of the questionnaire to ensure that respondents understood how to answer each question. Secondly, given that the data for all of the variables was collected from the same survey questionnaire, 'random ordering of questions' and 'a clear separation between the independent and dependent variables' were implemented to minimise the likelihood of respondents being able to identify the independent and dependent variables of the study. Thirdly, a careful data collection process was followed. Specifically, as the ORU rewards participants for completing the questionnaires using physical gift cards which are mailed to Australian residential addresses, we were able to identify panel duplication and minimise panellist fraud, thereby enhancing the quality of the data collected. Further, as previously mentioned, attention and speeder checks were put in place to improve the accuracy of the data

**Table 1**
Profile of respondents.

| Education level ($N = 400$) | No. of responses (Percentage) |
| --- | --- |
| School certificate | (15) 3.8% |
| Higher certificate or equivalent | (30) 7.5% |
| Diploma or equivalent | (91) 22.8% |
| Undergraduate degree | (135) 33.8% |
| Postgraduate degree | (129) 32.3% |
| | |
| Tenure ($N = 400$) | |
| 2–5 years | (144) 36% |
| 6–10 years | (90) 22.5% |
| 11–15 years | (57) 14.3% |
| 16–20 years | (41) 10.2% |
| 21 years or more | (68) 17% |
| | |
| Organisational size ($N = 400$) | |
| Between 1 and 49 | 132 (33%) |
| Between 50 and 99 | 54 (13.5%) |
| Between 100 and 199 | 48 (12%) |
| Between 200 and 299 | 24 (6%) |
| >300 | 142 (35.5%) |

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[5] Middle-level managers are at the centre of a hierarchical organisation, subordinates to senior management but above the lowest levels of operational staff. Middle-level managers are accountable to top management for their business unit's function. They provide guidance to lower-level managers and inspire them to perform better.Lower-level managers are the first line of managers who communicate the fundamental operating problems of an organisation to higher levels of management.

[6] A respondent was considered to be a speeder if his/her completion time was shorter than the mean completion time by more than two standard deviations.

[7] A response was considered as a low-effort response if the respondent clicked the same score for all items in one or more sections.

collected.

As suggested by Jordan and Troth (2020) two statistical strategies were also implemented. First, Harman's (1967) test was conducted with the results showing that the highest total variance explained by a single factor was 47.95%. This was below the 50% threshold, thereby suggesting that common method bias was a not an issue (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). Second, the Common Latent Factor (CLF) test indicated that the difference in the standardised weights between the model with the CLF and the model without the CLF was <0.20 across all of the measurement items for each variable (Eichhorn, 2014), thereby indicating that common method bias was unlikely to be a concern.

### 3.2. Variable measurement

The survey items for all of the variables were scored on five-point scales with the details regarding the measurement of each variable outlined below. An exploratory factor analysis (EFA) was first performed for all items using the principal components method and varimax rotation criterion with the results provided in Appendix A. In accordance with Gaskin's (2012) recommendation that the loadings on items must be distinct (more than a 0.2 difference) and the general principle that factor loading scores must be higher than 0.6 (MacCallum, Widaman, Zhang, & Hong, 1999), one item (i.e., ethical leadership item 2) was removed from further analysis (see Appendix A). Confirmatory factory analysis (CFA) were subsequently conducted with Appendix B providing the CFA results including the standardised factor loadings, the standardised error and t-statistics for each item, and the goodness of fit indices (i.e., CMIN/DF, GFI, AGFI and RMSEA).

#### 3.2.1. Ethical leadership

Ethical leadership was assessed using a ten-item measure adapted from Brown et al. (2005) with respondents asked to indicate the extent to which they agreed with each of the ten statements using anchors of "1 = strongly disagree" and "5 = strongly agree" (see Appendix B). As indicated, one item was removed due to a low factor loading (i.e., <0.6) in the EFA results (see Appendix A). The CFA (see Appendix B) also resulted in the removal of this item with the remaining nine items exceeding the cut-off point of 0.5 and the measure exhibiting a good model fit (CMIN/DF = 1.897; GFI = 0.974; AGFI = 0.956; RMSEA = 0.047).[8] Hence, all nine items were included in the structural model as the measure of the extent of ethical leadership.

#### 3.2.2. Employee environmental empowerment

The extent of employee environmental empowerment was measured using a nine-item measure adapted from Carlini and Grace (2021). Specifically, given that Carlini and Grace (2021) was conducted in a corporate social responsibility (CSR) context we revised the statements to fit the general environmental context of this study, focusing on the involvement of employees in respect to environmental management practices. Respondents were asked to indicate whether they agreed with each item using anchors of "1 = strongly disagree" and "5 = strongly agree" (see Appendix B). EFA revealed that all nine items loaded onto one dimension with acceptable loading scores (see Appendix A) and the CFA results (see Appendix B) show that the factor loadings for all of the nine items exceeded the cut-off point of 0.5 and exhibited an overall good model fit (CMIN/DF = 1.841; GFI = 0.976; AGFI = 0.954; RMSEA = 0.046). Therefore, all nine items were included in the structural model as the measure of the extent of employee environmental empowerment.

#### 3.2.3. The extent of use of EAM

The extent of use of the three levels of EAM was assessed using three single-item measures adopted from Phan et al. (2018). Specifically, respondents were asked to indicate, using a five-point scale with anchors of 1 "not at all" and 5 "to a great extent," the extent to which the statements provided described current practices in their organisation in relation to the three levels of EAM respectively (see Appendix B). While we were unable to assess the goodness of fit as we used single item measures, these measures have been empirically tested in recent studies (Baird, Su, & Tung, 2022; Baird, Tung, & Su, 2018; Nuhu et al., 2021).

#### 3.2.4. Control variables

Six different control variables were included in the model, organisational size, environmental uncertainty, and participants' education level, tenure, employee organisational commitment, and environmental citizenship behaviour. Organisational size was included due to its potential effect on both the extent of employee environmental empowerment and the three levels of EAM, with prior studies confirming that organisational size plays a significant role in influencing environmental activities (Kansal, Joshi, & Batra, 2014; Lee & Hutchison, 2005). Tenure and education level were included as they have been found to be associated with employee empowerment (Kohli & Sharma, 2017; Spreitzer, 1996) and hence, were also expected to influence the extent of employee environmental empowerment. Environmental uncertainty was expected to influence the level of EAM as the external environment of the organisation is considered to be an important contextual factor affecting management accounting practices (Laitinen, 2014). Finally, employee organisational commitment and environmental citizenship behaviour were included as employees with higher level of organisational commitment and environmental citizenship behaviour are more likely to work harder for the organisation and engage in eco-initiatives such as EAM.

Education level was measured using a range of nominal scales, tenure was measured based on the years working in the organisation, while organisational size was measured based on the number of full-time employees. Environmental uncertainty was measured using the Su, Baird, and Schoch (2015) three item measure with respondents required to indicate the extent of Dynamism, Hostility and Heterogeneity in their organisation on a five-point scale with anchors of "1 = Not at all" and "5 = To a great extent". Employee organisational commitment was measured using Cook and Wall's (1980) nine-item scale with respondents required to indicate the extent to which they agreed with each item using anchors of "1 = Strongly disagree" and "5 = Strongly agree". The CFA analysis resulted in the removal of 6 of these items due to low loadings and hence, this construct was measured based on the average score in respect to the remaining three items: 'I feel that I am a part of the organisation', 'In my work I like to feel I am applying some effort not just for myself but for the organisation as well' and 'I am determined to make a contribution for the good of my organisation'. Finally, environmental citizenship behaviour was measured based on a six item measure with respondents required to indicate the extent to which employees engaged in dysfunctional behaviour ('Taking undeserved breaks', 'Coasting toward the end of the day', 'Spending a great deal of work time on personal' phone conversations', 'Taking extra breaks', 'Spending work time in idle (social) conversations' and 'Taking unnecessary time off work') on a five-point scale with anchors of "1 = Not at all" and "5 = To a great extent".

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[8] The recommended threshold guidelines are CMIN/DF < 5; GFI and AGFI >0.80; and RMSEA <0.05 (Browne & Cudeck, 1993; Hair, Black, Babin, Anderson, & Tatham, 2010).

**Table 2**
Descriptive statistics.

| | *N* | Mean | Std. Dev. | Minimum actual (theoretical) | Maximum actual (theoretical) |
|---|---|---|---|---|---|
| Ethical leadership | 400 | 3.848 | 0.794 | 1 (1) | 5 (5) |
| Employee environmental empowerment | 400 | 3.396 | 0.840 | 1 (1) | 5 (5) |
| EAA | 400 | 3.630 | 1.028 | 1 (1) | 5 (5) |
| EACA | 400 | 3.520 | 1.038 | 1 (1) | 5 (5) |
| EABC | 400 | 3.420 | 1.078 | 1 (1) | 5 (5) |

EAA – Environmental Activity Analysis; EACA – Environmental Activity Cost Analysis; EABC Environmental Activity Based Costing.

## 4. Results

### 4.1. Measurement model

Table 2 shows the summary statistics including the mean, standard deviation, and the minimum and maximum values for each variable. The respondents exhibited a moderate[9] level of employee environmental empowerment (mean = 3.396) and reported a higher level of ethical leadership in respect to their supervisors (mean = 3.848). The results also indicate that the responding organisations used the three levels of EAM, consisting of EAA (mean = 3.630), EACA (mean = 3.520) and EABC (mean = 3.420), to a moderate extent. Table 3 further highlights that 59.25% of Australian organisations were found to adopt EAA to a great extent. Alternatively, the proportion of respondents using EACA and EABC to a great extent is lower (53.50% and 49.75% respectively). Such results are consistent with previous EAM studies (Baird et al., 2018; Nuhu et al., 2021; Phan et al., 2018).

The results of the CFA have assured the reliability and dimensionality of the two multi-item constructs, i.e., ethical leadership and employee environmental empowerment (see Appendix B). In addition, Table 4 shows that the Cronbach's (1951) alpha scores for both variables are above 0.7, thereby indicating satisfactory reliability. To evaluate the constructs' convergent validity, the composite reliability and Average Variance Extracted (AVE) scores were examined, with Table 4 showing that the composite reliability scores for both ethical leadership and employee environmental empowerment exceed the 0.7 threshold (Werts, Linn, & Jöreskog, 1974) while the AVE scores for the constructs are above the 0.5 threshold (Chin, 1998). Discriminant validity was assessed by comparing the square roots of each construct's AVE with the correlations between each construct (see Table 5). As the square roots of the AVEs are greater than the respective correlations between the constructs, discriminant validity is assured (Chin, 1998).

**Table 3**
The extent of use of the three levels of Environmental Activity Management (EAM).

| Levels of EAM | *N* | Non-adopter (1*) | Adopt to a moderate extent (2 & 3*) | Adopt to a great extent (4 & 5*) |
|---|---|---|---|---|
| EAA | 400 | 16 (4.00%) | 147 (36.75%) | 237 (59.25%) |
| EACA | 400 | 18 (4.50%) | 168 (42.00%) | 214 (53.50%) |
| EABC | 400 | 23 (5.75%) | 178 (44.50%) | 199 (49.75%) |

EAA – Environmental Activity Analysis; EACA – Environmental Activity Cost Analysis; EABC – Environmental Activity Based Costing.
* On 5-point scale.

**Table 4**
Cronbach's alpha, composite reliability and average variance extracted (AVE) scores.

| | Cronbach's alpha scores | Composite reliability | AVE |
|---|---|---|---|
| Ethical leadership | 0.939 | 0.947 | 0.676 |
| Employee environmental empowerment | 0.938 | 0.948 | 0.668 |
| EAA* | – | – | – |
| EACA* | – | – | – |
| EABC* | – | – | – |

EAA – Environmental Activity Analysis; EACA – Environmental Activity Cost Analysis; EABC – Environmental Activity Based Costing.
* not applicable as single item constructs.

**Table 5**
Correlations between the constructs and square root of average variance extracted (AVE).

| | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| 1. Ethical leadership | 0.822[a] | | | | |
| 2. Employee environmental empowerment | 0.468* | 0.817[a] | | | |
| 3. EAA | 0.358* | 0.620* | – | | |
| 4. EACA | 0.346* | 0.599* | 0.940* | – | |
| 5. EABC | 0.355* | 0.620* | 0.888* | 0.929* | – |

EAA – Environmental Activity Analysis; EACA – Environmental Activity Cost Analysis; EABC – Environmental Activity Based Costing.
[a] The diagonal figures in bold are the square root of the AVE scores. The remaining figures are the correlations between the constructs.
* Significant at $p < 0.01$.

### 4.2. Structural model

Covariance Based Structural Equation Modelling (SEM) was used to examine the associations between ethical leadership and the use of EAM, and the mediating effect of employee environmental empowerment in this association. As the three levels of EAM subsume each other we examined the hypothesised associations using three separate models, one for each level of EAM with the results presented in Table 6[10] (Panels A, B and C). In line with Anderson and Gerbing (1988) all of the insignificant paths in each of the three models were removed until all of the remaining paths were statistically significant. The four benchmark fit indices shown in Table 6 indicate a good fit of the three models i.e. for all three levels of EAM.

Unexpectedly, the hypothesised direct paths between ethical leadership and the use of the three types of EAM were found to be insignificant in all three models and were therefore removed from the final models shown in Table 6 and Fig. 1. Hence, H1a, H1b and H1c are not supported. The paths between two of the control variables, education level and tenure, with employee environmental empowerment and the extent of use of EAM were also removed from the model as none of these relationships were found to be significant. Similarly, the paths between employee organisational commitment and environmental citizenship behaviour with the extent of use of each level of EAM were not significant and were removed. However, all three models reveal that three of the control variables were associated with employee environmental empowerment (see Table 6). Specifically, environmental uncertainty and employee organisational commitment were significantly positively associated with employee environmental empowerment and environmental citizenship behaviour was significantly negatively associated with employee environmental empowerment. In addition, environmental uncertainty was found to be significantly positively associated

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[9] An average score less than the mid-point of the range (i.e., 3) is considered to be low. A score of 3 to 4 is considered to be moderate and a score above 4 is high.

[10] Please note that while exploratory analysis was conducted which included the three levels of EAM in one model the results remained the same.

**Table 6**

Results of the path analysis for the association between ethical leadership, employee environmental empowerment and the three levels of EAM.

Panel A Results of the association between ethical leadership, employee environmental empowerment and the extent of use of EAA

| Regression Paths | Final model | | | |
|---|---|---|---|---|
| | Standardised beta | S.E. | C.R. | p-value |
| Ethical leadership →Employee environmental empowerment | 0.290 | 0.057 | 5.110 | 0.000 |
| Environmental uncertainty →Employee environmental empowerment | 0.337 | 0.047 | 7.220 | 0.000 |
| Employee organisational commitment →Employee environmental empowerment | 0.157 | 0.061 | 2.584 | 0.010 |
| Environmental citizenship behaviour →Employee environmental empowerment | −0.144 | 0.031 | −4.628 | 0.000 |
| Employee environmental empowerment →EAA | 0.616 | 0.054 | 11.459 | 0.000 |
| Environmental uncertainty → EAA | 0.299 | 0.057 | 5.284 | 0.000 |
| CMIN/DF | 1.018 | | | |
| GFI | 0.995 | | | |
| AGFI | 0.974 | | | |
| CFI | 1.000 | | | |
| RMSEA | 0.007 | | | |

Panel B Results of the association between ethical leadership, employee environmental empowerment and the extent of use of EACA

| Regression paths | Final model | | | |
|---|---|---|---|---|
| | Standardised beta | S.E. | C.R. | p-value |
| Ethical leadership →Employee environmental empowerment | 0.290 | 0.057 | 5.110 | 0.000 |
| Environmental uncertainty →Employee environmental empowerment | 0.337 | 0.047 | 7.220 | 0.000 |
| Employee organisational commitment →Employee environmental empowerment | 0.157 | 0.061 | 2.584 | 0.010 |
| Environmental citizenship behaviour →Employee environmental empowerment | −0.144 | 0.031 | −4.628 | 0.000 |
| Employee environmental empowerment →EACA | 0.600 | 0.056 | 10.798 | 0.000 |
| Environmental uncertainty → EACA | 0.294 | 0.058 | 5.028 | 0.000 |
| CMIN/DF | 1.291 | | | |
| GFI | 0.994 | | | |
| AGFI | 0.968 | | | |
| CFI | 0.997 | | | |
| RMSEA | 0.027 | | | |

Panel C Results of the association between ethical leadership, employee environmental empowerment and the extent of use of EABC

| Regression paths | Final model | | | |
|---|---|---|---|---|
| | Standardised beta | S.E. | C.R. | p-value |
| Ethical leadership →Employee environmental empowerment | 0.290 | 0.057 | 5.110 | 0.000 |
| Environmental uncertainty →Employee environmental empowerment | 0.337 | 0.047 | 7.220 | 0.000 |
| Employee organisational commitment →Employee environmental empowerment | 0.157 | 0.061 | 2.584 | 0.010 |
| Environmental citizenship behaviour →Employee environmental empowerment | −0.144 | 0.031 | −4.628 | 0.000 |

**Table 6** (*continued*)

Panel C Results of the association between ethical leadership, employee environmental empowerment and the extent of use of EABC

| Regression paths | Final model | | | |
|---|---|---|---|---|
| | Standardised beta | S.E. | C.R. | p-value |
| Employee environmental empowerment →EABC | 0.646 | 0.056 | 11.549 | 0.000 |
| Environmental uncertainty → EABC | 0.317 | 0.059 | 5.379 | 0.000 |
| Organisational size → EABC | 0.000 | 0.000 | 1.976 | 0.048 |
| CMIN/DF | 0.904 | | | |
| GFI | 0.996 | | | |
| AGFI | 0.977 | | | |
| CFI | 1.000 | | | |
| RMSEA | 0.000 | | | |

EAA – Environmental Activity Analysis; EACA – Environmental Activity Cost Analysis; EABC – Environmental Activity Based Costing.

with the extent of use of EAA, EACA and EABC, while organisational size was significantly positively associated with the extent of use of EABC.

All three models (see Table 6 Panels A, B and C, and Fig. 1) reveal that ethical leadership was positively significantly associated with employee environmental empowerment, with an effect size just below a moderately strong effect[11] ($\beta = 0.290$, $p = 0.000$). Further, employee environmental empowerment was significantly positively associated with the use of all three levels of EAM, exhibiting a strong effect in respect to all three levels of EAM [EAA ($\beta = 0.616$, $p = 0.000$), EACA ($\beta = 0.600$, $p = 0.000$) and EABC ($\beta = 0.646$, $p = 0.000$)]. This strong effect size is in line with Adhiati and Ratnawati (2021) who identified a similar strong effect between employee environmental empowerment and pro-environmental behaviour ($\beta = 0.530$, $p = 0.000$).

The results suggest that employee environmental empowerment mediates the association between ethical leadership and the extent of use of EAM. Accordingly, the bootstrapping (5000 samples) with bias-corrected Confidence Intervals Method (MacKinnon, Lockwood, Hoffman, West, & Sheets, 2002) was used to test the mediating role of employee environmental empowerment with Table 7 indicating that employee environmental empowerment significantly mediates the association between ethical leadership with all three levels of EAM (EAA: $p = 0.005$; EACA: $p = 0.004$; EABC: $p = 0.004$). Given there was no significant direct association between ethical leadership with any level of EAM, employee environmental empowerment fully mediates the association between ethical leadership with all three levels of EAM. Therefore, H2a, H2b and H2c are fully supported and we conclude that the influence of ethical leadership on the extent of use of EAM occurs indirectly, through employee environmental empowerment.

## 5. Discussion and conclusion

This study extends the Environmental Management Accounting literature by providing an empirical insight into the extent of use of a relatively new practice, Environmental Activity Management (EAM) (i.e., EAA, EACA and EABC). The findings indicate that organisations adopt EAA to a greater extent, followed by EACA and EABC. Such findings are in line with the activity management literature which suggest that organisations may choose not to proceed to higher levels of activity management if they are satisfied with the benefits of lower levels and/or if they are subject to resource constraints inhibiting their ability to progress to higher levels (Baird, Harrison, & Reeve, 2004; Reeve, 1996). The extent of use of all three levels of EAM is higher when there is higher environmental uncertainty, while the extent of use of

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[11] Cohen (1988) suggests that an effect between 0.3 and 0.5 is considered to be moderately strong and an effect between 0.5 and 0.8 is considered to be strong.

**Panel A Results of the association between ethical leadership, employee environmental empowerment and the extent of use of EAA**
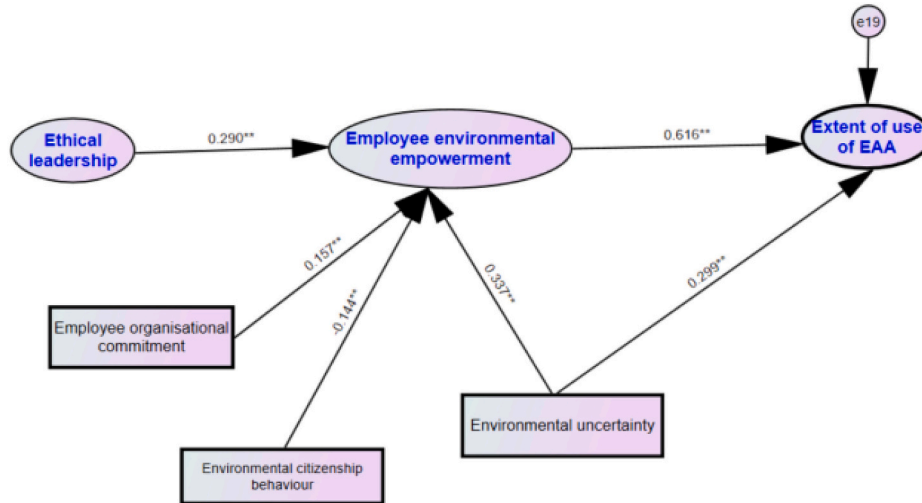


**Panel B Results of the association between ethical leadership, employee environmental empowerment and the extent of use of EACA**
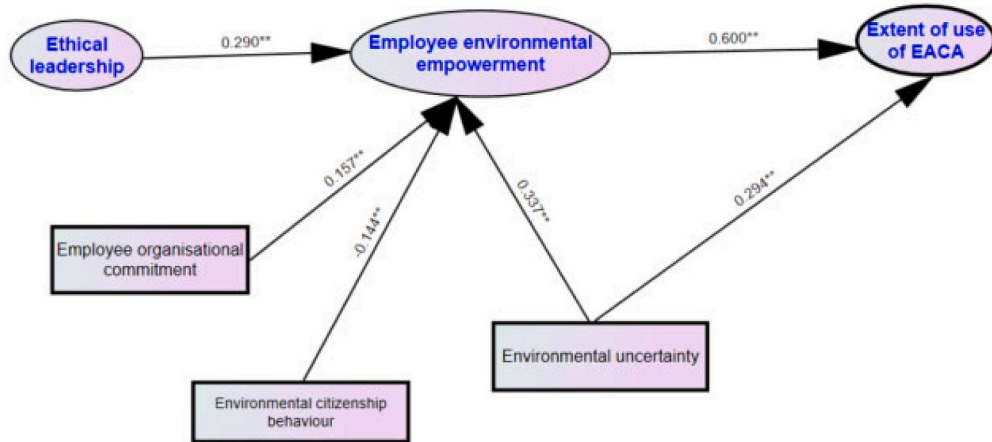


**Panel C Results of the association between ethical leadership, employee environmental empowerment and the extent of use of EABC**



**Fig. 1.** The final structural models.
Panel A Results of the association between ethical leadership, employee environmental empowerment and the extent of use of EAA.
Panel B Results of the association between ethical leadership, employee environmental empowerment and the extent of use of EACA.
Panel C Results of the association between ethical leadership, employee environmental empowerment and the extent of use of EABC.
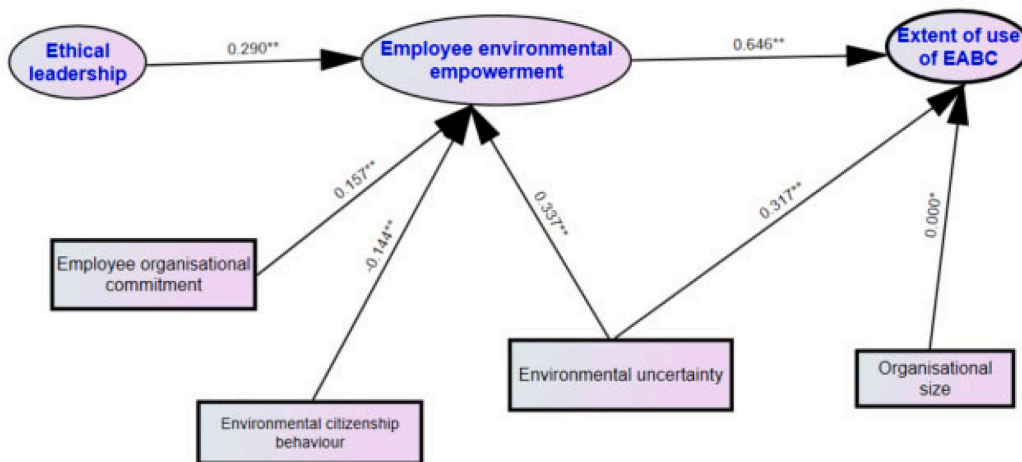N.B. ** at 1% significance level, * at 5% significance level.

**Table 7**

The mediating effect of employee environmental empowerment on the association between ethical leadership and the three levels of EAM.

| Dependent variables | Independent variable: ethical leadership | | |
|---|---|---|---|
| | LB 95% CI | UB 95% CI | *p*-value |
| EAA | 0.099 | 0.304 | 0.005 |
| EACA | 0.095 | 0.309 | 0.004 |
| EABC | 0.102 | 0.326 | 0.004 |

EAA – Environmental Activity Analysis; EACA – Environmental Activity Cost Analysis; EABC – Environmental Activity Based Costing.

EABC is higher in larger organisations.

In addition, the study considered the antecedent role of ethical leadership in influencing the extent of use of each of the three levels of EAM both directly and indirectly, through employee environmental empowerment. The findings indicate that the relationship between ethical leadership and EAM is an indirect one, with employee environmental empowerment fully mediating the association between ethical leadership with each of the three levels of EAM. Hence, we find that the influence of ethical leadership on the extent of use of EAM practices transpires through employee environmental empowerment. Specifically, ethical leadership exhibits a positive effect on employee environmental empowerment which in turn plays a crucial role in enhancing the use of EAM i.e. employee environmental empowerment exhibits a significant positive association with EAA, EACA, and EABC.

Therefore, given the importance of EAM practices, evidenced by the significant effect of EAM practices on organisational outcomes (Baird, Su, & Tung, 2022; Nuhu et al., 2021; Phan et al., 2018), it is recommended that organisations endeavour to enhance their level of employee environmental empowerment as a means of enhancing the extent of use of EAM. While our findings in respect to the control variables suggest that such empowerment is positively impacted by environmental uncertainty and employee organisational commitment and surprisingly negatively impacted by environmental citizenship behaviour, organisations need to be proactive in implementing employee environmental empowerment. Specifically, organisations should look to: enhance employees' awareness and understanding of environmental management practices; provide employees with greater opportunities to discuss and be involved with the development of new environmental management practices; actively involve employees in the development, management and evaluation of environmental management practices; and/or involve employees in strategic decision making regarding environmental management practices. It is important to recognise here that the empowerment of employees in respect to environmental management practices should be sincere and genuine and not just involve rhetoric, i.e., claims of empowerment and the impression that middle and lower-levels managers are empowered, while the reality is that leaders retain control (Argyris, 1998). As such, top management should ensure that there are official channels or supporting mechanisms that ensure employees actively engage with and participate in decision making in respect to environmental management practices.

Our findings provide an important insight into one such supporting mechanism, specifically the role of ethical leadership, in facilitating employee environmental empowerment. In particular, our findings indicate that higher employee environmental empowerment prevails when employees perceive their supervisors to exhibit higher ethical leadership, i.e., they are more focused on behaving ethically and in a way which considers the best interests of employees. Such findings provide empirical support for Luciano, John, and Thomas (2014) who refer to the role of leaders in fostering 'an empowered state' (Maynard, Mathieu, Gilson, O'Boyle Jr, & Cigularov, 2013) and Foster-Fishman and Keys (1997) who attribute empowerment to the vision of organisational leaders. As such, it is recommended that organisations promote and encourage their supervisors to engage in ethical leadership, leveraging on ethical leadership as a means of enhancing employee environmental empowerment, which in turn subsequently exhibits a positive effect on the extent of use of EAM. Organisations may endeavour to encourage ethical leadership through leadership training programs and/or the recruitment of appropriate 'ethical' leaders. Organisations may also consider incorporating 'ethical leadership' into their performance evaluation system to support and develop ethical leadership.

The study is subject to the typical limitations associated with the survey method. For instance, since the data for all variables was collected from the same survey instrument common method bias could be a concern. While a number of strategies were implemented to reduce this bias, future studies could employ other research methods such as case studies or an experiment to further investigate the relationships examined. In addition, while the three single-item measures used to assess the three levels of EAM were adopted from Phan et al. (2018) and have been empirically tested in recent studies (Baird, Su, & Tung, 2022; Baird, Tung, & Su, 2018; Nuhu et al., 2021), future studies could consider developing multiple-item measures to further enhance their reliability and validity. Similarly, future research may utilise an alternative measure of ethical leadership which concentrates on the environmental concerns of leaders as opposed to the much broader construct utilised in this study. In addition, while the study controlled for a number of factors, future research may consider alternative drivers of an organisations' decision to use EAM including their objectives, accounting system complexity and/or cost benefit analysis. Future research may also consider examining the moderating effect of specific organisational and environmental contextual factors that may affect the observed associations found in the study. Finally, future studies could consider examining the effects of employee environmental empowerment on both the extent of use of and effectiveness of EAM.

### Declaration of Competing Interest

There is no conflict of interest that are related to the production of this article.

### Data availability

Data will be made available on request.

## Appendix A. The results of an exploratory factor analysis for all variables

| Variables | Dimensions | | |
|---|---|---|---|
| | Ethical leadership | Employee environmental empowerment | EAM |
| EthicalLeadership1 | **0.710** | 0.198 | 0.203 |
| EthicalLeadership2 | 0.505 | 0.175 | 0.236 |
| EthicalLeadership3 | **0.777** | 0.107 | 0.053 |
| EthicalLeadership4 | **0.823** | 0.161 | 0.096 |
| EthicalLeadership5 | **0.835** | 0.111 | 0.131 |

*(continued on next page)*

(*continued*)

| Variables | Dimensions | | |
| --- | --- | --- | --- |
| | Ethical leadership | Employee environmental empowerment | EAM |
| EthicalLeadership6 | **0.822** | 0.154 | 0.072 |
| EthicalLeadership7 | **0.763** | 0.202 | 0.184 |
| EthicalLeadership8 | **0.783** | 0.214 | 0.155 |
| EthicalLeadership9 | **0.756** | 0.258 | 0.165 |
| EthicalLeadership10 | **0.824** | 0.205 | 0.159 |
| Employee environmental empowerment 1 | 0.162 | **0.749** | 0.254 |
| Employee environmental empowerment 2 | 0.214 | **0.710** | 0.253 |
| Employee environmental empowerment 3 | 0.199 | **0.744** | 0.225 |
| Employee environmental empowerment 4 | 0.199 | **0.795** | 0.246 |
| Employee environmental empowerment 5 | 0.139 | **0.795** | 0.213 |
| Employee environmental empowerment 6 | 0.269 | **0.775** | 0.166 |
| Employee environmental empowerment 7 | 0.236 | **0.693** | 0.317 |
| Employee environmental empowerment 8 | 0.126 | **0.695** | 0.448 |
| Employee environmental empowerment 9 | 0.093 | **0.777** | 0.345 |
| EAMuse1 | 0.144 | 0.314 | **0.903** |
| EAMuse2 | 0.135 | 0.283 | **0.927** |
| EAMuse3 | 0.145 | 0.315 | **0.895** |

N.B. Only those items with scores in bold were included in the subsequent CFA and final structural model.

## Appendix B. CFA results

These are the retained items after confirmatory factor analysis. The first item of each scale has no t-value since it has a fixed parameter in AMOS.

*Ethical leadership\**

Please indicate the extent to which you agree with the following statements (1 = strongly disagree, 5 = strongly agree).
My direct supervisor(s):

| Items | Loadings | Standardised error | T-value |
| --- | --- | --- | --- |
| Listens to what employees have to say (item 1) | 0.728 | – | – |
| Conducts his/her personal life in an ethical manner (item 3) | 0.727 | 0.062 | 14.482 |
| Has the best interests of employees in mind (item 4) | 0.810 | 0.067 | 16.254 |
| Makes fair and balanced decisions (item 5) | 0.834 | 0.067 | 16.784 |
| Can be trusted (item 6) | 0.815 | 0.071 | 16.376 |
| Discusses business ethics or values with employees (item 7) | 0.785 | 0.068 | 15.744 |
| Sets an example of how to do things the right way in terms of ethics (item 8) | 0.805 | 0.066 | 16.158 |
| Defines success not just by results but also the way that they are obtained (item 9) | 0.791 | 0.067 | 15.860 |
| When making decisions, asks "what is the right thing to do?" (item 10) | 0.854 | 0.061 | 17.205 |
| | | | |
| Goodness of Fit Statistics | | | |
| CMIN/DF | 1.897 | | |
| GFI | 0.974 | | |
| AGFI | 0.956 | | |
| RMSEA | 0.047 | | |

\*Items 2 "Disciplines employees who violate ethical standards" was removed due to low factor loadings.

*Employee environmental empowerment*

Please indicate the extent to which you agree with the following statements (1 = strongly disagree, 5 = strongly agree).

| Items | Loadings | Standardised error | T-value |
| --- | --- | --- | --- |
| I actively comment on environmental management (item 1) | 0.770 | – | – |
| I am aware of environmental management practices (item 2) | 0.745 | 0.056 | 17.295 |
| I have the opportunity to actively participate in the development of new environmental management practices (item 3) | 0.777 | 0.065 | 16.409 |
| I am involved in discussions in relation to the effectiveness of environmental management practices (item 4) | 0.835 | 0.063 | 17.813 |
| I actively participate in the development of environmental management practices (item 5) | 0.796 | 0.065 | 16.805 |
| I influence workplace outcomes regarding the way general principles are followed (item 6) | 0.804 | 0.064 | 17.116 |
| I regularly make decisions that affect the ethical climate (item 7) | 0.755 | 0.065 | 15.852 |
| I participate in the strategizing of environmental management practices (item 8) | 0.764 | 0.065 | 16.042 |
| I participate in the management of environmental management practices.(item 9) | 0.817 | 0.065 | 17.433 |

Goodness of Fit Statistics

(*continued*)

| Items | Loadings | Standardised error | T-value |
|---|---|---|---|
| CMIN/DF | 1.841 | | |
| GFI | 0.976 | | |
| AGFI | 0.954 | | |
| RMSEA | 0.046 | | |

*Extent of use of EAM*

Please indicate the extent to which the following statements describe current practices in your organisation (1 = not at all, 5 = to a great extent).

1. our organisation identifies and analyses the activities with potential environmental impacts involved in producing goods and services.
2. our organisation identifies and calculates the costs of the activities with potential environmental impacts involved in producing goods and services, for the purpose of identifying the factors which influence costs.
3. our organisation identifies and calculates the costs of the activities with potential environmental impacts involved in producing goods and services, for the purpose of enabling a more accurate assessment of the costs of each product.

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